Please stand by for real time captions.

We are about to get started. Good afternoon welcome to the innovation and science technology seminar series. I am Carlos Milan Carl Lucero I am the host today's -- for today.

We have to presenters today, Dan Isaac and Mike Jones.

Both are within the Forest Service RND Rocky manned station -- Rocky Mountain station.

[ No Audio]

I am sorry, we are to serve the try what -- Forest Service strategy, the techniques can be applied to other needs as well, climate change or water commission framework.

Before I turn this over to our presenters, I would like to ask my colleague Michelle and give us some overview of what the strategy is all about.

Michelle?

[ Indiscernible-low volume ]

All participants in listen only mode.

Okay.

Thank you for the introduction and for allowing me to give a short overview.

I and Bush -- I am Michelle I am a member of the IMNA implementation team. I am an employee on the ecosystem staff resource group.

Jamie and I implement the IMNA strategy released in July 2013. Resolve of the work of the core team including individual from State Department for street research and development. Input from the US Fish and Wildlife Service, geological surveys, and national association of state Forest Service.

The Forest Service has the IMNA activities does not allow us to answer critical conservation questions. At the regional and national levels. These OGD tells the need for information that is integrated, aligned, effective and efficient. Involving agency priorities, climate change, vulnerability, watershed, restoration, requirements to monitoring and specimens and interagency reporting requirement.
We are pleased that we are included in the seminar series which challenges all of us to think outside of the box and discuss the most court research and innovative techniques. -- Current research and innovative techniques.

Before -- let me tell you how this will work. The speakers will come up and give a 30 min. presentation and we will have time for questions and answers.

Those of you online, we will put you on mute, there is a way to stay in contact through the chat room. We can ask Carlos Milan to give you instructions on how this works? Carlos?

Press start and the number 2, to speak. We will through the Live Meeting at the top left on the window.

Thank you Carlos.

I will introduce the two speakers, then Isaac. -- Dan Isaac. PhD for music -- from University of Wyoming. Mike Young also has a PhD from University of Wyoming.

With that, take it away Dan.

Thank you, great to be here and have the opportunity to talk about their projects we had going for several years, both Mike and I did work to build the foundation for the things we will talk about and show you today. I will talk about something we call national Internet, this project is simply a fact, if you add money that all state, federal, tribal organizations spent clipping data for the streams, quality data or biological survey data, we spent hundreds of millions of dollars collecting the data.

In many cases we have scratched the surface of the information we can get out of the data. Therefore an opportunity we had a national RFB last year, we are one of the two projects they funded. We will talk about what we will do for the national stream Internet. Aaron Peterson, Dave Nagal, Jeff Ver Hoe and Jeff Kershmer.

Another motivating factor is simply the fact there are more pressure on the natural world and resources, growing human populations and unfortunately drinking or of the budget there is a constant need to do more with less.

The 21st century will be transitional, there will be 1.5 billion people living in the US, the climate will change, where to invest the conservation resources to maximize bang for the buck? Having good information on worried -- on where to invest the resources.

You want consistent information across all lands and agencies seeking see the big picture. And precise information, ultimately doing things like adapted climate change will be through
effective hundreds of thousands of different projects people have on individual streams. Information that is broad but also precise.

What is the stream Internet? There is a lot of parallels between Internet we are married with and data system and information system we try to develop for stream information. The definition I use is network of people, data, digital information systems and analytical techniques that interact synergistically to provide information and Bill -- transmit the information to different parts of the country.

Data collected through the system every time you click on a webpage, something is monitoring the fact you did that, it goes into a Google server and database and you have high-powered PC the team up, they can market and so you -- tell you what you need.

We are trying to build a system similar to this, for the streams, all of the people on landscapes that work for whatever agency, they collected a lot of data. The information can flow into the corporate database, Forest Service has the resources monitor, PC a water quality, lots of different corporate systems. We want to gather the data that people collect, put it in a database. Once you do that their research can go in and create a lot of information from the data sources if it is organized and you can use them.

The information can flow back to the people to the field so they can manage the resources. There are several components to this that already exist in the key ingredient is something that emerges from the synergy between those. One of the ingredients is simply the fact that we have a nationally consistent geospatial stream database. This is a product, a EPA product. For every region the country, they calculated hundreds of different reaches, elevation, slope, percent of land-use etc. the all -- all of that exists.

