Webinar transcript: Preparing for Wildfire Season

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Dr. Paul Smith: I hope that is about right for everybody and not too loud or too soft, that can get to be obnoxious after a while. Thank you for allowing me to present today, that, certainly this is going to be an important topic for us over the coming decades. You know, it's pretty clear that forest fires keep getting bigger, hotter, and our fire season keeps getting longer, and it is kind of hard to think about that impact right now with the nice rainy weather that we've had, but it is certainly going to be something that we continue to face in years and decades to come, and is probably going to get worse instead of better.

This opening picture is from my back deck last year looking at the Lolo fire so I got entertained every night, watching the red sky glow every night and the fire blow up, and sure I had to deal with what most people did, and then this is a picture from the same place the next day, not able to see more than 200 yards off our back deck, so it is certainly something that impacts all of us here in western Montana, and I was probably one of the least of those. What I hope to cover today is what wildfire smoke means to us on our health. I will talk a little bit about what the composition of it is and also talk about what some of the air quality numbers mean. I'll spend a fair amount of time talking about how wood smoke actually hurts you and who it is that's most vulnerable, and then some time talking about the events that we had last year and recommendations of what we can do.

So, again, Missoula and western Montana are certainly prone to increases in particulate matter and a lot of that vulnerability is simply because of our wood fire or wildfire smokes. The bottom red graph shows the percentage of our days that are caused to have particulate matters over the hazardous level simply caused by wildfire smoke, and those are over 90% of our days that are air pollution days, are because of wildfire smoke, and then the percentage of the pollution that is particulate matter 2.5, and we'll talk about what that means. American Lung Association last year, and American Thoracic Society, came out with the health of the air report, and those years covered in that report were 2013 to 2015 so it didn't even include last year, but as you can see the number of days that we have with particulate matter over the safe level are very numerous, and they don't meet either the 24-hour or the yearly recommendations for exposure to 2.5.

In this picture, it's showing the smoke generated from fires distant to us. So, here's Missoula and Montana and western Montana here, and each of these little red dots is a forest fire and showing the smoke that we have to worry about not only being generated locally but then what the effects of that smoke are very distant to us, all the way out into Nebraska and to an extent even in eastern United States, the smoke that we generate does affect the rest of the US population. The components of wildfire smoke that are hazardous to us are many. There are over a thousand components to wildfire smoke and those components probably vary depending on the particular smoke. So, for example, a very moist forest generates a different set of chemicals than a very dry forest. Turns out that deciduous

forests probably generate a different set of chemicals than the coniferous forests that we have out here, but also varies depending on the amount of heat within that forest fire. Very hot fires tend to actually produce less particulate matter and fewer chemicals than the smoldering fires. So, even though we are, I think, getting better and better with our science of how to put fires out, once they are smoldering they are producing even more in the way of components.

Some of those components include gases like carbon monoxide, carbon dioxide, nitrogen, and sulfur species, some of those species then generate secondary irritants such as ozone, which forms in large part because of the nitrogen oxide compounds reacting with oxygen. There are a fair number of liquids obviously water that creates steam and hydrocyanic acid. Then many solid chemicals, many of which are carcinogens, the volatile hydrocarbons such as benzene styrene formaldehyde for the most part. What we're going to talk about today is particulate matter, in part that's because it's one of the easiest compounds for us to track, and in part it's because it's one of the EPA's index pollutants that are regulated by the US government.

When we talk about particulate matter you'll hear us divide it up into coarse, fine, and ultrafine depending on the size. Coarse particulate matter are those particles that are less than 10 microns. Fine particulate matter or PM 2.5 are those particles that are less than 2.5 microns. And then the ultrafine are those that are less than 0.1 micron. I think many of us have the concept that these particles are round, spherical bodies, and that's just not true. They really vary a lot in their structure and their composition, and this photo micrograph is to demonstrate that well. To the right of the screen is a hollowed spheroid, to the left of it is one that is very complex and net-like, and each of those little niches are places where other chemicals can hide and even bacteria can get within these, and so when we talk about a particle, you know, I think many of us have the concept of it being black carbon or little spheres and that's just not the way it is, these are very noxious, very complicated things.

