Transcript - EPA Tools and Resources Webinar: EnviroAtlas the Eco-Health Browser

January 20, 2016

Lisa Matthews: I want to introduce our presenters today, we have Annie Neale with ORD's National Exposures Research Laboratory and she is going to be talking about the EnviroAtlas and we have Dr. Laura Jackson with ORD's National Health and Environmental Effects Research Laboratory and she is going to be talking about the Eco-Health Relationship Browser, so please mute your lines *6 for all those who've called in, and we will start the presentation. Annie –

Annie Neale: Ok thank you Lisa, and thank you so much everybody for joining us. As Lisa said, I am Annie Neale the project lead for EnviroAtlas, and I am joined by Laura Jackson who is also one of the deputy project leads for EnviroAtlas and is going to be talking about the Eco-Health Browser as well as EnviroAtlas. So if we can go to the first slide place – thank you – so we are going to be going over some brief background material about EnviroAtlas and what it is, and then we'll talk about the Eco-Health Browser we'll do a live demo and then we'll come back and talk about the things coming in the near future with EnviroAtlas and then we'd love to have a discussion and answer any questions you have. So, why are we building this? It's probably pretty obvious is that we're trying to provide resources to a number of people so that we can make better decisions. It's also to encourage a systems approach to decision making, our data and tools have become very useful to researchers as well as educators and our data are being used in many different research efforts across the country, especially those linking ecosystem health with human health outcomes so there is quite a lot of research going on in that arena with our data. Also typically in the past research results have not always been made readily available to the public and so with EnviroAtlas we are trying to remedy that by making things very readably accessible. Many of the data sets that we are incorporating into EnviroAtlas have public health implications, and so briefly about what it is - it's an online decision support tool which gives users the ability to easily view, as well as analyze and download if they want just a wealth of data and other resources and again it's really designed to inform decision making for use by educators as well as researchers. It includes maps or geospatial indicators of the natural resources providing benefits to humans, the benefits as well as the beneficiaries of those resources and then the drivers of change - so stressors impacting those services. It also includes a wealth of supplemental data, so information about land cover, about populations, about the way we build our communities, roads, impaired water, land cover, etc. and we will get into some of those as well. It includes analytic and interpretive tools and we're adding more of these all the time. The initial version of EnviroAtlas was released in May of 2014. We are improving it all the time, and we definitely use the feedback we get from our users to help drive where it goes in the future. It's a collaborative effort. It's being led by EPA but we also have a lot of organizations including other Federal agencies that we are collaborating with to build this tool. Everything that is in EnviroAtlas is organized around the seven benefit categories that you see on the screen. Again we are looking at the resources providing those benefits, the beneficiaries as well as the drivers of change. Next slide please. So again you see those seven benefit categories there and obviously every one of those categories has strong linkages with public health outcomes and so in some case the linkage - for example is recreation, culture and aesthetics perhaps we are providing data related to