An national Fish habitat partnership has done more on this framework, they develop more descriptors. All of that is available for every reach in the lower order needs,. Coordinates -- in the lower court in its.

-- Lower coordinates. This is odd this is the 21st century and we do not have these tools, they did not exist until recently. Something that the collaborators on this project, this is Jay and Erin, they have been develop a theory. The network structures of the streams and rivers.

They understand or embedded within the network it is important it affects the way in which information flows on the network. If you develop a valid model for something in the rivers you need to accommodate the network structure.

Like any other branch, these are a class of model. You can use them for water quality and genetic attributes that Mike will talk about later.

There is a lot of work getting here, it is a collaborative effort building on pieces out there in many cases. The lineage of how these tools go back to the EPA there is a need to develop the flow, functional, water basin streams. 4-5 years ago, the Washington office of the Forest Service had money that I was able to get. So they continue to develop statistical software. And there are
external grants, a bunch of different agency partners that play a role in developing the tools available for the data.

We had a national center for ecological analysis on the spatial statistics, that has been going on in parallel to this. There are papers that are coming out of at the end of last year and currently, that will talk about the utility of the tools. There is now free open source software resource models, that is published in the software, it is out on a website it is free and available for use.

The last major ingredient, there is a mountain of data that we have collected. Looking at the temperature data, discharge, water quality, other samples, there is just tons of thousands of points. To many times through the -- we have not organized the data in a functional way, we need to do to extract useful information. The fact that we have the tools that we can start to mine the database.

I want to run through one example we have -- how we have been doing this in the Northwest. This is not a conceptual thing, something that we can actually do, it is yielding a lot of value. This is the Norwest project, this is for the landscape cooperative system. The first step of the project and was to go out and talk to the different agencies that have been collecting the data in the Northwest, get a copy, centralized and get a resource that everyone can use. At the end of the process, we had the world largest temperature database, it had been scattered amongst hundreds of hard drives. It was not usable. We had more than 70 agencies contribute data to the project, if you look at the raw value of collecting the data, it takes something like $10 million.

It was not available, spending $100,000-$200,000 to organize the data were everyone can use it. This part of the world has a heavy footprint of the Forest Service lands, half of the database actually comes out of the Forest Service and the corporate data structure and system.

The idea in Norwest to use the temperature database on these statistical model networks, use the model to make accurate predictions on what historical climates have been sued get a status assessment of what the conditions are economic that to that private model to make the projections about the future. Building the maps is so how's everything it will give us a consistent status assessment and way of making apple to apple comparisons.

And in the process we will get high resolution climate for about 50 national forests and the lands in between.

This shows the performance scan of the model on the bottom right, looking at the typical sort of predictive accuracy received with these models on the database. Extreme temperatures we explain 90% of more of very ability in the temperature. And less than one degree of error.

Models allow you and observations you have the [ Indiscernible ] to use that to make a picture, high resolution on the landscape. If you wanted you that you can do so, you can repeat that at it another point and time, the difference between the two maps that is the Prince. -- print.

The first place we started with central Idaho. Just
Being the landscape -- just napping the landscape -- just mapping the landscape and looking at the status and making comparisons across them. This is the Western [Indiscernible] national Park ago this is upper Missouri. This is the upper [Indiscernible] and then mid-Columbia. This is something be called the BLOB it keeps on going and picking out information you get to the point you can make the high resolution scenario, it is something that 30,000 summers of data, Kojima did by hundreds of individuals working for dozens of different agencies.

For a perspective, there is a people on the core database team, it has taken us about 3-4 years, even with a small team you can do big things, this is a sense of what that looks like. The motivation for doing this, but her understanding the cold water fish vulnerability to the climate change. How it evolves in the future under different scenarios to get a much more precise understanding of what the thermal state will look like.

The papers that we will write we'll talk more specifically aware the cold water reference will be - - identify where those things are, that will give you on the ground doing the different projects and the habitat, things to work around. There are lots of things that we can do, right now, opportunistically [Indiscernible] to do those.

The Internet project is really -- build in the same digital infrastructural -- infrastructure nationally, we want to make that available everywhere so people are empowered with the tools they can apply with their own data set. There are three basic objectives, the first is developing compatibility between the spatial network stream and data set that EPA developed. Secondly updating the spatial themes, that is something that has been done. The software that people have used. Thirdly, host national workshop of the sky next year in Boise to engage people from various agencies and discussion about now that the tools are out, what do we want to do? Are there useful things that we can do? Just have the discussion.

