

Development of a Global Change Monitoring Portal

Shayna Carney: Good morning or good afternoon, whatever the case may be. Welcome from the U.S. Fish and Wildlife Services National Conservation Training Center in Shepherdstown, West Virginia. My name is Shayna Carney and I'd like to welcome you to our webinar series held in partnership with the U.S. Geological Survey's National Climate Change and Wildlife Science Center in Reston, Virginia.

The NCCWSC Climate Change Science and Management webinar series highlights their sponsored science projects related to climate change impacts and adaptation and aims to increase awareness and inform participants like you about potential and predicted climate change impacts on fish and wildlife. We appreciate you joining us today.

To start things off, I would like to welcome Emily Fort, data and information coordinator with NCCWSC, who will be introducing today's speaker. Emily...

Emily Fort: Thanks and thanks everyone for joining us. We're really happy to have Cari here today. Cari Furiness is the research associate in the Department of Forestry and Environmental Resources at North Carolina State University.

She received a Bachelor's degree in General Biology from Cornell University and a Master's of Science in Forest Ecology from Duke University. Cari has had the privilege to work on a broad range of research projects while at NC State focusing on issues such as air pollution and projects related to sustainability of natural resources and climate change.

She has played a long-term role coordinating precipitation monitoring sites in North Carolina as part of the National Atmospheric Deposition Program National Trends Network. Cari is working in the Southeast Climate Center to develop a centralized portal of information about environmental monitoring data resources that are relevant to assessing climate change in the Southeast. She will describe that project today. Take it away, Cari and thanks again.

Cari Furiness: Thanks for that introduction, Emily. Good afternoon and good morning to all participants. The presentation today is going to describe a project that's been underway in the Southeast Climate Science Center.

The name of the project, as you can see here, is "Development of a Global Change Monitoring Portal." We've undertaken this as a pilot in the southeastern U.S. A bit of background. The Department of Interior established a network of Climate Science Centers across the US with the U.S. Geological Survey as the lead agency.

Each CSC or Climate Science Center, is hosted at an academic institution. In the case of the Southeast Climate Science Center, it is based at North Carolina State University as the host institution.

That leads me to acknowledge my partners in the project, Jerry McMahon of the USGS, who is the federal director of the Southeast Climate Science Center and Damian Shea, who's the former lead

PI for NC State at the CSC. I'm based in NC State working within this Climate Science Center partnership.

A brief overview of my structure of this webinar is here. I'm going to cover briefly the objectives and the goals of the project, and the approach that was used to develop the database and design the user interface and portal. The real meat of the webinar is going to be a live web-based demonstration of the Global Change Monitoring Portal.

I want to apologize in advance to any online participants if that causes any issues with bandwidth or what not. But I really think it's the best way to demonstrate some of the features and functionality of the portal. Then, we'll hopefully segue back to the presentation for a summary of next steps for the project and then answer any questions.

This project developed to address a problem that emerged as a common issue among partners as the Southeast Climate Science Center developed its science agenda. The real issue is that no one really knows who's measuring what where.

There's a lot of climate-relevant data being collected but not much of it is easily discoverable or accessible by interested scientists and managers. Our goal is to pull together information about a broad range of measurements in a maze of a broad range of ecosystems across the Southeast and to create a centralized database that's as comprehensive as possible.

I think this comprehensive aspect is what separates this project from some other very good efforts, but that pulled together information in a more ecosystem-specific or media-specific basis. I want to emphasize here too, that our intent is not to portal data in this project, only metadata, but provide information on data access. That will enable users to connect with these data resources.

This project is related especially to the Southeast Climate Science Center's mission to characterize the effects of climate change on land, water, and wildlife.

We are not directly including information on cultural resources in this project, but the types of environmental data that are incorporated in the portal are relevant, certainly, to effects on and management of cultural resources in the Southeast. This project is also shaped by the needs in the Landscape Conservation Cooperatives as the primary partners and stakeholders in the Climate Science Centers.

You can see here in this graphic how the Landscape Conservation Cooperatives, or LCCs, fit in the landscape of the Southeast. I'll mention that we also are including the Caribbean, which isn't displayed on this graphic. One of the missions of the LCCs is to develop and monitor shared landscape-level conservation strategies.

This schematic gives an overview of the basic steps in our development process.

I'm going to cover each of these in a little more detail in the next slides, but briefly our steps were to compile, based on our current knowledge -- and a fair amount of legwork, I guess -- an inventory of what we know about monitoring resources in the Southeast at this time, define our region of interest, and then develop a scheme for classifying the metadata or information that we thought was relevant about each of these monitoring resources.