health promotional services and if we look at things like air and water pollutant removed by neighborhood tree cover in communities then we're looking more at [what] has a buffering public health outcome related to these services. So again, every one of these services and all of the data contained within has got some explicit linkages with human health and wellbeing and some of those are listed on the right hand side of the slide there. So I mentioned that water and air pollutants removed by forests and tree cover, looking at mitigation of extreme heat events perhaps in downtown areas as well as opportunities for exercise, outdoor experience, social engagement, etc. Then also we can assess where [it is that] we have vulnerable populations because we do have a lot of demographic data as well. Next slide please. So the EnviroAtlas includes an interactive map, and we will show this to you, and within this map there are at least about 300 data layers that a user can just easily click on or off so that they can discover the data through this interactive map and then they can use this data. They can either download it or stream the data onto their own desktop if they want to or online application. There is a National component to EnviroAtlas. So we have wall to wall coverage for the conterminous US, and all of the indicators we are including on EnviroAtlas are summarized by a medium sized drainage basin so there are about 90,000 of those drainage basins across the US that we are talking about. There are also a number of data layers that are included in the EnviroAtlas that are there in their resolution that we originally derived them at which is typically 30 meters so for every 30 meters square on the ground we have a data point in EnviroAtlas. Then there is also this high resolution component where we are doing much more for selected communities across the US. We're starting out with 50 of these communities, right now there are about 14 of those published in the public facing EnviroAtlas. We start out with a one meter land cover classification for each of these communities so that we can really get at green space in relation to populations so where people are living, walking down the street, etc. So the map on the lower right there is an example of data layers there from Portland Maine. So in this data layer we are looking at the average reduction in night time ambient temperature, and that has been summarized by a census block group. You can see that's the yellow to dark blue so again looking at benefits of trees and reducing the ambient temperatures at night time and then overlaid on that is the population with income below twice the US poverty level so perhaps people who are less likely to be having their air conditioning turned on. So this is an idea of what the interactive map is within EnviroAtlas and we will show you that. Next slide please.

Laura Jackson: This is Laura Jackson, I'm going to describe the community component a little further. These are some example maps out of the hundred or so we have for all of our featured communities, we have the same data for all communities that we feature so they can be compared not only the information within a community by block groups or smaller resolution, but between and among communities across the US as well. So we are interested in communicating the state of the science about what kind of metrics have been linked to aspects of public health in scientific literature. We have health promotional maps as Annie mentioned for instance in which every point in the city at 1 meter resolution for all of our communities is classified as to the distance to the nearest park entrance. That's what you see on the left. Walking distance to the nearest park entrance because that has a lot of implications for children and elderly in particular for access to physical activity for interacting with others also for the opportunity to engage with nature. In the middle is an example of a hazard buffering service and the health benefits from that. This has to do with the tree cover reducing the nitrogen dioxide, which is then beneficial to certain hospitalizations related to respiratory diseases so we have

several pollutants removed by tree cover and health effect benefits that are estimated from those at the block group scale similar to in this center panel. On the right is another health promotional map it has to do schools in the community. In this case, Durham, NC was our first community that we developed and schools that don't have at least 25% green space within a 100 meter buffer around the school centroid so that's an indication that there might not be much green space outside window views from classrooms and the cafeteria. Our data are remoted sensed so we don't go on the ground and don't actually validate how many windows have what percent green space visible, but from aerial photography we are able to get a sense where there is not green space in a reasonable view-shed, and those might be block groups where officials may want to focus more closely on those schools and perhaps do some planting to increase the green space around classrooms. It has been related in many studies to school performance and mental health and other important measures for children. [Participant question] Just a real quick question- I'm having trouble since it's so small reading what the colors mean so is white better or yellow better? Well white has no schools in those block group. There is no data there because there are no schools there. No schools in the [yellow] block group have less than 25% green space in a view-shed around the school. Participant: So yellow is the best? Yes, yellow is the best and one school has less than 25% green space or two. We can make these slides will be made available and we will also show you the website where you can look and get more information to take more time to see perhaps a little better than is possible in this webinar. I apologize for that. So we also wanted to show a number of metrics that we do derive with the forest service that have a number of direct regulatory implications since we heard that was of interest from this audience. The criteria of pollutants that are regulated by the Clean Air Act are estimated at the community scale in EnviroAtlas and those are all the ones in green here. So the pollutants removed by trees all the different criteria of pollutants by the Clean Air Act plus the health implications of removing those pollutants. Cases avoided of asthma and school days missed and work days missed and those are converted also into dollar values. So this is a very powerful set of metrics that we get with our cooperation with the forest service and they in turn then use the EPA's tool Bend Map to derive the health and economic values. There is also water quality and quantity metrics that the forest service calculates for us at the block group scale. Many of these are relevant to TMDL's and other water quality management concerns. Annie mentioned spatially explicit data that go below the watershed and block group summary scales. So these are some examples of very spatially precise data available to you for free, for download, for use online. Up in the top left is what is known as day symmetric modeling of the population. So we take the census data at the finest scale available for population, which is the census block level and using models of where we would expect people to be absent, based on land use or land cover - like we know people aren't in water or on steep slows or in agricultural fields - we can map to the 30 meter pixel the probability of where the population actually is. That can be very useful for fine-scale kinds of analyses like people living around airports for example that might be subject to pollution or nuisance from noise if a big facility is being sited there can be a community data to get a more precise estimate of the population that would be affected. The lower left is mapping of vegetation and tree cover along roads in this picture. We also do streams so at the one meter scale you can see what roads might have pollutants coming off them or streams that need to be buffered from run-off from the land, where there are gaps in vegetation that could be filled in so the environment could help do a better job at filtering pollutants if it where restored in these areas where natural features are currently missing. On the right are what we call heat maps and they are created by looking at every single one meter pixel in a community land cover map and doing a circle around them. The top one [map] is where every impervious surface within one kilometer from every spot here, and