The projects like Norwest done in the Northwest, those can be done more routinely, people will have the incentive to do the hard work to build the sorts of databases so they can get information out of those. Using the stream Internet will be relatively easy all a person has to do is just organize and develop a reference database for whatever attribute they have, go to the website, the software can run the models for free. And we want them to grow the community of users associated with it. We have have a website up for 1.5 years, we had 14,000 site visit, software has been downloaded 500 times, it shows the location not just within the US but globally were people come to the website to get information. There is a hunger out there for this sort of thing for the data.

Grow the database we do the annual training workshops we will have a second one in Boise Idaho. We have more than 100 people signed up from across the country coming to Boise or attending through the webinar. One guy in Egypt will stay up all night to get a better sense of the tools and maybe someday we will have these things done on them -- the Nile.

We will always do more, there is opportunity to do more with [Indiscernible]

That is all that I have, I think Mike you are up next.
In 2003 Canadians suggested we use a genetic sequence to identify the animals. It was met with laughter, it turns out 95% of the animal species on the planet is hundred percent accurate. -- 100% accurate. You will go through a [ Indiscernible-low volume ] of the sequence.

You have the barcode library sequence, globally available to everyone right now. The international barcode is something like 10,000 fish. To go and see they have the access to the bank they have 150 sequences right now of the species. Once you know the sequence you know the conservation unit. You can use more sophisticated genetic tools, you can look at the adaptive traits. Identify biodiversity is one part, the other part is delineated but where is it in the map? You have to very broadly to get the entire species or group of species that at the level of their range.

You need to sample to make sure you do not miss the nuances of where those are located. Ensure your sample is not [ Indiscernible-low volume ] you can Mac -- map the conservation unit. They are biodiversity [ Indiscernible ] there are concentrations. The Northwest in general the Forest Service has a good example of what the network will look like. They monitor the network and they will show you examples of what is will look like.

First of all talk about the West slope cutthroat trout, [ Indiscernible-low volume ] a freshwater stream it is a state fish in Montana and Idaho. Widely distributed across the northern Rockies and Vicki percent decline in distribution. -- 50% decline in distribution.

It represents a single conversation -- conservation unit, they did not have the tools available to them to see if there was more than one conservation. We did have those tools available, we applied the barcoding to looking at the West slope cutthroat throughout the historical range. Through the two Canadian provinces within the US. We have the [ Indiscernible-low volume ].

You have to find things right here on the upper jaw, you need to know how many there are and on what row? these characteristics do not show up until they are adults.

[ Indiscernible-low volume ] the taxonomy is unsatisfying. [ Indiscernible-low volume ] British Columbia, all Burda, Idaho, Utah and Colorado. This fish has a lifetime range of 100 m.

Is is that moves like that is not going to have distribution. -- The fish that moves like that is not going to have distribution.

A lot of work has been done on identifying the species, if we sampled the network, what are we going to find, are we expecting to five real species? The conservation unit, at this level for this
group there is a level of different species. There are 12 on the map not 5-6 and they all have different names.

There is one species, I outline here [Indiscernible-low volume] it additional unnamed species, the idea held -- the ones and Idaho flow over and do not take into the snake River.

[Indiscernible-low volume]

The Clearwater River this was named as a species in 1932. This is not new, we did the genetic work on it and it [Indiscernible-low volume]

The Idaho and Washington, it is the version from all of the other [Indiscernible] and there is one up here.

My colleagues were able to describe this species in the last couple of months. I apologize for the name, the reason we did this this range overlaps that of the historical home Lane of the [Indiscernible] tribe. They came back and said would you name that after us? We said yes.

What we're trying to do is build the biodiversity portfolio for the Western United States, across the states and the species. We are starting out on working on the [Indiscernible]. Not only for the upper all of the freshwater fish. [Indiscernible-low volume] and that sort of thing we will be pro active. The first thing that happens we generate a sequence to find out the conservation unit, we can manage to work on these things. Prioritize where we are before the [Indiscernible]

[Indiscernible-low volume]

Everybody has the same method. It is locally, globally relevant. A district manager cares [Indiscernible] and the data is available at the University. Anybody can get to them at any time.

[Indiscernible-low volume] has dropped dramatically over the last decade. This has not been done yet which is surprising to me. It is so easy to do.