We developed a pilot database and user interface, had that reviewed, and iterated in that step a few times. Now we're at the stage where we're going to populate this now production phase, public-facing prototype, which became available at the end of the spring.

This shows where we currently are in that development process. It shows that we're taking this evolving list of monitoring programs, which currently has a little more than 300 programs on it, gathering specific, defined metadata and information about their measurement sites, and then populating the database.

We currently have about 49 programs in the database that represent about 40,000 measurement sites. At the same time, I'll mention that we're also identifying other monitoring resources, observational networks to add to this compilation and then potentially feed into the database.

As we've gone about this, we obviously are not starting from scratch. We're capitalizing on some other efforts undertaken here in the Climate Science Center and also those of a fair number of partners. There's a list here of some of those, both groups that have undertaken this, and then some of the existing data portals that we're trying to harvest from as part of this initial effort.

I'll also mention too, that we're defining "monitoring" rather broadly in this case. We haven't developed specific criteria for length of record, for instance, or the geographic extent. This allows us, hopefully, to incorporate some smaller projects, with the thinking that these data resources may be or may become relevant as either baseline conditions or just in conjunction with a larger suite of networks on the landscape.

As I mentioned, we currently have this working spreadsheet of more than 300 monitoring programs that are in the hopper for potential inclusion.

Our next step is to define our region of interest. We necessarily tried to constrain it to the Southeast. You'll see a little more about that when we get to the portal, but you can see here that this does show the Caribbean LCC geography on this map. This encompasses all of five LCC regions and part of a sixth.

We then developed a classification scheme for the information we had gathered for each of these programs. This was actually one of the more challenging aspects of the database design.

Because they tried to develop a system, a scheme that would be broad enough to describe types of observational data that are collected by a disparate set of networks. But give enough of a level of detail that would allow users from those different disciplines to find programs and data that were relevant for their purposes.

This gives a layout of what that measurement or classification scheme is. You can see that in media, we characterize them by the type of media, the abiotic component of the ecosystem in which a measurement is made, as air, land and water, pretty broad-scale classification. Then within those media, what category of ecosystem property is measured, either biological, chemical or physical.

Then within each of those measurement types, some fairly broad categories of parameter types. Because some of these categories are fairly broad, we've tried to provide both some definitions and

examples to guide a user and hopefully be able to find, search for data that are relevant to a particular user.

We do have the ability in this database to add or revise those parameter-type classifications, if necessary, as we add more networks and we see that we may need to modify that.

In addition to information about what types of measurements are made by a particular program, we're incorporating information to the best of our abilities. If that information is available, about where measurements are actually made.

We've developed some classifications that would hopefully provide a means to allow users to find the data that are relevant, based on where those measurements might be made. These also provide the basis for search criteria within the portal.

Up-to-date, obvious categorization. We also have categorized them by the LCC, which those measurement sites fall into, and have assignments for the level three eco-regions and for eight-digit hydrologic unit codes (HUC).

OK, so using 10 monitoring programs, which we tried to select from a broad range of monitoring types, we developed a pilot database and user interface and worked with a really great development team that's based at the USGS Fort Collins Science Center. I think a couple of them may be on the phone, so if we have any hard questions, I'll quickly punt to them.

We then had that pilot database reviewed by a group of stakeholders in the region and monitoring program representative and did some iteration on that, as I mentioned. Now, I have a site which is public facing and in production phase.

We're now at that stage, as I mentioned, of populating the database with additional monitoring programs and sites, and getting feedback, hopefully, from additional users about those things that should be in the database and ways the database might function better or the portal might function better.

Now, I am going to move to a demonstration of the Global Change Monitoring Portal. Hopefully, this will work and demonstrate some of its features and functionality. Hopefully, you're seeing this home page of Global Change Monitoring Portal. You may or may not have noticed that the URL for the portal has been on all the slides. Hopefully, you've memorized it by now. But if not, there it is again.

I'll just walk through some of the features here, so that it can hopefully give you an idea of the way the interface works and some of the functionality. Starting at the home page, we have a sort of general overview of the project and some general information about the database.

There's information here in this Updates / Adding Programs section. That is one of the more important aspects of it, which tells about how you can provide information about either updating some of the information you see in there, or adding additional programs.

I currently am funneling that information. We don't currently have ways for other users to actively enter information, either online or otherwise. But we've developed some simple spreadsheet templates that I can send you and hopefully provide additional information.

Also, we'd point out that the information in the database is not dynamically updated. Right now, we've sort of taken the snapshot approach at this point, though it is updateable. But we haven't developed web services or some such. We're really not taking that on at this point. But that may be in a future development, perhaps.