So, PM 2.5, while that really encompasses a lot of things that get inhaled into our lungs, just to give you an idea of relevant size, I think this is one of the most frequently used pictures that are of particulate matter people use from the EPA, and it demonstrates that if you take a human hair that's between 50 and 70 microns across you could easily fit five of the PM 10s across, and at least 20 of the PM 2.5 s across, so very, very small, much finer than a beach sand, and in terms of relative size you can think of those particles are about the size of bacteria or pollen or spores. It's about the same size of those oil, smoke, and tobacco smoke tends to be on the smaller side of particulate matter, and the reason it's an important number for us to think about in this science of air pollution is that it's the science, rheology of those particles that determine where they're going to land within the pulmonary system.

So, coarse particulate matter, greater than 10 microns, tends to settle out in the nasal passages and it's the small particles, less than 10 microns, they get down into the lung and into the terminal bronchioles, so the smaller they are the more they tend to settle deep, the larger they are the more they tend to get filtered out before they actually get into your lungs. As far as relative exposure, most of the time ambient air pollution is within the range of 10 to 25 microns, indoor air pollution that we worry about in homes that are using wood-burning stoves is in range at 25 to 40, secondhand tobacco you're exposing yourselves to 40 to 50 microns, and then indoor cook stoves can be very, very high, up in the range of 200 microns, and there is some relationship to the total amount that you're inhaling and the seriousness of the disorders that you get.

The other reason that that's important to think of is that the alveolus itself, that is the little air passages within your lungs that are responsible for transmitting gas, are very, very fine. This bar up here is 20 micrograms, that's about the thickness of a piece of saran wrap if you would cut a cross section, and the alveolar walls are only about 1/10 of that, 1 to 2 microns across, and so these particles actually have the ability to cross directly across the alveolus and into arterioles and certainly to land on the alveolus and then to get stuck there. When a particulate matter lands in your lung it's got three different ways, at least, that it can hurt you. It can land directly on those alveolar surfaces, and when you land on those alveolar epithelial cells you make them generate all kinds of chemicals. Once you get it into your lungs sometimes it's picked up by pus cells or macrophages and then those macrophages can cross directly into the capillary, or again, as I was mentioning, you can get direct particle translocation across the alveolus and directly into the bloodstream, and from those sites then you make inflammatory mediators stimulate macrophages to cause damage throughout the rest of the body and transport that damage to other organ systems, including the fetus, and there is a fair amount of data out there to show that pregnant women exposed to particulate matter do have adverse effects on the fetal circulation, in fetal growth.

One of the other pathways, I think it's worth mentioning, is that each of those can also then promote clotting by stimulating procoagulant and platelets and that's the mechanism whereby we increase the number of strokes and heart attacks to people that are exposed to particulate matter.

Just to give you some idea of the scope of this, the normal lung tissue of an adult, if it was spread out, has the surface area of a tennis court, and you can compare that to the surface area of the normal human skin, which is about one and a half meters square, so this total surface area opposed to the skin surface area that you have. Do you realize how sick and awful you feel after a sunburn, simply from inflaming this surface area? You can imagine the systemic response of inflaming this whole surface area, and just to be entertaining, a cigarette filter doesn't fill up even one of those little net things.

So, the things that we study and have very good data on effects of particulate matter includes everything from asthma to COPD, cardiovascular disease, strokes, we can do a lot of studies in terms of healthcare utilization and how many ER visits people have, we certainly can study the symptoms that people undergo, and then we can look at some blood components and find out how much the body itself has been affected by air pollution. It is a difficult area to study, many of our studies of air pollution look at ambient air pollution, which is kind of a constant background noise that we have, and then of course indoor air pollution, that varies depending on use of wood burning stoves or tobacco. We can certainly know very acute effects, that might be something like firefighters and first responders, but wildfire exposure is a completely different beast. These are very intense but sort of prolonged exposures and hard to predict, and so to actually do very good epidemiologic studies on the events that happen around wildfires is a difficult area for us.

Nonetheless, there are many articles out there and on the next two slides, if you look at the very bottom of the slides I've given you some reviews of multiple studies that have been put together so that we can look at the weight of the evidence. The evidence is very strong that it increases asthma ER visits, risk of death from COPD, risk of cardiovascular events from things like strokes, hypertension, also it increases the frequency of respiratory tract infections, and just anecdotally I think that this year after our fire season last year has been one of the worst that I've seen in terms of children that have come into the hospital with bronchiolitis, and I think it sets them up for infection for a number of months afterwards.

