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Please stand by for real time captions.

Hello, everyone. This is Amy Daniels in the Washington office of forest service research and development. I want to welcome you to the June condition of the landscape science webinar series. We have a great talk lined up today by Dr. Bill Hargrove. He is of the Southern research patient and also part of the EFETAC .

He will talk today about the ForWarn tools, the cross cutting forest resource management and decision support tool.

Just to get us started, I will give you a couple of slides of introduction. Following the same pattern that we always follow up on these monthly webinars. I will do a quick orientation of Live Meeting so you're comfortable with the platform we are using. We will have the feature presentation by Dr. Bill Hargrove, which will last about 30 min. And then we will have 20 -- Q&A for 50 min. And then we would have data Spotlight . We can open the dialogue about data that might be needed or, in this case, coordination about climate structure.

Then we will close out the our with general announcements from anyone online.

Just a couple of slides of orientation about who we are. We are the forest service, within the US Department of Agriculture. The forest service is broken into three different branches and we are research and development, one of those three branches. You can see that our job is to provide the science and technology. We develop the science and technology and deliver it to the other branches of the forest service and also to state and private landowners.

We are located throughout the country. We are about 500 research scientists distributed across these regions that you see here on the map in different colors. Five regional research stations and 67 different labs and we have 81 experimental forests and ranges. We have 80+ years of forest inventory data, perhaps a signature program that we are best known for that covers 47 states.

Our research programs cover a broad portfolio from social science to to address -- terrestrial, interdisciplinary work, covering a broad for folio.

We have forest monitoring system in place that I mentioned, it is probably unparalleled in the world in terms of the archive of data and the spatial extent.

A couple of quick notes on the webinar logistics. This webinar is being recorded aircrew if you object, you can log off at any time. The global beaut is presently activated to reduce background noise so if you need to speak at any time, particularly during the question-and-answer session, press\*six\*62 unmute before doing that and I will be sure to remind you.

The Live Meeting controls, we will walk through that really quickly. At the top left corner you should see the attendees menu. If you click that, you can see the other participants on the line today. At this point we have 69 people online. I'm glad that you are all here. You can double-click the name of any participant and that will open a chat window if you need to have a private conversation of any sort or if you need to contact me.

Yuri the Q&A session, after Bill stock, we we use a Q&A box . I ask that you raise your hand. If you do not want to speak, you can type in your question and click the ask button. The preferred method is for you to simply open that Q&A box and raise your hand as you see highlighted here in the yellow circle at the bottom right of the screen.

That are the basics. As always, I will collect a little bit of data just to see who we have in the audience. Please respond to the poll questions. Lease select your affiliation -- please select your affiliation.

It looks like we have a largely federal audience today. In what region of the country are you? I keep waiting for someone from want to join us, but so far, that is not happened. It looks like we have a pretty good distribution, slightly more folks in the South East, which is to be except acted.

For the forest service on the line, please specify your deputy area. Great. And for the forest service research and development employees, what station are you with?

Anchorage, state office.

And the primary nature of your role and the organization where you work.

I am the Forrester.

Okay, great. Thank you for participating in the polls everyone. I will close the polls here and queue up bills slides.

Again, this is Bill Hargrove from the southern research station. He is part of the EFETAC . It spans the whole for service. The Easton forest threat assessment Center. He will talk about ForWarn, a cross adding tool for forest resource management and decision support system. This one 2013 interagency partnership award. Congratulations to Bill and the team. With that I will hand it over to you, Bill.

Press\*62 unmute self.

Hi, Amy. Can you hear me?

I sure can.

Thank you for the invitation. It is always a pleasure to talk about one of my favorites adjust, the ForWarn system . It is short for forest warning. The Eastern and Western forest threat centers of the forest service our leaders and is. We could not have done it without the rest of the ForWarn team which includes our colleagues at NASA space center, Space Ctr., Oak Ridge national Lab and UNC Asheville, as you will see.

Greetings from the beautiful Southern research Station in gorgeous Asheville North Carolina. I want to take a minute to thank Amy Daniels to set up such a cool seminar series. I am sure that I am about to struggle a lot to achieve the same standard that has been established by my predecessors. I do not know who this weird guy is in a loud shirt that we need to get him away from our nice sign.

What is this ForWarn system anyway? You can think about it as a eye in the sky essentially. A satellite-based system that is designed to recognize, identify and track forest disturbances. It covers the entire lower 48 United States, we are still working on Alaska. It generates new potential to service maps every eight days, even throughout the winter. I do not know what the heck I was thinking.

It detects all kinds of for services. It is 231 m resolution map size. It take significant ongoing cooperation from four different government agencies.

We had our official unveiling and rollout of the ForWarn system back in March of last year. But we were secretly, without anybody really knowing it, running the ForWarn system the entire time, since January 2010. This is actually our fourth season of operation.

ForWarn covers the entire lower 48 . We hope to add a Lasko as well, but that is hard. It detects every kind of forest disturbance you can imagine given this 231 m resolution, which is about 13 ASIC -- 13 acres Purcell. It is a fairly coarse resolution, but you do not have to disturb the entire forest itself for the disturbance to be detected.

You can seriously disturbed one corner of the cell or more lightly disturbed uniformly. This is not a standard off-the-shelf forest product, we generate this. In fact, we have three different types of disturbance maps, each emphasizing forest services of different ages. We see less than one year, less than three years and less than 12 years old. And I will show you the format just a second.