this is St. Petersburg, over into Tampa of what is the concentration of impervious surface and the darker colors towards red would be the higher impervious surface and these would be the hotter places in town where you might worry the most about extreme heat events. The bottom one is the inverse, it's a finer scale but its green space across that same area. So the communities that we are featuring that are currently have going on are listed on this map and Annie mentioned that we are headed to 50 in the next few years and we are slowly making progress on a number of them around the country – really trying to get geographic spread, and these are larger than municipal areas these are the census definition of an urban area. Like in Tampa for instance there are over a hundred actually little towns and larger cities that are included in the Tampa boundary so there is a lot of information there not just for people who live in Tampa proper, but who live in the vicinity so we try to get highly urbanized as well suburban areas characterized and data provided to hopefully get to the most users we can because we can't do the whole country at the community scale.

This is information about additional content in EnviroAtlas – it's not just maps although maps are really fun, very useful and we get a lot of downloads on our maps, but there are a lot of tools there is the Eco-Health Realtionship Browser that I'll be demonstrating in a moment, there's the ability to do analysis of the data in the maps, and there's watershed flow mapping. Every data layer has a fact sheet that explains where the data come from, recommendations of how it might be used, limitations of the data, who created the data and where to go for more information as well as a short list of references to find out more about the topic. There's an elevation mapper, we are developing curricula for classrooms we have a guide for using EnviroAtlas in health impact assessments. We are always working with potential stakeholders to figure out what kinds of tools and information might be the most valuable and most useful to include in our EnviroAtlas tool. The Eco-Health Relationship Browser is one of the featured tools we are talking about today, and it's basically a user-friendly front end to a massive literature review about everything that has been published in scientific literature on the relationship between ecosystem services, or lack there of, and the specific health outcomes. I wanted to give you a quick demo of this by going out of the slides and in to Internet Explore. So hopefully you all have seen that transition, are people looking at the internet now? [Yes, we see it] So this is the front page of Atlas, we'll give you the URL at the end, but you can see it up here. There is a lot of information here the two main apps in the atlas are the interactive map and the Eco-Health Relationship Browser and there's information on the browser and there's a little explanation on how to use it, we have a paper that substantiates what's in the browser, there's a demo to help people use it. We're going to launch the browser. I'll make it bigger so you can see it well. Basically it's meant to be an interactive information tool. People like to play with it, it's fun to see what's all in it. It opens up with Urban Ecosystems in the center but we do have feature 4 common ecosystems, forest, wetland and agro-ecosystems in addition to urban and the browser has 6 commonly researched and written about ecosystem services. It so happens that urban ecosystems have the potential to produce all 6 of these ecosystems services, so we have links to all of them around urban. Whatever is in the center there is a description about that feature on the side, and there are pop-up boxes for all of these linkages, the linkages from let's say urban ecosystems to water hazard mitigation (that could be flooding or drought) so the pop-up box comes up and in there is a summary of literature explanation of what urban ecosystems have to do with water hazard mitigation so this talks about gardens, urban forests, medians, roads, rain gardens it talks about how these can help slow water flow and storm water and filter it and there's a little bit about how