And then finally, the evidence is very strong that it does affect birth outcomes, that appears like it's most relevant to women who are exposed during the second trimester of pregnancy that the risk of low birth weight and premature birth goes up in those pregnancies.

This is a picture from last year of Missoula in the middle, the Lolo Peak Fire, Moose Creek, Sapphire Complex, and Rice Ridge, Liberty, up around Seeley, and shows just the intensity of smoke. I took this slide from Sara Cofield, you know, how do we really regulate our way out of this? There's not a lot that we, I think, can do to keep us from having the forest fires that we're going to have to deal with. One of the other problems that we have obviously in Missoula is, this is a picture taken from Ch-paa-qn Peak looking out over Missoula, and this is all the inversion layer and you can just, I'm sorry it's taken from Point Six, and you can just barely see Ch-paa-qn in the distance, so our inversion layers and our geography are setting us up for increased exposure to particulate matter.

To kind of relate back to numbers, EPA standards are that we have an annual exposure daily of less than 12 micrograms per meter square, or a max in 24 hours of 35 micrograms per cubic meter for PM 2.5. This is the data from around Hamilton and Missoula last year from July through September and there weren't many days between the middle of August and the middle of September where we did not get out of the hazardous level, this hashed red bar here is 35 micrograms, that's the peak that I just put up on the previous slide. For daily exposure, if you combine that data, this orange line and this red line, with years past you can see this orange line is really quite high. In one of our worst years ever, if you look at Seeley Lake, Seeley Lake was unimaginably high, the scale is different, the 35 microgram line is here, and they had no days between the early August and middle of September where they dropped below the hazardous level, and if you overlap theirs with that previous slide that I showed of all ours, this red line really is unbelievably high. There were days that it topped out in terms of micrograms per meter square of what the monitor was able to measure. It was probably record-breaking. Amy Cofield and Chris Migliaccio, who I do research with over at the University, tell me that EPA is unaware of this type of event having happened previously and it did matter, the amount of ER visits in Seeley Lake just about tripled over that period of time for a number of different illnesses.

So, what are our recommendations? Well, number one, we have to avoid. That's hard to do, you know, when many of these areas to avoid they would actually have to evacuate, and that's hard for a family to do, especially if you don't have resources outside of the city, but especially vulnerable populations, the elderly, those that have known heart and lung disease, pregnant women, and children if you combine all of those, at least 30% of our population is an at-risk population, whether it's a child with asthma or an adult that has one of those pre-existing conditions, it's certainly a large percentage of our population.

Certainly we want to avoid outdoor activities and we really should be avoiding sports, we should be suspending sports practices. Many of the masks and respirators that are on the market out there do not work, bandanas do not work, so it really is a matter of avoidance, trying to get people to go back indoors, especially if you have air conditioner with a filter, and I know that the future speakers are going to be talking a lot about filters so I'm going to not steal that thunder, and then to make sure the indoor atmosphere that you're getting them into is healthy, that they minimize tobacco and wood-burning stoves, provision of local measures and healthy spaces, again I think that that's going to be talked about, there's a great resource in Climate Smart Missoula of safe spaces for patients and other people to go, and then there has been quite an effort locally to get more filter units into schools, into homes that don't otherwise have them. I'll skip through that, it's expensive, it's hard to know where to have them,

you know, if you have them around for some schools and some schools aren't using them some years how do we get them to the places that actually need them?

And then finally, resources to give your patients, especially those that have some of the diseases we talked about, looking at AirNow.gov to look at what the health of the year on a particular day is. You can also get that information from missoulacounty.us, and then I had mentioned the MissoulaClimate.org website which is wonderful for looking at resources and healthy spaces to be active in. That's my presentation, I'm happy to take any questions.

Montana Asthma Control Program (MACP) Host: Awesome, thank you so much, Dr. Smith! If anybody has questions for Dr. Smith he's going to hang on for a couple of minutes, feel free to put them into the chat box. I'm going to start the transition of our presenter over to Marcy Ballman, Marcy I'm going to make you the presenter here, and while we're getting set up and waiting to see if anybody has questions for Dr. Smith I'm going to introduce Marcy for anyone who's not familiar with her already.