I'll just note, too, that this main, this is not our live map but it clicks through to our main map.

Just talking through some aspects of the navigation here. I guess one important element is this Dictionaries link, which is sort of a centralized location for information related to some aspects of the database, especially this dictionary of terms. So that you can hopefully find information giving sufficient detail of a term if you're not certain how it might be being used and some examples.

We've tried to actually link some of this information directly throughout the portal. But this is a centralized repository for that type of information.

Also have information here on acronyms that are used, that are sometimes arbitrarily assigned to some of the monitoring programs. Those, again, are linked throughout the portal.

The organizations that are sponsors of some of these monitoring programs. We also have a dictionary here of just a simple HUC assignments, the English language labels and the HUC numbers.

Also have here a link that goes directly to the Southeast Climate Science Center, which I won't click on because that opens a direct link into our home page -- if you want to get more information about that -- as does this link on the navigation bar. Then we have a contact page, so you can hopefully not miss the fact that you can send information to me at any point in time.

Continuing on, I'll start here at the Main Map, which gives several options to visualize some of the geographic features of the portal. I'll point out that this has an Esri map interface, as you can see here. That allows a user to switch basemaps among some of the various Esri products. If you prefer a specific map to visualize on, you can make that assignment.

You can see that we also come here into a map of our predefined GCMP region, which you can see there also includes the Caribbean. On this map, you can superimpose the different layers, geographies which our measurement sites are assigned into. We have the states. We have the LCCs. You can display ecoregions.

Sometimes there's a bit of a lag. When you get to appropriate magnification, it will display the labeling, and likewise for the HUC boundaries.

I would also just like to show you here the fact that, you can also see in addition to the general geographic displays, you can also display on this map all of the monitoring programs that are currently in the portal. That shows the whole list of those, noting that these are just the acronyms for the sake of display purposes. With a mouseover, you can see what the actual monitoring program name is.

You can actually display all of them on the map, the whole population of monitoring things that are in this geographic region. You'll note that they are color coded by the media type in which the measurements are made -- air, land, and water -- and then a multiple media coding.

On the map, you can click on any of the monitoring site icons, or dots that you see, and get some basic information about that. This is an attempt to get some basic, general information about that site. If, in looking at this geographic representation, that looks like a point that you would be interested in, you can pull up some general information about those geographic assignments here and then go directly to information about that site or information about the program that that site is associated with.

I'll go back up here. It would be easiest to see. One of the other features of this is instead of showing all of the programs -- which fills the map at this scale -- you can display, at different magnifications, the different...you can layer on different monitoring program measuring sites to get an idea of the range of geography that they cover and see if that merits delving in further.

Moving on, we'll go to the Browse Programs link, which is the main summary display of programs that are in the database. You can see here that this has general information about the sampling purpose, program name, who sponsors it, the classifications of the types of measurements that they make, information on sampling frequency, and what timespan that they have collected data on.

This also gives an idea of where that monitoring program makes measurements, keeping in mind that in some cases they make measurements in a much larger geography than our region of interest.

This, conversely, gives you an idea of the actual number of sites that we have registered in our database that we have information for, that we've gotten coordinates and some measurement information for.

Other features of this display are that these columns are sortable. If you wanted to just look at them and sort them by media type, say, you would be able to do that.

You also have here a feature that would allow you to jump to a program if you've been working with the database for a while and you don't need to do a browse, you just need to get to a program. You could do that here.

This has a text search as well so that you could shoot straight to an acronym of a program that you already know and then delve into it from there.

Doing that, I'll jump right into this program. This is actually the Program page for this program that I pulled out of the Browse Programs menu. This is the main set of information that we have pulled together for this monitoring program, the National Estuarine Research Reserve System, NERRS, which some of you are probably familiar with.

This has a general description and information about whether it's a currently active -- in some cases, it may be a historical -- network, the number of sites in the overall program, as I had mentioned previously, and the number of sites that we have in our region of interest, a point of contact, a URL for general information about the program, and how you can access data.

This also shows the range of parameters that that program makes measurements in. You can then have a map display of where they actually make measurements in our region.

From this, you can click to get a full list of the monitoring sites in our database from that program. You come here to this listing of all the lists in the program. It is a page-by-page listing, but you can click all the way through and then get some general information about the specific sites.

More importantly, you can actually download the full site list, as either an Excel file or a CSV file, and use it for printing or other manipulation or input to other databases, whatever.

From here, I'll give you an idea of what the site-level information looks like. These are the specific site details that have been pulled together for that particular site, some obvious things, and then a means to get back to the program.