The ForWarn disturber maps are available to anybody during rush backfire the website. We call this thing the forest change assessment viewer. Most of the maps that I show you in this presentation are taken directly from our assessment of your. This is the website that you do not have to write it down because I will show it to you at the end.

The forest change assessment viewer is the main delivery. For all the help and for for one Quan --. It was developed by the University of North Carolina in Nashville -- in Asheville.

This is totally open, you do not need a user ID, a password, it runs on almost any computer that has a browser. Nothing is downloaded from your machine. It is very nonthreatening. If you know how to use the Google map interface, you can use the forest change assessment viewer.

It shows the three most recent products, as well as all the historical ForWarn products every eight days since January 2010. The most important thing of all is it shows a lot of other relevant ancillary maps. We have hundreds of maps that cover every subject billeted to forest disturbances, including insect, disease, Rob fire perimeters, tornadoes, everything you could think of.

The idea is that you can, after you pushback from using a separate -- assessment viewer, you will have a very good idea of what might have been the agent or agents that caused this particular forest disturbance. It is very egalitarian, democratic approach because we use the same kinds of tools here. People out there through the forest change assessment viewer can see the map at the same time the threat assessments to.

How does this thing work? It is not like magic. It is a very simple comparison between two things. The current greenness as measured by the MODIS onto satellites. The current greenness of the forest presentation and we compare that with an expectation we develop of what we expect to see from normal, undisturbed, healthy forest vegetation that grows usually at the spot during this time of year.

Now we compare this expectation we have with the current greenness that we actually see and we can see how if we got less screen -- greenness than we expected, that would be the basis for marking a particular location as gently disturbed.

There are location that have more greenness than we expected might represent vigorously regrowing or recovering presentation. This is how it works. The sickle comparison does two things. Current and what we expected. This expectation is developed as you will see in a minute from the historical data that we have.

One important when done hit the bottom is we mask the final product so that only forest it areas are shown. But since the beginning of ForWarn, we have used it to detect disturbances in all visitation. So it actually includes agricultural crops and rangeland forage. We have to unveil that very soon.

Every map I show you today will have the same unit and it is the percentage of what we expected. So if it is exactly 100%, we got what we expected. If it is less than 100%, then that is a potential disturbance. We will show those on the maps as greens, yellows and reds. If it is greater than 100% of what we expected, that must mean that there's vegetation recovery are somehow and we show that is a blue-collar.

One important thing to consider that is kind of a neat effect here is that everything we see is through the eyes of the vegetation. ForWarn will only show disturbance if it affects the plants and to the degree that it affects the plants. If there's a tree that falls in the forest and there is no one there to see it, ForWarn will still see a. But if there is no tree, we will not see it .

Here is a ForWarn map taken straight out of our viewer. This shows the tornadoes -- spate of tornadoes that ripped across the United States early in the 2011 growing season. What I want to call your attention to are these long parallel red and yellow cat scratch scars. Each one of these is a separate tornado from this tornado group.

I will call your attention to this one right here, we will zoom in on that one, and this is Birmingham Alabama. You can see that this tornado just miss Birmingham, went to the north of Birmingham. Unfortunately, it did not miss the city down here, which is Tuscaloosa. Now resume into the point where you can actually see the scale of the individual MODIS pixels . This is the damage shown by ForWarn from that track an Tuscaloosa on May 24.

You may say we can see these large tornadoes, but what about smaller disturbances? Here is one that is close to Kingsport, Tennessee that we saw in June 2011. This is a ridgeline, a south facing ridgeline effect and this was either a windstorm or a hail event, it is hard to tell. What I wanted to show you is that one month later, this area had substantially recover. It essentially leafed out again.

We see these kinds of ephemeral disturbances all the time. They happen and they get well again. We wonder if we're the only one seeing them. It really take such a regular set of synoptic observations at a very frequent time interval to steps that these kinds of ephemeral force damages.

Here is hurricane Irene. This is before on the left and after on the right. Here's the track of the storm. What I want to call your attention to is that we saw some forest services from Irene passing. But look up here. At the Astor compared to the -- after compared to the before. There was a drought event going on and the forest presentation in this area actually benefit from the rainfall that was brought.

It is very spatially dependent thing. Here is hurricane Sandy, much more recently. Landfall was right here. I think that track gamebreaker here, through New Jersey. You can see these forest damage all along the wind had. We do not know whether this damage was distributing lease and it was ephemeral or knockdown or more permanent, but we can look at more subsequent images to try to make that determination.

Enough about whether. Now I will take you to New York, Pennsylvania and here is Yuri. This is the Allegheny national Forest. By Midshipman August of 2011 is were looking fine. But we were very surprised by mid-September to see a bloom of a disturbance here. This was an outbreak of all Web worms in the Hickory Creek wilderness area. They verify these fall Web worms. In 2012, this area experience and even more superior and wider outbreak of the same fault Web worms right in this area.

We actually have three slightly different products, slightly different national maps in every eight day period. The differences have to do with the age of the two services that are mapped. If we developed that expectation, that normal, based on the short-term historical baseline, the prior only, then we are looking only at recent services.

If we use a midterm history baseline, going backwards to the three previous years, it shows an intermediate ages turbans. If we alert -- of her user long-term history baseline, everything that we have, then that shows all of the disturbances since MODIS Let me show you example of this. This is the Yasuo, Mississippi tornado track that occurred in 2009. If we look in 2010, with a one-year baseline, we see what we saw before, what we expect to see, which is is red and yellow skipping track of the tornado damage.