Marcy Ballman received her Bachelor's degree in neuroscience from Allegheny College in Pennsylvania and her PhD in toxicology from the University of Montana. Her dissertation work focused on improving quality of life for asthmatic children living in homes with wood stoves. She is the Montana Health Services Manager for the American Lung Association and provides asthma education and quality improvement initiatives at primary care clinics across the state.

So, I'm not seeing any questions for Dr. Smith being typed into the chat box, and so thank you so much Dr. Smith that was an amazing presentation and you hit 20 minutes right on so thank you for that! Marcy I'll let you go ahead and take it away. I might have to unmute you, hang on, sorry Marcy. There you are!

Dr. Marcy Ballman: Thank you! All right, so thank you, Anna, for that introduction. I am with the American Lung Association here in Montana and it's the perfect segue, the end of Dr. Smith's presentation on different strategies to reduce wildfire smoke exposure especially for those with pre-existing lung conditions. So, first and foremost, make sure I can get this to work here and not jump too many slides, there we go, so the main public health messaging when there is a wildfire smoke event as Dr. Smith said is to stay indoors, but we have a lot of data that have been compiled that shows that many times the outdoor air can be just as bad or contribute to very poor indoor air quality, so this is just data over a couple of days in 2015 from the University of Montana that showed obviously very high levels outside of PM 2.5 during a wildfire smoke event and they had about 75% of that outdoor PM 2.5 measured indoors.

There's some really similar data from last year, 2017, you're seeing across Missoula where there were some modern monitoring devices in several buildings and you saw the same pattern, that when there's a spike outdoors there's typically a little lag and then a spike indoors, and so what I'm going to focus on for the next several minutes is just what else, especially for those in the healthcare system, is what else can we tell patients about how to reduce their exposure to wildfire smoke, aside from just staying inside.

So, first and foremost we recommend that individuals change their furnace filter and to keep the air in their houses moving. So, we want to advise the use of high MERV rated filters. MERV stands for minimum efficiency rating value and it's really just a grading system for how well filters remove particles

from the air. So, as that little infographic shows, the higher the MERV value, the tighter the weave of that fabric of that material and the filter, and the smaller the particles that are going to be able to be captured. HEPA filters usually are high-efficiency particulate comparator filters, those types of filters usually fall around 11, 12, 13 on the MERV scale, kind of depending on the company that designated that designates and determines what the MERV is, there's not like a standard regulation for a MERV, so it's kind of relative, but the reason that I didn't say to include HEPA filters in furnaces is it, while it's really important to have that high MERV value there, especially in personal homes, private homes, some of these HVAC systems, the HVAC professionals say that they don't have the power to push the air through that HEPA filter. So you really have to ensure that the system that you're working in and that you're working with is capable of sending air through that filter. So, it's just kind of a caveat, as with all of these recommendations, there's always a caveat for, you know, what's best case scenario on a case by case basis.

The other piece with keeping the air moving is that even if there's not central air in a home or in a building we advise people to keep their furnace fan on to keep that air moving around, so even though their furnace isn't generating heat in the summertime then when you have this wild fire smoke it's still circulating the air through the fans.

So, as Dr. Smith also mentioned, it is really hard, and there's a limited amount of data that show the efficacy of air filtration during wildfire events for all of the logistical reasons that he mentioned, what I kind of use as an example here is worked on by my old group at the University of Montana, they're still doing great work, kind of using homes with wood stoves as a model for wildfire smoke events. So, it's a little different, but we're still looking at PM 2.5, we're still looking at a large wood fire derived source of PM 2.5, but essentially what we can see in these published studies and others is that standalone HEPA air filter units in this case reduced PM 2.5 indoor concentrations by about 66 percent relative to a placebo intervention where the placebo intervention was a standalone air filter unit with a very low MERV value of about three, that blew really loose filter material, so we do know that these have, the air filter units, the standalone units, are effective in reducing PM 2.5 in the indoor environments.