they regulate flow throughout the year to avoid the peaks and valleys of stream flow that happen when you don't have good infiltration and they help to prevent drought. Not everything in the world has been written about with this subject but it enough hopefully to give people a good sense of the topic and then there are citations about where people can go for more information. There is also indication of where in the world the information in our summary has come from in different studies. There's a bibliography online you can look for any of these citations right in our bibliography. You click on most bibliographies, if the journals allows, and there will be the abstract so you don't have to go to the paper, you can read about it right here. If you want to go to the paper you have the full citation to do that. So if we are particularly interested in water hazard mitigation, we can click on that and it will go to the center, and the slide bar now describes this topic and it does get into flood and drought issues. This one is a little long, there is a slider bar that should scroll down. I'm not sure about this particular one. So you can see all the different health outcomes that have been related flooding and drought and sometimes even how green infrastructure can mitigate these various health outcomes. For instance in we are looking at respiratory symptoms, this one is associated with too much water and mold can result and cause asthma and other respiratory issues. There are some you might not even expect – there's mental health issues. If you remember having experienced Katrina and other major storms, people are dislocated they have to move away and move jobs and families are separated, so there is considerable mental illness that is associated with natural disaster that result in severe flooding. All this is documented in here. You don't have to use the interactive bubbles if you don't want to, there is a pull-down menu you can go straight to things that interest you here. We have more than 30 health outcomes listed here – I'm just scrolling through in the pull down menu so you can see. Unfortunately we don't have a whole lot of time to talk about any one thing today. I think we would like to show you a little bit about the mapping application itself online, in which case we will go back to the front page of the Atlas and Annie is going to talk about the national mapping application.

Annie Neale: Thanks Laura – so again this is just the entrance page to the EnviroAtlas and from here you can get to all kinds of background information on the data, various tools, GIS tools and how the data were created, etc. As Laura said one of the main features is the interactive map, and we're going to go to that quickly and show that to show and show how you can look through all the various data layers. So Laura is going to open up the map. Here she has zoomed into the Great Lakes region and if you look across the top, all of the data are available through those first three tabs up there and then there are also some analysis tools as Laura mentioned and also some mapping tools. You can change the base map if you want to, you can go to a specific location from that location bar, you can also just look at all the data though the data layer matrix. We're going to look at ecosystem services and biodiversity tab for a moment, and if you go there you know we've been talking about national scale data and community scale data. If you open up either one of these you will see a table of contents for all of the data layers that are available to you to either look at or download or whatever else you'd like to do with them. Again all of data are organized into these 7 benefit category buckets. Laura has just opened up the Clean and Plentiful Water bucket so we'll just click on a data layer. Maybe we will look at impaired waters, so we will look at the stream length that has been impaired by metals. We know that this is something that has been in the news recently with the Flint, Michigan situation, and we thought we would open this map for a second. This shows the number of stream kilometers that are impaired for metals across the nation. This has been summarized by the mid-sized watersheds or drainage basin. The areas that are