If we move to 2011, with a one-year baseline expectation, now the appearance is quite difference. Blue. Why? Because the normal has been redefined inside the tornado track. This is now normal after the tornado has passed. What we see now is the recovery, the vigorous regrowth, inside that tornado track. ForWarn is very easy to track these kinds of recoveries.

In the mail here national Forest in Oregon in 2011, there was an outbreak of a defoliation that we had not seen and probably 30 years. This pine butterfly. We use ForWarn, the aerial sketch mappers, flew this area and they drew these black lines to try to define the locations where the pine butterfly had defoliated.

We compared these sketch map area -- aerial delineations to the ForWarn map and I think they compare very well in most location. This is the pine butterfly outbreak in the national forest in 2011.

This is an epileptic slide, it is a blip comparison between a rather randomly selected July ForWarn image and the parameters of past wildfires. The point I'm trying to make here is that you can see the last signature, the lasting parameters including the effect of different areas from these old historical wildfires and any current ForWarn image . At least where it was affecting forests.

We can see the past signatures of these old wildfires.

There are two features of our viewer that I want to call to your attention that I think is really cool. One of them is called share this map. I user can be looking at a particular map composition and extent that he or she likes and you push this button to share this map button and it shows you a URL, a standard web address, and the user can cut and paste it into an e-mail and send it to someone else. Whoever they send it to, clicks on it and it launches the viewer showing the exact same ForWarn disturbance map that was viewed by the sender.

This is really cool and we have used it quite a bit. We use it to send information to ourselves, among to threat centers and this is how we issue alerts on the ground. And uses on the ground can ask us questions. It is a very good thing for facilitating communication and consultation. Now that we have a, I do not know how we lived without a.

Another thing that I want to tell you about is something we call past oximetry. The user can in the viewer click on a particular spot and it shows a list of all of the usual suspects, all of the insects and diseases that have been found by the aerial disturbance survey program near that spot. They are shown in the order greatest likelihood by the area -- the amount of area affected. The idea here is it gets resource managers think of all the possible causative disturbance ages that might be causing a particular disturbance in a particular location. It looks very well.

Usually the resource managers can say I never thought of that. May be is that when. It works very well to spur their thinking long.

Something else that we can do that is really neat and quite addictive as you can click on the map anywhere in the forest assessment viewer and wait a few seconds and you get a graph that looks like this. The vertical access is the amount of and DDI and the horizontal access is years. So we see 11 annual profiles -- each one of these is the profile of the greenness. You click on any location and you will get a 12 year graph of historical smooth and DDI green. This is very addictive and you better have a lot of time to waste because you will suck a lot of time and it is fascinating to do this.

This is West Virginia, Kentucky and Virginia. So a couple of tornado tracks here that were quite easy to see in 2012. What I want to call your attention to are these red spots. These are stripped mining locations in Eastern Kentucky. We consume in on all these, this is not a ForWarn image, this is an aerial for graph . Click down here and you get a graph that looks like this. It is quite easy to see from this history that the strip mining began in this location in 2007. We click over here, not too far away, we get this graph and it is quite easy to see from this one that the strip mining and it and the reclamation began in 2003.

These strip mines are an easy place to show how this chronology can monitor -- monitor but the disturbance and recover.

Now we are in Linville Gorge in North Carolina and I wanted to show you this. There was a burn in 2000, a wildfire and another one in 2007 started to recover a little bit from the first one. Then we got the 1/2 punch. Something happened here. A state change occurred in this ecosystem. If we go there today, it is quite easy to see with that state change was. You see the standing burnt bowls surrounded by invasive felonious, which is Princess tree. Is invasive plant ticket ventures of these sequential 1/2 punch, SQL Job disturbances, to gain a foothold and establish and takeover.

We did not run ForWarn for too long before we rely something really cool and that is we are not just measuring disturbance and district sense, but really looking at departure from normal. The cool thing about this is that we cannot just detect what I call the classical forest disturbances, we can also see other kinds of departures. The most interesting sort of which are whether departures caused by extremes of temperature, hotter than usual/colder than usual, and extremes of participation, wetter than usual/drier than usual.

All of Gleason show -- and let me show you these. This is a random -- I picked July 2011, this is the comparison between the US drought Monitor product and the ForWarn all lands for one product the same date. It does not matter which one you.. And area and a time when drought is active, the ForWarn image strongly resemble this US drought Monitor product. Why? Because ForWarn can monitor these types of drought disturbances just as easy as the classical.

Everyone knows what comes after drought, in 2011 we had wildfires. There were burns in these area. It was hard to see the wall far parameters which are usually very easy to see because the drought disturbance had already essentially pegged the needle. ForWarn was already showing us the severity of the disturbance that was caused by drought.

Here is a wildfire in Arizona that happened lot long after this. All I did was put the perimeter of that fire around the standard ForWarn image. This inset is an analysis based on a land set that was done to try to establish the current severity. The red areas are severe burns. Everywhere there is a severe area in the Landsat, it is already the start chocolate red color in of ForWarn image.

We already see the burn severity directly in the ForWarn product . In the -- and the ForWarn severity runts very closely to this land set.

This is a monthly series -- what I wanted to call your attention to, this is a wet swampy area, look at the recovery in the same year. It is a lot of water, a lot of nutrients here, light fuels. And there was substantial recovery of the fields within the same year that it burned.