So, what these filter units are really just a fan and a filter, that's kind of as simple as it is. When you see ones that are so expensive you can't help but scratch your head because essentially this is what they are. Some of them have different features. The one on the left that's closed and then open to show the filter there, that was the one used in the previous study, they're actually not made any more by 3M, but you can see that HEPA filter in there. The one on the right is the one we ended up purchasing by Honeywell for about a dozen schools in western Montana. We got about a hundred, the American Lung Association got about a hundred air filter units distributed across the state last year for schools that were impacted by smoke, and it's the same general idea at the fan, this one has a circular filter and it filtered the, filters the air through to capture those particles before it's sent around the room.

There are a couple of things that people want to consider when buying a HEPA air filter unit for their home or office or clinic, wherever they are. You want to make sure that the unit that is purchased is capable of cleaning the square footage of the area that is going to be used, so you might have to have multiple units or a larger unit if it's a big open space, as opposed to if it's a small doctor's office or a small bedroom you can use a smaller unit that's capable of circulating that quantity of air. Second thing that's really important is that some of these filter units have an additional way of removing particles from the air through ionization where they actually charge the particles which causes these statically

charged particles to drop out of the air and they fall into the carpet or the floor, but the way that they create that charge to give to the particle to keep it out of the air is by generating ozone, and so ozone is a potent respiratory irritant especially for those with asthma, COPD, or other respiratory conditions, so we want to make sure that if our goal is to improve the indoor air quality and to create a clean space for everyone and especially those with respiratory issues that we don't want to be generating another, especially indoors.

And then finally, you always want to make sure to follow the manufacturer's instructions for replacing or cleaning. Some of these filter units have washable filters, and so following the instructions for cleaning those when they're dirty, and many of the units have usually a type of gauge that you can tell how dirty the filter is without having to take the unit apart and physically look. The Honeywell, for example, in the previous picture, it has a little light on the front and it's a stop light system so it's green when it's clean, yellow when it starts to get dirty, and red when it's time to change the filter, and the way that works is really just a fan sensing how much power it needs to use to push the air through, and if it's getting that restriction then it's not going to be able to clean the particles out of the air as effectively and what gets restricted when it gets so dirty.

This was a really interesting study that was just published last year in indoor air on the health benefits on the cost a filtration intervention had. Almost, one of the closest things we have to a real intervention study, but really interestingly what they did is they went back, so retrospectively they had all of the data from a really bad wildfire smoke season in Northern California. They said we have the air quality data and now, you know, looking retrospectively back we have the emergency care services, hospitalization admission, things like that, and so they said if we had in theory gone back and done several different types of interventions before the smoke came, how much money would that have cost us, and then how much money would that have saved us?

And so they made several conclusions that were all very interesting and just the main ones were that many of the interventions were projected, based on their very fancy math, to prevent between 11 and 63 percent of the hospital admission and 7 to 39 percent of deaths attributable to these wildfire particles. There were also some calculations done again on that return of investment, on a return on investment of the economic value of these prevented deaths, which far exceeded the intervention costs, that didn't use the portable air cleaner. So, they looked at several different types of interventions like the furnace filters and central air and things like that as Dr. Smith mentioned, those portable air cleaner interventions, well, can be very effective or also very expensive, and then the main, one the take-home message really was that the cost of effectiveness and in terms of the economic value of prevented deaths and disease and hospitalizations was improved by intervening only in the homes of older people who tend to experience most of these health effects of the particles from wildfires. So, a really interesting way to look at it and something that might drive our protocols and programs moving forward in terms of how do we get the best return on investment from these programs.

Not an uncommon sight in Missoula during wildfires season, like Dr. Smith mentioned, a bandana is not going to work over your mouth to protect you from the PM 2.5, but at quick glance you can't really tell the difference between these two masks. The one on the left is, for five dollars you can get about fifty of them, and for the one on the right, for five dollars you can get about five, maybe ten of them, so they're not drastically different in price either but they are drastically different in the amount of protection that they provide from PM 2.5. So, the one on the left is a dust mask, and you can see it has the one elastic

there, some of them do have the metal on the top for the nose clip for the better fit, but on the right is an n95 respirator, is what they're called, and they'll always have the stamp on there that says NIOSH, right here with the n95 that shows that it's been certified by the National Institute of Occupational Safety and Health, that research branch of OSHA, so they're approved for use in workplace settings where people are exposed to high PM 2.5 levels.