Once we have done de-identification were, the next step is to monitor and assess these things across the larger landscape, this is where the environmental DNA which is free and loose from the organism. The DNA within the water, we higher [Indiscernible] to the deck -- detect the manner of all of the species, optimize how we do this on a local scale, do a stream to detect the presence and how you look at the entire range of the organism. Look at the patterns, habitat, emphasize user driven applications so we send out what we want the environmental DNA to event -- to replace. We will send them kits and here is how you do it it will take 15 min. to collect a sample the cost $150.

The cost of doing this work relative to the traditional sample is usually pennies on the dollar.

[Indiscernible-low volume]
To determine whether the species is present or absent within the water stream. I will stop right here, now we are going to [ Indiscernible-low volume ]

Thank you Mike this is Carlos Milan we have a few folks online fund the national Forest Service I would like them to share their perspectives. John if you would like to press star and the number 6 to unmute yourself and then after you, Scott?

Hopefully everyone can hear me I am John I am the species program manager in the Region 6. I will talk briefly in regards to how we view determine its products. -- Tremendous products. Stream temperature database, there are download products one a map that shows you where the temperature information exists and more poorly where it does not exist .

-- More importantly where it does not exist for the word we have certain species what is the trend? Ultimately how is the management affecting this? A couple of species we monitor, cutthroat trout, and bull trout to determine where we have the temperature monitor going on and where we need to put the temperature probe so the graphs can fill in the temperature gap we have and we use the information to look at the very narrow temperature reaching of the species to predict they will be likely occur in the landscape. Using the information to better direct our sampling in the field, intensive electoral fishing over a landscape scale with limited resources this information really helped determine where we can do the sampling for both of the species.

Also we have a lot of buyers we know the temperature information

And do the follow-up monitor to see how the temperature is changing as a result of the fire burning Google as well as -- -- and some of the areas on the landscape. Another project is the model stream temperature, we work closely with Dan Isaac to use the information to predict temperatures with climate change and how they will change in various time frames in the future to determine -- the habitats that they occupy today versus what they will occupy tomorrow.

Provides a broad network of temperature reaching, the final thing I will say with regard to the temperature, this is a use it will be in the future, with the condition framework, one of the attributes is looking at have at it -- habitat fragmentation, based on water temperature, places that are too hot for certain species. Provides a tremendous landscape tool that we have never had before to be able to answer the question and rate that and come up with iteration on a framework assessment.

The last thing, the DNA, where do you sample for these when you sample you do not find the species always -- with the water simply can't make a detection we are not able to detect with other sampling techniques. I cannot say enough about both of the products there is tremendous potential and we have only scratched the surface.

Thank you John.

Scott please unmute your phone you are up.

We cannot hear you if you are talking.
These press star number 6 again.

You are not coming through, is Scott on?

Can you call in remotely, why don't we open this up to some questions and answers for the key speakers.

[ Indiscernible-low volume ]

[ Indiscernible-low volume ]

Thank you Michael, any other questions in the room?

I think Scott has figured out how to unmute his phone.

Scott you are on.

I am the Region 1 program leader and had the privilege of pleasure of working with both Mike and Dan for 4-5 years ago Mike -- Mike had the office remodeled and has been directly in the office we benefited from the physical one-on-one interaction. It has been a good run over the last four years.

This work has benefited us and we hope the work will go -- I will hit a few realities. Number 1 in our region although unit in the region are basically seeing a decline in the budget we do not anticipate that will change. Along with the budget we see unit realignment and capacity to maintain the unit specific monitoring is not feasible anymore. Some is not appropriate.

Some of the challenges as with most regions, large-scale concert EFA responsiveness, litigation is a huge thing as we respond to innovative projects to aquatic analysis, how world -- how well we know the system. And the effects of the activity, one thing we no if sound science German inventory of the physical and biological systems is done well. That can help us work effectively in the arena.

We worked with Dan and Mike and said -- set up the sampling read genes for the fish by the region wide sampling. This don't off as a physically-based habitat monitoring regime, across the interior Columbia or race and -- Columbia basin about every [ Indiscernible ] of federal land is out there. I worked with Mike to place the biological sampling pieces on top of that.

In conjunction we use samples to identify conservation units for managing and monitoring for diversity as Mike mentioned, I did a physician -- identification of units.