Here is another example, this is Everglades. The honey very fire. By the end of the season, again, we saw a lot of recovery in the fuels. At least a recovery in the and DDI.

Here is a different way of looking at that Everglades picture. It was a 2002 fire. It looks like it's that things down a little bit. We are getting a lot more frequent wildfires in this Okefenokee area they we have in the past.

Here is Pagani Creek. This is the boundary Waters in northern Minnesota. This is a daily progression that and here is a ForWarn image. All we did was put that perimeter around the ForWarn image. There is a lake so there is a wind fire shadow from this lake.

There is that the commie fire in a larger contact. I want to call your attention to these disturbances in Minnesota and northern Wisconsin. These resulted from an early hard frost that shut down the end of the growing season prematurely and northern Wisconsin and Michigan. We saw this as a disturbance detected by the ForWarn system.

My colleagues here at the Eastern Forest Center has taken this reading of the past NDVI on a cell by cell basis to heart and has extrapolated this.

He will do a talk about this so I do not want to steal his thunder but I want to put in a plug for him. He has done something that is very cool. He has been able to, on a cell by cell basis, extrapolate, it -- him. Eight extrapolate the rate of recovery following wildfires for every cell in the wildfire. You can draw a map like this. Look at the legend on this map. This is how many years we believe are going to be required for the NDVI greenness to recover back to its full prefire extent.

Steve Norman in a couple of months, I think is in the fall, and the same summoner series, will be showing you these kinds of analyses for a number of fires. We actually believe that we can do this not only for fire, varies -- very severe disservice but mild disturbances as well. Projected years to recovery.

Here is Midshipman April 2012, last season . We alerted, close to the Mississippi Delta, we saw some action. They flew immediately and had a GPS in the heck have. They sent us the GPS TrackBack. This is what we like to see. This kind of information is we like to say.

Here is another example. This is the Western Smokies, there was a tornado the pastor here in 2011. You can see it as is blueline just underneath a yellow arrow here. No one seemed to notice this storm that we saw in 2012. We called it a tornado, it could've been a linear star -- storm event at sometime. Here's the Landsat, you can see the recovery from that tornado in 2011. Here's a line that is just as easy to see of the storm that we seem to be the only ones that track in 2012.

Here is another example. This is Bayfield Wisconsin gypsy moth. It is not a nuclear blast, total defoliation gypsy moth. The comparison here with the red and yellow polygons is from the aerial sketch mappers. If you look closely, you can see that there flightpath is in here as well. They come down here and do curlicues and go back and forth.

I think there is pretty good agreement and I think it was a challenge because this is a relatively mild -- but I like is this area over here that we detected, I think we can tell why they did not. They did not fly over that area.

Ironically, we do this for the whole lower 48 United States and we saw something right in our own backyard in June of last season. This is the Asheville watershed. You can see the pickles -- pixels are quite large here. It is important because it provides all of the drinking water, the municipal brick-and-mortar stores, for the city of Asheville.

We saw these disturbances there. I actually thought there were insect outbreaks. They were very concerned because you cannot spray pesticides on a watershed that is used for municipal drinking water. They asked us to have a look. We found foliage that is dark green and tattered. There we found a new flash of light green foliage. Here's the kicker. We saw these little scars always on the top size of the branches.

This is a signature that we realized of a severe is but very localized hailstorm. They were relieved because they did not have to put a pesticide down. The interesting thing to me is even though this is an intensively managed watershed, they did not notice that it happened. Now they're watching ForWarn very closely .

This is a map that we can never keep updated. These are all of the spots that we've seen things, we put things in our protocol to see if we should issue an alert. The red areas are where we did issue alert. And this is the map that we can never keep updated.

The ForWarn team was pleased to receive in October 2012 the Southern research Station award for science delivery. It was very flattering.

This season we have three new standard ForWarn products that we are adding in, for a total of six now. And we have also the new prototype assessment fuel. I will only talk about one of the three products. It is an early detect product. The idea is it should provide faster detection of new disturbances. The idea is to provides the earliest possible initial indications of new disturbances. Let me show you how works.

This is another picture of that state -- spate of tornadoes. This is Mississippi, this is Alabama, and Georgia. This is the image from May 8 and the tornadoes were late in April. What you were supposed to see here is nothing. You do not see anything. As is after the tornadoes but we did not detect the net. Why? Because we are using this maximum the causes up to a 24 delay.

When we use our new product, now I hope you can see, from the same a eight date, you can see what we saw before. These cat scratches. Here is that Tuscaloosa/Birmingham. The idea is simple. With the early detect, it allows new disturbances to be seen as soon as the atmospheric seeing commit -- conditions will permit us.

We also pleased to have learned that the ForWarn team was honored to be awarded the national federal laboratory Consortium interagency partnership award for 2013. They were amazed that we could heard the for agencies. We were very pleased of one that.

As is not a ForWarn image. This is an aerial photo. These great things that you see understanding that emergent corpses of hemlock trees that have died. If you click in this area and you get one of these history track so we are looking at. We have come to recognize this signature as a fingerprint, and earmark, and activity of the hemlock. This is a transition between a more Evergreen like signature to a more deciduous like signature that is caused by the lock -- loss of the Evergreen hemlocks.