So, they always have these two bands for a better, tight fit, and they'll always have the nose clip for a tight fit, and that's really the key. The difference between a dust mask and a n95, aside from the material itself to help it really filter that PM 2.5, the dust mask we want to make sure that patients and every individual knows that these are really just for larger particles and chunks that may come at you, oh you're mowing or gardening and then the larger pieces when you're sweeping or dusting, and the n95 respirator is a minimum of what you want to use, it will have that NIOSH designation, and it is known to filter at least 95% of airborne particles and they consider particles in this case to be less than 100 micrometers of PM 2.5, we're talking about 2.5 micrometers but it is considered to be the ideal protection from PM 2.5.

There's a lot more out there in the world of masks and respirators, but just the most important to know take-home message is that minimum of n95 for PM 2.5 protection for the wildfire smoke. The other caveat, again, being that individuals that are already restricted in their breathing, that have COPD for example, a good fitting n95 respirator is going to take some more effort to move the air in and out as you breathe through that filter, so you want to be sure they know that it's, you know, it could potentially restrict their breathing more, and it might not be appropriate for somebody who's breathing is already pretty restricted and they have to work around.

And finally, also like Dr. Smith mentioned, there are some existing air filter, HEPA filter distribution programs in the works for this coming inevitable wildfire season both in Missoula here, these have both been funded through the Montana Community Foundation Wildfire Relief Fund and the plan as of now for the City County Health Department is to increase their cache of filter units to provide more future public clean air spaces such as schools and libraries for places people can go to get away from the smoke. Climate Smart of Missoula is planning on reaching that older population working with Missoula Aging Services and Meals on Wheels.

They're also using some of the funding they receive to create a landing page for wildfire resources, so as BJ will tell you in the next segment there's tons of local and state and federal resources and guidelines to follow the fires and track the smoke and trying to just make one place where you could go to follow links to that information, and kind of just a good landing page for that, so they are working on that now.

Then finally, what the American Lung Association is doing with funding that we received from this wildfire relief fund, which was donations that people gave and then the Montana Community Foundation turned those donations around into grants for Rural Fire Department's and nonprofits to do this same type of work, we are doing a HEPA air filter unit distribution for individuals with lung disease. It is not limited to any specific type or severity of lung disease, it is not restricted to age or income, and how it's working is where individuals can contact Montana@lung.org to get on the list, they can include their physical mailing address and then a contact phone number, if they don't include it I'll email them back and ask for it, and so essentially we're compiling a database of individuals who know that will likely be in need if and when wildfire smoke does impact their community, and then it's kind of just a hurry-up-and-wait type situation where once the fires inevitably start and start to impact communities we'll be

able to refer to this database and see who is being impacted by the smoke, and then we'll be able to ship the air filter units directly to them. So, if you have any patients or individuals you know in your community that might want to get on the list or know about this list, please share, and we have about 80 air filter units to distribute. If and when we get through all of those we'll always look for more funding and more ways to get these air filter units out into the community.

With that I'll end with another picture, same fire Dr. Smith showed, the Lolo peak fire from the Missoula Airport, you can really see the difference between that actively burning particulate and smoldering particulate level there. So, that's all I have, I'll take any questions or we'll wait for after BJ's.

MACP Host: Awesome, thank you so much, Marcy! Everybody, I'll be sending out with the evaluation information tomorrow and I'll be sending out that information that Marcy just ended on for how to get in touch with her to refer your patients to be added to her database. If you do have any questions for Marcy please feel free to enter them in the chat box and we can check in on questions again for Marcy and BJ both at the end of BJ's presentation, but do feel free to enter those in the chat box now. I'm just going to go ahead and start to move us over to BJ's information, so William or BJ Biskupiak is the School Health Coordinator in the Chronic Disease Prevention and Health Promotion Bureau of the Montana Department of Public Health and Human Services where he has worked for five years. BJ advocates for the connection between school health, public health, and medical health providers such as your primary care physician. BJ oversees the delivery of trainings in chronic disease prevention self-management and health promotion through a variety of initiatives.

I think I've got it, alright, okay so BJ, whenever you're ready!