Though notice that in our navigation in general, things open in individual tabs so you can easily get back to where you were. In this case, we have general information about the site and again those monitoring parameters that we saw in the program-level page, but also see those geographic classifications and where that site fits within each of those.

We have a map display at a higher resolution in order to see where that monitoring site is located. You can, of course, layer on your different geographic boundaries if you wish.

I would also point out, too, that we tried to also incorporate information about when the last revision to that information might have been, so that you can have an idea of how updated that information is.

Some of the main functionality of this, in addition to discovering and visualizing what types of information are there, is how to drill down to get at some of the data that's relevant for your needs, for instance.

We developed what we think is a pretty good search interface. This is our main search box. I'll point out that there's a help screen that you can open up. It can stay open while you're formulating your search, in case you need some additional guidance while doing that.

The functionality, I think, is intuitive. I will just run through a search to give you an idea of how that would look. Within this, you can choose either only by geography, only by measurement type, or both. You can also choose to search just by programs or by sites.

I will start here and just put in a pretty simple search. Within the boxes...Of course, those are an exclusive functionality. In this case, I would be doing a search for any sites that fall either in Florida or in Georgia.

Let's say I'd only be interested in the South Atlantic LCC portion of those states. I don't really care in which ecoregion or HUC they fall into, and I don't care about what media type it is. I just really want to know about biological measurements, in whatever media. Whatever type that you see here, you could also choose those.

Once you've put in your search criteria, you can click Search. You see that our search results come back with 11 programs. You can see this is the Browse Programs interface that we've seen previously. You can see the list of 11 programs that make measurements that fit those criteria.

You'll notice here there's also a Sites tab. By clicking on the Sites tab, you perform that same search for the sites that are associated with those measurements made by those programs.

This can sometimes take a bit of time, depending on how many sites we find. You can see in the case...I guess I didn't mention it with the previous...but with the results you can always scroll back up to see what your search criteria were so you hopefully don't lose track of what you've searched by.

You could potentially go back and, based on your results, go back and refine the criteria you put in for the search. When you do a site search, again you get a map since you're interested in locations. You can see here that our results are defined by both within the states of Florida and Georgia, but still within the South Atlantic LCC boundary which will display momentarily. There we go.

Other aspects of this I wanted to teach. In this case you can also download your search results in either of these two formats and go back to refine, change your search, clear individual selections, or your entire form and start over. That hopefully gives you a sense of what some of the features of this portal are.

I'll mention, like I said, we have 15...These search results are also displayed here as far as the overall search results. I will now try to go back to the presentation here and finish up with time for questions.

The next steps in our process are to continue to expand and refine this list of monitoring programs and observational networks that I've mentioned. This evolving spreadsheet of potential monitoring information, and use that list to continue to populate the database with information for additional programs and sites.

That involves basic drafting or getting specific information directly from a monitoring program, having them review it, and then requesting and getting specific site-level information for the stations where those measurements are made.

We'll make revisions to this information as it's brought to our attention, in addition to additions, like revisions. Then consider whether there's additional development of functionality that we might want to consider for both the database and the interface, the portal, within our project objectives and within our project budget, I guess.

Then use this collection of information to sort of contribute to an assessment of monitoring resources in the South East. Put this inventory in the context of the big picture of data needs for landscape-scale conservation and adaptation strategies, and basically how this information fits and where that might lead to assessments of monitoring gaps or other data needs.

Finally, consider if this is a tool that could be expanded to other Climate Science Center regions or other LCCs.

Again, here is my contact information. I would welcome any information about monitoring efforts that you don't see here and/or specific details of monitoring sites or other functionality you might want to see in this portal. With that, my contact information is there, and there's our URL again, and I'm happy to answer any questions.

Shayna: It looks like our first question, Cari, comes from Terry. Terry asks, "Who is creating the metadata records for the program and all the sites? Also, who is tagging these programs with the classification scheme so you can do all these great searches?"

Cari: Currently, we've taken several tacks. One is, if we have an outstanding offer of information, I will send a blank template. We've developed a classification scheme. In response to the second part of that, we developed that specific classification scheme in conjunction with several subject experts and a group here at NC State and some other partners.

It's me and a small group of folks who have been doing that classification of information, in consultation with a monitoring program representative in most cases. Alternatively, I've drafted something and sent it to a program for their review and then further input. Then we, and I've had a student working on it to some degree, just input it directly into our database.

Shayna: Thanks for that Cari. Our next question comes from Paula. Paula asks, "Will this also be accessible via the federal data clearing house, data.gov? If so, is there also protection from hackers trying to seek information they possibly shouldn't have access to?"