As we are hoping there will be great promise with the DNA sampling in terms of the range wide identification. Funding is decreasing, going out with a backpack electroshock or to determine the distribution of the bull Trout is a huge challenge. DNA present some great opportunities for the future.
As we fly the pieces we hope the work world we find the recovery and [Indiscernible] strategies.

To date we struggle with these sort of projects, I know they have been identified through the CFLA as one of the pieces of the acceleration restoration strategy. As we start pick off larger boundaries we need to get better at identified the true priorities are to spend the dollars. It will help us with smart organization of the unit, not everybody should have one of everything, we need to -- place people in the most important aquatic conservation areas. That is not always popular I think that is a reality that we will phase.

-- Will face. Gain and loss of the habitat units of interest, that is what we need to do we have struggled in the past, these broader applications that are consistent can be applied across geographic areas. We look for to working with these two as we move forward, thank you.

[Indiscernible-low volume],

you are familiar with Ryan and Chuck and the work of a deed -- work that they did with the reference temperatures and the landscape and so on? There is a tremendous amount of empirical data and the modeling -- the question came up. To what degree me you have taken some of the work that Helen Hawkins did, have you integrated that into your thoughts? Also can we get the PowerPoint presentation? At the end of this, please tell me how we can do it, thank you. That is all.

With regards to the Hawkins and Hill paper they published the stream temperature assessment for the whole country. Using a sparser temperature database. When you look at the predictor variable and the model a lot of times they are similar to the ones that we use, people that are doing this type of things they put thought into the budget and represent that any spatial equation that you can that make sense. There is commonality in terms of how we include the landscape characteristics.

The specific Russian that pertains to the reference I condition, something I think the spatial model or network or infrastructure we build our model on, there is tremendous amount of flexibility. There is a field of GO statistics and ways of getting the information. Those are really powerful, those are the sorts of things that we go into. What you have and the model and use the analytical approaches, there is a realm of powerful techniques. Extracting useful information, you would apply the same sort of question about what is the reference site. We can do this more powerfully that we have been able to do in the past.

Thank you Dan.

Joe responding to you, mentioned earlier the webinar is being recorded. We will put this session and all of the other sessions online, we have not identified a spot. Send me an e-mail, Carlos Milan I am on the Flyers for the e-mail I will make sure you get a copy. We will send out actual directions for where the webinar will be located online.
Carlos Milan? Is that correct?

Yes.

We will be having this -- at least the location -- you can get into this on the main page on the ND -- RND website. [Indiscernible-low volume]

That was Cindy Webb.

Any other questions online or here in the room?

Can you please come up to the microphone so people can hear you.

I have a question about the [Indiscernible]. Future maintenance and variations, have you thought about how you are going to do that?

Dan and I have thought about that a great deal, primarily with respect to the [Indiscernible]. One of the things we are working on is [Indiscernible-low volume] be able to draw a line around certain Watterson to see -- water synergies.

[Indiscernible-low volume]

At this point we think about what we needs -- need for the sure population and that will be a component of that. We have not thought much about that at this point, [Indiscernible-low volume]

Thank you Mike.

Other questions on the phone or in the room?

Not hearing any, the looks like the time is up, a thank you for participating in the webinar. Those on the phone and those in the room. We will have a follow-up session for in-depth discussion for Dan Mike and. If you want to participate, you need to call back into using the same phone number, we are moving to a different location. Those in the room these follow us to the other room.

This is Cindy Webb for RND this is one in a series of webinars we are putting on to bring in new science and technology to inform future inventory monitory assessment. -- Monitory -- monitoring assessment. We cannot do this the same way and get the kind of data that we need to address the rapidly changing environment we are working in.

This project highlights the need [Indiscernible-low volume] how do we use all of the data? Incher great it's so it is more useful as an agency? We collect a lot of information and try to do the integration is not an easy thing to do you. You are very commended on making this successful it should be a great mother -- model for other stuff. It can be done. Thank you very much.
Great work Cindy.

Thank you for Mike and Don for coming in, I mentioned that this webinar is over there is another one tomorrow as -- at 11 AM it will be on the conservation science tools. For the Forest Service planning. There is a flyer out for this, if you have not seen them they are also online.

We have another webinar on May 1 that will touch upon the Forest Service that Dan or Mike mentioned earlier, stay tuned for the next webinar. With that, thank you so much and we will talk to you soon. Met [ Event Concluded ].

-- [ Event Concluded ]