BJ Biskupiak: Alright, thanks, Anna. So, as Anna said, I'm going to cover the outdoor activity and air quality guidelines for schools and childcare facilities in conjunction with the Today's Air website, and I'm going to talk about how to use those together to make the best decisions to protect your health during wildfire events.

So, while these guidelines were developed for schools and child cares, the health effects categories and the activity recommendations can be applied to both children, adults, and even a general population, so when you're trying to make these decisions you want to start early, well before your event you want to start monitoring the air quality by visiting TodaysAir.mt.gov and then in addition to just looking at the air quality of current air quality readings you want to review the daily for smoke forecast, which is really only available during the wildfire season. This smoke forecast includes current weather changes activity on the ground in and around those wildfires and then upcoming weather patterns.

So, when you arrive on the today's air landing page, you'll see various monitors placed around the state. There are 19 permanent monitors that continuously collect air quality data throughout the year. These core stations are sited in accordance with regulatory obligations or have been installed at the discretion of DEQ to represent a significant population area. On occasion, DEQ will place temporary monitors in response to episodic events, typically to address wildfire impacts or special impact studies. Depending upon the nature and duration of a monitoring event, a temporary station may be represented on the today's air webpage, which is the case last year with a more severe wildfire season.

So, it is important to remember that the air quality measured at the monitor may differ from the air quality in another part of the same region or even in the same town. So, if you'd like to know where

those air quality monitors are in your town you can either contact us to get exact locations and we get those from our meteorologist partners at DEQ or you can contact your local county health department and they should be able to help you locate those. So the near real-time hourly PM 2.5 concentrations collected from the ambient monitoring network provides the basis on which the NowCast average is calculated. So, the 1-hour average concentrations are posted at 15 minutes after the top of the hour for the previous hour. So, for example, 7 a.m. through 8 a.m., our average concentration will be posted at 8:15. This delay is really provided to allow for equipment malfunction, power outages, scheduled quality checks, maintenance, things like that.

The Today's Air main page provides a snapshot of air quality across the state from each monitoring station depicted by a dot on the map, and you can see those dots right now across the state, most of those should be green, maybe yellow if there's some kind of weather event, but you'll see those change obviously as we go through the wildfire season, hopefully not too much, we hope! The colored dot indicates the air quality condition for a particular site based on that NowCast concentration value and then the corresponding health effect category. So, when you're looking at those dots, and on the bottom of the page, and we'll see in a few minutes on another slide, you want to use the 1 and 24-hour concentration values. what I do is identify the health effect category before you make your decision, you don't want to simply rely on the current hour's reading because the air quality at that monitor may be improving, but there still may be elevated levels of PM 2.5 in the air at different points throughout the town or region as we discussed. You could have two different weather events, wind, there could be some rain coming in at that location but a few miles away it might be a different, different situation, so, and on this page, the only other thing on that page up is so you can actually find links to our outdoor activity guidelines as well as the Department of Commerce fire activity page and other governmental organizations, resources, so I won't spend too much time on this but this just illustrates the difference between the one hour average ratings and the 24-hour rolling average.

Really what I wanted to point out, and the main difference here is the cautionary health advice, so for that one-hour average cautionary health advice normally isn't given, but it is for the 24-hour rolling average. This is due to the evidence out there for health impacts of 2.5 is based on exposure periods of 24 hours or longer. So, as I've already mentioned, weather conditions can rapidly change at air quality monitoring sites, so we really need to be paying attention more to the 24 hours as well and make our decisions. This image that you're seeing here is from Thompson Falls on September 9, 2017 you can see how the 24-hour average, there is 87 micrograms per cubic meter, and as I see on the next side a 24 hour average can be helpful, but it's important to look at the hourly average along with the weather forecast when we're making those decisions, so while the daily average with 87 micrograms per cubic meter, you can see that the earlier in the day the PM 2.5 averages were well into the unhealthy and even hazardous levels, reaching all the way up to 157 micrograms per cubic meter.