ForWarn can see this is as clearly as it sees the wildfire parameters. This is that most recent fire in Linville Gorge. Here is the Blue Ridge Pkwy. and here is not Mitchell. This area right here is hemlock activity and mortality detected by ForWarn We got as soon at UNC Asheville to painfully digitize tiny black dots. Everyplace you saw one of those emergent debt hemlock corpses. We can take the hundreds of thousands of black dots and superimpose it on any ForWarn image. This is the winter of Faerber 2012. We see a very high degree of correlation between the standing dead hemlocks and the ForWarn disturbances.

We can do something else here that is really cool. I wanted to show you this. MODIS pixels are large and everyone is probably a mix of deciduous and evergreen visitation. We can do a trek and the trick is temp oral on mixing. If we think about that greenness of partly contributed by Evergreen trees and partly contributed by greenness from deciduous trees. And we think about the fact that it is only evergreen visitation that each location is contributing in the winter, we can quantify that amount of Evergreen and subtract the amount of ever greenness from the total NDVI for the rest of the year to estimate or partition the amount of deciduous visitation that is present.

This is a trick to separate and map separately evergreen and deciduous presentation.

We can go on from there to try and identify the decayed old trends enforce health. We have a linear regression to this 12 year sequence. Now the slope of that line, no matter how appropriate a linear regression was, will be interpretable as a long-term trend enforce health over that last 12 years. The only thing we have to do it is still 150 million times for every cell in the map.

If you look at the places that have negative slopes, that is places where the force have been declining. And places that have positive slopes is where the forest has been thriving. Remember we are doing this separately for evergreen and deciduous.

The cool thing about this is, if you think about the decline mass, to show the combined effects of everything. The good news is it is all in their. The bad news is it is all mixed up together in their. We are fascinated by these national Evergreen Drive locations.

It is reassuring to see that we see the southeastern United States, we see the northern Lake states and we see the Pacific Northwest, which are the places where our forest products industries typically located.

Here is Evergreen decline locations. We can identify some of these as well. Here is mountain pine beetle, various kinds of fire. We do not see much of Western North Carolina where I am until we zoom in. Here is Western North Carolina. This area is a Smokies. This is that Linville Gorge, the latest fire. But the rest of these areas are essentially a map of hemlock [indiscernible] mapped as this Evergreen decline.

I will give the same extent and switch true deciduous thrive. This is the same map. Let me bounce back and forth here. What you can see is the same places that are shown Evergreen decline from hemlock mortality seem to be showing some deciduous thrive, which is a suggestion that there's been some competitive release of one more deciduous species following the loss of the hemlocks.

We can look at those fires in Southern California again. I hope you can recognize that we see the same parameters, the same wildfire parameters, outlined as Evergreen decline. If a wildfire but only burned Evergreen, shows up as Evergreen decline. If it Perdomo labor deciduous, shows up as the surgery decline.

We can look at deciduous decline in Colorado and compare it to the sudden aspen decline as Matt by the sketch mappers in red. Ours is yellow. We can find deciduous decline shows sudden aspen decline pretty well.

We can apply hours across the whole US and when we do, the interesting is you think of Colorado as a poster child of sudden aspen decline, but we see the Lake states as actually having a higher proportion of aspen decline than the Western states. This may be because of harvest, that is another thing that may be different and distinct from sudden aspen decline, per se.

Winding down now, the ForWarn system is very good at detecting the occurrence and extent of deter -- disturbances. And also works very well for mapping the severity, both within a particular disturbance and across disturbances. What I am increasingly fascinated by is this ability to track and follow multiple year recovery.

I think that we typically -- typically we get a lot of emphasis on incur -- occurrence and severity but shorter shrift on recovery. I think the fact that ForWarn does all three well is a great tential significance to ecology and also to forest management. Why do I say that? I think the forest managers are generally pretty well informed about how likely a particular disturbance is jerker within therefore is. -- Within their forests. They are less able to efficiently want to find a long-term consequences of those disturbances. There is a missing back half. If we could provide that back half of the cost or consequences, it would go a long way toward permitting a made full risk and else -- analysis appears to force mentioned. Another was a likelihood of disturbances and the likely -- and the consequences of that disturbance.

If you're forest manager Larry Burns and it pops right back, then you do not need to be concerned. I think this is really cool because I think he really believes it is one of the rare places where pure forest ecology research and applied management overlap and I find that to be very exciting.

The goal of the ForWarn system. We have a proximate goal and that is to act as a smoke along for forest disturbances. The ultimate goal is really to convince forest managers to use ForWarn themselves to monitor their own forests. I am proud to say that ForWarn has become increasingly popular. It is going viral . We are just tried to keep up with it at this point.

It is certainly true that once we issue an alert and somebody verifies that the has been a disturbance, that maybe, converse. They typically become committed ForWarn users and cells. This is what we are really looking for. We want to establish a two-way to indication in a working partnership with forest managers across the United States to look over the shoulders and help them as they monitor their own forests.

Anybody who wants to collaborate, we are absolutely happy to have that.

I know that was quite quick. I have provided a link here at the top so that you can review the slides at your leisure. The second URL is a rather deep, broad, elaborate ForWarn homepage . You can learn everything you want to about the ForWarn system.

This third one is is the same as that one is that it adds FCAV . This is the viewer. I encourage you to play with it. I do not think you can break it up please do not take that as a challenge.

If you want to try the new viewer, you just add a 2. With that, I will give it back to Amy. If there is time for questions, I will be very glad to try and not answer them.