Cari: We have not made that connection in order to put this in the federal data clearing house. I guess the short answer is at this point, there's not direct protections against hackers. I guess I would say in some cases, and I neglected to mention that when I was showing that part of the portal, if there's proprietary information, say as far as locations of a monitoring site, we have a means to indicate a non-specific monitoring location.

If there's some concern about security or other proprietary information with regard to location, but we haven't really developed those direct connections yet, since we're still at this initial production phase. I'll certainly make a note about that and see what steps we should take.

Shayna: Our next question comes from Richard. Richard asks, "Does this site have Web services available, for example, REST?"

Cari: No, we have not developed that at this point. That's one potential further development that we would consider, but at this point, at this phase, the short answer is no. We are aware that these data that we're pulling in here are often continually updated and program networks grow. But we've, just within limits of our resources, decided to do a more snap-shot approach at this stage, and then look to that in the future.

Shayna: Adrienne says, "Great presentation, Cari. I really enjoyed it. Monitoring programs are designed with different original intent. Is the idea with the GCMP to rely on the context for each program to highlight the strengths, weaknesses, and intent of each program, or will the GCMP provide some guidance to end users on these kinds of things?"

Cari: I think at this phase, at this stage, we're not pre-judging, if you will, that, but really taking at face value a monitoring program's intent for monitoring. The idea is that if we have all of these data resources in one place, that leads to the idea that we can do some assessment of what types of information these provide and are they providing a type of information we need. I think some of that will come out, but it's really up to the user, I think, to delve into, "Based on the information I have, is this a data resource I want to research further, and then possibly access?"

We're not, again, portaling the data. We're trying to provide sufficient information about a data resource that a user could make the decision whether they wanted to go ahead and investigate further and actually obtain this data.

Shayna: She also adds, "Also for the search, will a capacity to search with a user-defined polygon or user-provided shape file be provided at some point?"

Cari: Yes, it may be that we can right now. That's not obviously part of the functionality, but that seems an obvious next step, is, "Here's my region of interest, and what's in that?" Yeah, we hope that we can potentially add that functionality at some point.

Shayna: Great, thanks. Our next question comes from Phillip Martin. "Do you use a standard vocabulary for classifying monitoring programs?"

Cari: What we've tried to do, is tried to adapt, if we can't adopt, standard vocabulary for recognizing that that vocabulary is different in different disciplines. I alluded to the fact that developing that classification scheme was pretty challenging, and we may not have it right.

What we've tried to do is categorize something with sufficient examples that if you're coming at it from a discipline of a water chemist you would hopefully be able to find information relevant to you, even if some of those terms might be used differently than by say, an atmospheric scientist.

We tried to use vocabulary that's consistent in different disciplines, but recognizing that there's inconsistencies across those disciplines.

Shayna: Another question and comment here from Nancy Green. "It looks like this is a very useful tool. For some potential users involved in species management, it would be even more useful to be able to search for monitoring efforts that involve specific species. Are you considering adding key words so that it would be possible to search by species names?"

Cari: Yeah, that is something that we've thought of, and in initial development we had considered using a system that would incorporate that. The short answer is yes. We're trying to figure out how best to tag some of these data resources so you could narrow down in that way. If that's some functionality that would be helpful, we would certainly see what we could do to try and incorporate some of the key word searches.

Shayna: Cari, what is your timeline on adding additional programs to the database?

Cari: We, as I mentioned, are in production phase now, so we're trying to pull in as many types of programs and sites as possible. I'm hopeful. Again, I have a list of potential sites or programs that I would love to get some additional information from. It's really dependent, in part, on if I can get site information from some of the monitoring programs in order to provide that site-level information. I'm hopeful that by the end of the year we would easily double, if not triple, the size of the database.

We know about a bunch of programs. It's a matter of getting sufficient information and review in order to confidently put good information into the database.

Shayna: Cari, It looks like that's all the questions I have chatted in at the moment. Of course your contact information or your email address is there on the screen, if anyone has any questions or wants to contact you. Did you have any final words or comments you wanted to leave the group with?

Cari: No, other than we've recognized that this is an initial step in what we hope could become a larger project. So would welcome input from anyone online or anyone that is not on the line, as far as additional monitoring programs and information about some of those measurement sites that we could incorporate into the database. So we're kind of depending on the users to shape this in part.

Shayna: Great, thank you for that. Emily, did you have any closing comments or words for us?

Emily: No, just a big thanks to Cari for a great presentation, and thanks to everyone for attending.