yellow those are watersheds that have no reported impaired stream length for metals, going to the darker blue which is showing areas that have a significant number of stream kilometers that are impaired. If you look, there is an eye icon next to each and every data layer in the atlas and from here you can look at a short map description so you can get a better idea of what you're looking at. You can also access the fact sheet so Laura mentioned every data layer has this explanatory fact sheet talking about what you're looking at, why it's important, how you could use the information, and in general terms how the data were generated. Again, you can access that through that eye icon. Also, from there you can change the transparency, so if you wanted to look at the underlying map or if you wanted to look at satellite imagery or aerial imagery for example – you can zoom right into an area and look at that underlying aerial imagery at a very high resolution. You can also change the way a map looks, you can change the colors that show up on the map or the number of classes and the way it is symbolized, so there's a lot of flexibility there to change how the map looks. Again, there are about 160 map layers in the national component, many of which have public health implication. There's also a category there for people and built spaces. Perhaps Laura can open this table of contents and we can look at that. I apologize that the wording isn't larger on the screen but it's designed for somebody sitting at their desk using it, and when it's like that you can see very well what the words are. This just gives you an idea of some of the data layers available for looking at the make-up of the population so age, poverty level, total number of population, housing units that are built before the 1950's, etc. This is an area that we are expanding the Atlas into quite a bit and we will talk about that towards the end of the presentation about the things that are coming soon. If we quickly look at the supplemental map we can see that there are all kinds of data incorporated in this bucket as well, including as Laura mentioned the down-scale population data so there's this asymmetric data layer that shows you the density of people every 30 square meters, so that's a data layer that's available for the entire nation. There are analysis tools, one of which lets you look up and down stream another which lets you put a point anywhere on a map and it will trace the pathway to wherever the water would flow into a water body, which can be very useful for spills or for siting an intervention. Then there is the fine-scale, the community component that Laura talked about some of that in her slides. If we go back to the ecosystem services and biodiversity tab, Laura can pull up a couple of the community maps that she talked about during the slides.

Laura Jackson: Thanks Annie – So right now we have 12 communities listed here on our public website, and we have 6 more that will be coming by the end of the year. These listed here coming up are Des Moines, Iowa, New York City, Boston, Memphis, Cleveland and New Haven for 2016 and we will keep chugging away until we get to our 50. I wanted to show you some maps from our first pilot community, Durham, because you saw some slides earlier so the shape will be familiar. I also just wanted to show you how we use the day symmetric data in creating some of our maps. These maps for the most part are all researched based, there not just data we've found here and there from the census and other places to pull in serve here, for the most part we actually synthesize land cover data with hydrology data and climate models and other things to come up with original data layers that are products of EPA's Office of Research and Development and our collaborators that we make available to the public, but are things that are not available anywhere else for the most part. I wanted to point that out. I'm going to clear these maps. We want to look at Durham, and I wanted to show air data from Durham. It's interesting there is only water here, let me see if I can do a different city. We were talking about Tampa these are generally what you will see, the 7 benefit categories just like the national component which I'm going to

close. I wanted to show you some stuff about near road environments. It's very fine scaled and I wanted folks to see the level to which you could go down and use EnviroAtlas data in one of our featured communities. The first thing we can do is zoom right to that community, which is nice – here we are at Tampa, St. Petersburg and surrounding environments. We use the day symmetric to look at for example how many people are living within 300 meters of a major roadway. These are roadways with speed limits of 50 miles per hour or greater, so they tend to get more truck traffic and are busier, not entirely, there is certainly a lot of pollution and you can get traffic jams on other types of roads, but where the near road research is in general we tend to look at the busy roads that have a lot of lanes and high speeds and tend to have more vehicle miles traveled. We use the day symmetric data that we described earlier to summarize all the people who live within those 300 meters of one of those busy roadways on either side and summarize at the block group scale. So as a caller pointed out earlier if there are any block groups that are clear, there is nobody living there, but for all the others in this instance we go from not worrying as much in the upper part of the scale to getting more of critical concern as we go into the darker colors. People in the blue block groups have more people living near busy roadways. We can also do percent of a population not just the numbers, but the percent of people in the block group. I actually think the raw numbers are better for this – the actual count of people in the busy roadway. So what we often do is look at out of those people, are there more vulnerable populations in those block groups. (Music interruption) Here we are in Tampa, there is also a community tab for the people in built spaces so we don't just have national we also have community. If we want to look at other than white non-Hispanic, unfortunately often considered more vulnerable, we can look at the percent of all these block groups which is (zoom back into Tampa) you can see in the legend (you do have to zoom in pretty far to look at the demographic data layers because symbols must resize since they overlay the block groups) where we have the darker block groups, remember those were the most people living near the busy roadway, and where we have the larger demographic markers this is the greater percent of those populations that are other than those white non-Hispanic, so it could be that folks are disproportionately vulnerable, perhaps have more health issues of concern, maybe near road pollution could be more of a problem for these block groups. So it helps to screen and work down, and it's no replacement for work on the ground, but it does help zero in on where intervention may be the most appropriate.