Great, thank you so much. That was a really great presentation. I love your enthusiasm. This is indeed a useful tool. We have a couple of questions already in the queue. Arbor read them off. I will just quickly review, at the top left part of the screen, hit the Q&A box. You can either type in your question and hit the ask button or raise your hand and then just speak your question by pressing start six by pressing start 62 unmute your line.

I will get started with these questions that we have in the queue. I see more people raising their hands. Can you specify the temp oral and/or spatial scale that designs the normal conditions?

It is a good question. That is the reason why we do not give just a single standard product. That is why we supply all three of these. You cannot specify a custom one, but we hope you will like the flavor of one of the three that we do specify in a standard products. Again, that is a one-year backward look. So you are comparing essentially just the prior year. A three-year backward look, so you are compared to a normal based on the play three years. And then the third one is everything we have, a 12 year normal. Again, the difference between those really boils down to the age of the disturbance. You see it in the one-year, then it is less than one year old by definition.

You can understand the reason why we did not simply define one normal that is the same for everyone and then force that down everybody's throat. You can imagine a Forrester who has been there for a long time and remembers that burned from 15 years ago and wants to see in the ForWarn map that burned 15 years ago. Or he or she will say I do not see this burned that I remember 15 years ago. You can imagine a different forest manager who is brand-new and really on top of things and we show them the back that has a burn from 15 years ago and they said that is old news. I want to see compared to a newly redefined model. I hope that helps.

Alright. Moving onto the next question. Are there plans to include metrics other than NDVI that indicate disturbance and recovery? I will read the next question as well. Is is available for Puerto Rico?

The question of what else besides NDVI is a good one. There are other metrics that are tantalizing. One is NDM I, a moisture index. And another one a disturbance index that has been developed and published for MODIS data. We are finding , though, for the moment that the NDVI history is so rich that I think it will keep us busy mining the NDVI iteration for some time.

The question of Puerto Rico and Alaska and even kind and wise is a good one. We are crawling before we walk. And walking before we run. We are interested in expanding to those places. Alaska, in particular, we have done some development work. But it is hard. There are high latitudes in particular, there are a lot of MODIS tiles that have to be glued together special throughout the entire allusion Jane. And clouds are the bane of everywhere -- and snow.

I can tell you that the fire's and the disturbances caused by insects are amazingly frequent and amazingly huge in the forests in Alaska in particular. I think we really do not have as an agency a really good handle on this disturbances.

So, help us and stay tuned.

Great. More to look forward to. How about it Mary Morrison -- press\*sick --\*six and speak your question. I see your hand raised.

While we wait to see if Mary is still on the line. When, if at all with the -- these remade to the public question

I am more to blame for having mapped only forest. The reason why is I believe that a shrewd forest resource manager who wants to know what his/her trees will be doing two is now would be wise to look at crops and range forage and what they're doing now. These are light oh by a mask or shallowly rooted and respond much more quickly in particular to the weather departures. Extremes of temperature and extremes of just rotation. They turn out to be the canary in the coal mine. The harbinger of what is to come for the forests. Have been working on this very hard. Part of the impetus for developing a new viewer, the forest change assessment viewer to, because it will contain a prototype masking capability.

Now the products will be delivered as an old Lance product. All terrestrial vegetation. And the users would be able to select among combinations of four masks. And they are not forced of area, which is agriculture, range nine, urban and water, but am only deciduous trees, predominantly evergreen trees and mixed forests. We are looking very forward to the ability -- to putting it in users hands to be able to apply and remove whatever masks they wish.

I will tell you another thing and that is our fellow USDA non-forest service rather in may be interested to know that we are doing this kind of disturbance reduction in crops and in rangeland. We may find, I hope, that we opened ForWarn to new potential audiences that will be interested in seeing these results.

Great, we will just take a couple more questions here. We are running a little tight on time. I see Mary Morrison's question appear. She is working on a force plan revision and she is interested in looking at historical disturbance maps. How difficult would it be to make a good -- historical disturbance map for her forest?

It is pretty easy. Will we have set up to use for that. If you want the maps, you need the maps and want to include them in your own analyses, we have web map services set up. There are two of these. A WMS and AWC's service and most of the state-of-the-art GIS is these days will allow you to contact our map server and you can automatically download and load into your GIS these maps. It does not matter that is the current ForWarn map or historical. Every map you can see in the FCAV is served by our map services. This is the mechanism that we hope you can use to download our ForWarn material into your own GIS for overlaying with whatever US are what you want to include in your force plan a revision or to do more analysis.

If you are interested in that go to the ForWarn webpage and have a look at data access. The data access tab has a lot more information about how to connect to our Web map services for downloading.

Great. I see that answers one of the questions that are up here. I will take one more question. What I would suggest is I would do the data spotlight and we can return for anyone who is interested in staying a couple of extra minutes and we will return to these and many questions. The final question I'll ask right now is for trend analysis can you select the date of the start or is the default 12 years?

If you are using the standard ForWarn product, you only have three choices that we preselected. The one year, three year and 12 year. We can easily provide you, again, to that Web map services a connection. The individual historical NDVI , the same data you would be getting if you did the graph for a particular cell, except this would be the entire map.

No, we do not have custom links of backward looking custom temp oral ranges. But you can still do it to our map connection if you do the analysis yourself GIS. How is that?

Great. Thank you. For those of you with questions remaining, if I did not get to you, please stay on the line if you're able to and we will revisit the Q&A session at the end of the hour for another couple of minutes.

We will move on to the data spotlight. This month I am grabbing the microphone here, this is a 5 min. session to just click over either data produced by the forest service spatial data in particular or [indiscernible]. I thought I would take this opportunity to tell all of you something that I'm working on. It is a little bit more targeted for the forest service researches on the line, but if there's anything of interest here and I'm using too much technical language in too many acronyms because I do not have a lot of time to talk about details, please contact me. I am happy to discuss any ideas or concerns or interest that you have this topic.

I'm talking about climate projections. This is a matrix, many you may have seen this before, I put this together over the last couple of years and represents all of the data modeling from the third assessment and fourth assessment of the IPC see, those generations of modeling.

You can see on the vertical access that I have organized this data by climate sensitivity, different category of climate sensitivity. On the horizontal axis, you can see the emissions scenarios. These gray boxes indicate the geographic coverage of a given data set.

All told, this is one of two summary gas. All told we have 150 downscaled time and production data holdings in our agency. On the lever of rigor in selecting data has varied greatly. The most common justification or selecting criteria used is simply that of availability. Folks say we use this data in our model because it was available or we get the data, collect.

So there has been a lot of concern about the lack of defensible data selection criteria or the lack of an organized or coordinated process. There is a group here in the headquarters, the Washington office -- it is a cross agency, it is enter agency land management added Tatian group or ILMAG. This group wanted to address the concern of lack of defensible data criteria and look for opportunities to more efficiently use the funding because across all agencies, we have spent an awful lot of money either doing repetitive work or storing cross-section data in multiple locations.

And then there is more practical driver to simplify the vast universe of choices with regard to how to select diamond ejections and what they mean and what constitutes a rigorous process for doing that.

The objective of this group, this ILMAG, is to address these concerns by developing journalized criteria or guidance. It could look like a decision tree to help facilitate using a standardized process for data selection.

The participating agencies are here on this slide. We are meeting biweekly and we are the managing partner agency. So forest service is a managing partnership agency and I'm the lead contact. How does this affect those of you in research and development? If you are research scientist, this may or may not directly affect you but it is certainly something that I wanted all of you to be aware of.

If you are a land manager then I think that ultimately as a downstream user of that information, I certainly would want you to be aware of this effort.

If you build decision-support tools, Hobley those of you who are research scientists, such as the ForWarn tool that Bilger spoke back, if your tool actually incorporates future climate then you should stay in the loop on how this develops.

Any of you with perspectives, experience our concern on this topic, there is always a lot of input whenever this topic comes up. Please get in touch and let me know so that I can represent your concerns in this group.

Just a couple of notes. About the status of downscaled data. This latest IPP Cindy -- IPP C generation of modeling, those downscaled data are now available. They are made available by the Bureau of reclamation at this website that you see here back in early May.

Just a quick comparison of the last generation archive of data versus the latest. There are a lot more models included in 5. So 37 compared to 16 global models in the last generation. The general approach for downscaling use by the Bureau of what planation, this is the only one that I am aware of that has been nationally downscaled and made available to the public in this time.

They use the pattern for the downscaling after what they did for 3, which as many of you are familiar with. It has been highly used within the forest service and the land management committee in general. As you can see, the downscaling techniques are the same for the monthly versus the daily data. The daily data is constructed analogue.

The technical report here that I refer to at the end, I would strongly suggest if you're considering using the stater if you want to know if it would be appropriate for you to step into this rail, please see this report. It explains how these model runs compared to the older one.

What is different about this latest generation of data is that the parallel modeling approach that was used. You can see on the left, in the past there was a linear process where emissions scenarios were first developed and then there were fed into climate models to get I'm a projections and then waited near the very end, after something of a long lag, you could actually use the data to evaluate impacts and develop adaptation strategies.

That was viewed as problematic in the last few rounds of the assessments. This time around they came up is -- with what they call a parallel approach. You can see how they rearrange the boxes. If you look at the colors of the boxes, you can tell they are rearranged in different shapes. They started with what was in common to both the climate modelers and the impact mollies or the integrated assessment modelers, which is the admission. Or, in this case, the new version of emissions scenarios which are called RCP's or representative coppers aspect --

These are curves of radiative forcing, meaning that the emissions are transformed into atmospheric concentration of greenhouse gases and then transformed into forcing levels. That is what -- here, these are the different RCP's. There are four main ones represented by numbers of forcing levels. It is more intuitive in the sense that the number is lower. You can do something of crosswalk to the old scenarios -- the fun after that which is totally unintuitive. You can crosswalk between these old guys and the new data over here.

The challenge of this, these representative concentration pathways is that remember I said we started in this round with what was in common. And essentially what this means is you have different futures resulting in this exact change forcing level.

The same forcing level can result in different alignments depending on many things such as what might be of interest to all of you on the line the spatial configuration of land covers. This is not accounted for in this modeling system. They look at land-use and land cover changes as a source of emissions that they do not consider direct forcing. What I mean by that is mainly albedo or the reflection so the spatial pattern of land coverage. If you change from snow to oriole forest, it has an impact on the albedo.

That is a challenge trying to match up this, which is being back model to Redrock leave -- retroactively fit to the forcing which is already to determine. Trying to map this, the assumed future and the resulting climate is proven to be quite challenging. There was a lot of work going on in the integrated assessment modeling community and the system modelers on that. You can read more about that.