I see that we are taking a lot of time, so I'm going to skip a few things so we can finish up and get to some discussion. I wanted to show you the near road way vegetative cover, but we did see that in a previous slide – those lines along the roadway that show percentage of tree cover and you can zero in on where there's a lack of vegetation that could help buffer against roadway pollution. Let me go back to our slides at this point and we can talk about "coming soon" to EnviroAtlas. I was talking about the guide that we have for using EnviroAtlas and Health Impact Assessment this is on the public website, here is the report number. A lot of people have used the browser for health impact assessment related uses. So these are the steps you may recognize for doing health impact assessments across the top. In the guide it gives examples of how you could use different parts of the atlas to go through these different steps. I think Annie was going to talk about some future things that are coming to the EnviroAtlas as they may be of interest as they have public health relevance.

Annie Neale: Sure, I will very quickly go over some things that we are working on now they are well underway and we are hoping that every one of the ones listed here will be incorporated in the coming

year. One of those is looking at future potential climate change scenarios, we'll talk more about that in a moment, flood plain mapping, looking at drought projections, looking at future land use scenarios, incorporating something called the Smart Location Database, which is another EPA product that's nationwide and it looks at make-up of built spaces so things like access to public transit, intersection density, employment diversity, access to jobs, etc. All those data are presented by their census block group. I'll talk a little more about shade and green views so walkability metrics in a moment, summarized point discharges, pesticide loadings to streams, looking at harmful algal bloom data which is going to be very close to real time because it will be derived from satellite imagery, some tools to allow people to combine multiple different types of data into a multi-metric index, a more educational tool for the classroom use, especially looking at the linkages of how EnviroAtlas data could be used to help train future public health employees, and then also we will be updating the Eco-Health Relationship Browser that Laura showed you with literature through 2015. Very quickly I will show you a couple of those – this is a tool that will let somebody look through very quickly 150 years of climate data, so it goes back to the year 1950. It allows users to look forward at modeled projections out to the year 2099 using different emission scenarios, and having access to different climate variables like precipitation, temperature and potential evapo-transpiration. This is a change analysis tool that will also let the user calculate change between two time periods for any of those metrics. Next slide please, we talked about taking some down-scaled climate scenarios so it's been down-scaled to an 800 meter pixel size and doing drought projections looking out to the year 2099 and looking at projected occur as well as duration, so that's something that will be coming soon. Next [slide] please, I mentioned these indicators of walkability so looking at shade along streets by each city block and this is a metric for our selected communities so this is one of the high resolution metrics so we are using a one meter land cover again, and looking at trees and green space within the street view-shed, and also combining that with a street intersection density heat map. So you may be able to look at areas where you have a high street intersection density and low tree cover may indicate areas where walkability could perhaps be improved through strategic enhancement by adding some green space. Another one is summarized point source discharges so taking all the information EPA has in their point source databases and summarizing that by these watershed basins and presenting that as a data layer in EnviroAtlas. So somebody could look very quickly to look at watersheds where they have high discharges for metals or nutrient discharges or temperature loading, etc. So again areas that are dark blue is where there is a high point source discharge, yellow is where there is low discharge, and the areas where there is no color there is no discharge there that has been recorded. Next [slide] please, these are the links to the Eco-Health Relationship Browser as well as to EnviroAtlas. Again we thank you for your time, and we would love to open it up to questions and a discussion.