Everything I wanted to point out is something new about this latest round of modeling is that there are near-term climate predictions. This is the only climate model experiment rent to date that were initialized with actual starting conditions and they are matched to the major climate oscillations that we study.

It can actually be coproductions as opposed to productions there is a lot of work coming out of this right now. They are far from being ready to use in any kind of support way but this is a movement toward the idea of addressing management concerns with the need for near-term, meaning the next decade or two.

Finally I wanted to say that is important to note that just because this data is not downscaled and available to public, available to riches, it does not mean that it is research data. The pattern larger correspondence with what we saw in 3 with a little bit of latitudinal shift, downscaling method itself appeared to Wetten the data relative to the native resolution. That is all for the new stuff. My point is I talked about the new stuff, we cannot forget about the last generation which is still really valuable. The new stuff is not anymore useful, it is not better data. This project that I've highlighted here, the homepage of the national climate predictions and projections platform, they are doing a lot of really interesting and meaningful evaluation still on the last generation of data.

We are really just now getting into the meat of what that means. For those of us on the user side of the equation in the land management community and elsewhere who are looking at impact. Do not necessarily turn away from looking at this data and think that you have to rush out and get the latest and greatest data.

With that, those are just some highlights of some of the things that I'm working on in the Washington office. If you have ideas, if you have a perspective that you think that any of this Effexor in a way that I need to be able to represent in this group as we develop a process, please get in touch.

With that, I see that I am now over time. I will return back, we still have 56 folks on the line so thank you for those of you sticking in there. I will return back to questions for Bill. It is not standard to have questions -- if you have questions about that or would like more a want a separate discussion on that, let me know.

For now, I will queue back up the closing slides.

I will just announce this. On July I will just announce this. On July 23, on Tuesdays as always we have mapping human ecological interactions of the land scope scale that she has done in the Olympic Peninsula in Washington. Please join us next month.

Now I can queue up the slides from Bill's presentation. If you have to sign off now, I want to say thank you for joining, thank you for sticking in there, little bit longer than usual. I hope that you will join us next month. Thank you to Bill for the great presentation.

My pleasure.

I will look back through -- having something of a lag here. I am looking back to the questions to see what we did not get to. Regarding greenness change in the deciduous evergreens, how did you account for height structures and areas where the tallest trees and conifer were under stories deciduous or vice versa?

That is a good question. We are actually doing some [indiscernible] work but that is limited to just the state of North Carolina. Your question is a good one. Greenness results from what the satellite sensor can see. Sometimes that is the over story, in the clays -- in the case of a closed over story. In the case of and open canopy, you are looking at secondary understory and even herb layer.

It is a mix. Remember that the satellite sensor is operating over this rather large motorist pixel and -- MODIS pixel and it comes up with a single integrated number four greenness that is average for this entire area. So we do not really know. There are probably many combinations of vertical forest structure that were result in the same, if not a very similar, value of greenness for that pixel. It is something that we cannot do very well. We hope that the averaging over these large spatial cells helps us in some way. Otherwise, we cannot really control that.

Alright. Keith has a question. You mentioned the weight of evidence of pros to assessing the cause of disturbance, how does that work from a users perspective?

That is a good question. The keyword in the forest change assessment your is assessment. We hope -- we designed the assessment viewer so that we provide lots of ancillary information. We realize that this is not an airtight conclusion but it is a weak inference, a weight of evidence kind of approach, so that given all of the stuff that you can see very easily in the viewer, you can get a pretty good guess most of the time about a first order attribution not only about the fact that there has been a disturbance, but some idea about what particular agent might be behind it.

That is what I meant when I said that. Of course, then we go to our protocol, we issue an alert if we think it is required and we do not really know until we get that all important feedback from the resource managers on the ground. That they look in the back 40 and they say you are right, there was a disturbance there and it was a big outbreak we have ever seen. We record this information and we dream of the day when ForWarn might be taken to a level that it could learn from its past successes and mistakes and to make a first order asked about what the most likely attribution of the damaged agent is itself.

In fact, that past proximity feature, you could view as the first trembling steps toward the direction of automated first order guesses about what might be causing this disturbance.

Okay. Can you view NDVI slime -- time series grass more than a particular cell?

No, we only have it as a drill down for one particular cell at a time. I am not sure how you do the visual interface for more than one at the time. I guess you could draw an area which is, but we have not done that. Again, this is where that map service might help you. For a particular area, Union get into GIS and connect to our map service and download those layers and do it yourself inside your own GIS. Bill Christie is a guy here at Southern resource -- research station and EFETAC is the guy who can help you with that after you reach -- after you read the page on the ForWarn webpage.

The last question that I see here is will the presentation be posted so that we may access the link to report?

As Bill already pointed out, I was but the last slide here where you posted the URL, Bill. He has already made it available at a time. -- I had of time. That is a web presentation and you click the light show at the bottom and you can go through all the slides at your own speed.

Write me if you have any questions or get great ideas or if you want to work with us.

Great, with that, I do not see any more questions on the box. I will post here a moment and see if there's anyone else on the line with comments or questions for Bill. You can hit star six. You can hit star 62 unmute. Give it a minute here.

Hearing none, I want to say thank you again, Bill, for a great presentation. Thank you for sharing this work and congratulation for both of your awards, the directors award and the interagency partnership award that this team has one.

We look forward to checking in on the progress with ForWarn That sounds great. Thank you very much for your invitation, Amy .

Thank you. Have a great day, everyone. Thank you for joining us.

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