So, this slide is a little busy to look at, a little complicated, but I just want to share this to point out that when air quality is bad, the today's air algorithm that they use is usually controlled by the 24-hour rolling average, and what this means is that the 1-hour average is very slow to respond at times. So, on that left side, that's from Hamilton, Montana, and you can see in the previous day there was several very elevated concentrations and the dot color is slow to respond to the relatively low concentrations in the morning, that still doesn't really respond appropriately to elevated concentrations in the afternoon, so that number at the bottom that we showed, that 87 on that first page from Thompson Falls, that's going to change on that rolling average but your dot might not exactly match up with that, and on the right

side there is just another one from Sydney, and it just, again, it kind of shows that effect but this is a slightly opposite effect, where the hourly concentrations start off elevated and then improve and then the dot color catches up in the afternoon, so I show you these two to again emphasize that while it may be good to use the information on today's air, it can be used with air quality guidelines to really get a better picture of the air quality in your area.

So, now I'll go through a couple examples of how to use the air quality guidelines. This picture here is from Stevensville, Montana and you can see the Idaho border in the background at about twelve miles, Crown Point at about seven, St. Joseph peak at 10, and Bass Peak there at 12, and so when we're using these guidelines we want to keep in mind the five steps and we'll go through these here. First, you want to use predetermined landmarks such as these that were established on a clear day from a distance. You want to face away from the Sun and determine the limit of your visible range by looking for targets at those known distances, and if you're wondering how to measure those distances that's as simple as going on Google Maps or some kind of map program and just drawing a line, most map programs do have that feature now, so then number four, visible range, you want to keep in mind that the visible range is when an object you can easily see in the distance disappears, and then number five, use the visibility values in the table to determine a local wildfire smoke health category.

So, in our picture we have our clear points of distance and then on the right you see that same picture taken October 2nd there, and you can see that our range, you kind of see the Idaho border disappearing there, as well as Bass peak and you can kind of see Crown Peak a little bit there, but what we're gathering from this is that our visibility is about 9 to 12, 13 miles there, so that'll be in the moderate to unhealthy for sensitive groups range, so using the visibility guidelines we've determined our health category at the top.

The next step would be determining which activity most resembles your plans. So, in this example we're trying to decide whether or not we should hold our physical education class outdoors. So, if we were to decide that it's still okay to hold a class outside we'd want we'd want to monitor students with chronic conditions, especially those with asthma or respiratory conditions, if you believe that the air quality is truly unhealthy for sensitive groups you'd want to hold the class inside if possible in a closed-off building with a working HVAC system or proper HEPA air filtration units, and then if you decide to stay outdoors you would want to limit vigorous activities for those with chronic conditions and strongly encourage asthmatic students to use their albuterol inhaler 15 minutes before going outside as a form of pretreatment. Again, this is a sign of control not of weakness, they know that that wildfire smoke is going to be a trigger for them, so they can pretreat that way and then they should continue to monitor their asthma and those responsible monitor those children. That applies again to adults in the general population.

MACP Host: BJ, before we go to the next example, we've got a question here from one of our attendees, was this chart for recommended physical activity developed by the state of Montana and are these EPA recommendations as well?

BJ Biskupiak: So, this chart was developed by the state of Montana with DEQ and DPHHS, OPI also gave their input as well, but these aren't necessarily EPA recommendations. EPA does have visibility guidelines and NowCast concentrations and they're very similar but our NowCast concentrations go off of that rolling 24-hour average which is just a slightly different than that EPA regulation.

MACP Host: And the EPA regulations don't necessarily make suggestions for health, right? So, the state of Montana put this together to attach those health recommendations with the air quality?

BJ Biskupiak: Right.

MACP Host: And DEQ would be the Department of Environmental Quality, and OPI, Office of Public Instruction, so a group effort, awesome. Okay, wow, that looks terrible.

BJ Biskupiak: So, this example is from Seeley Lake, and we all know how bad it got there last year, this is just a picture from the main street in town, you can barely see, you know, half a mile there. So, by using the visibility guidelines and/or the NowCast concentration readings, in this example we've determined that the air quality at Seeley Lake is very unhealthy to hazardous for everyone and the public, so at this point in our example we're considering having a recess or some other outdoor activity that's 15 minutes in duration, so in this case all children and adults should stay indoors and try to find a clean indoor air environment. If possible, people should leave the area like Marcy and Dr. Smith mentioned, to evacuate if you can, it can be difficult because there's nowhere to evacuate to and for hundreds of miles there's poor air quality, but if that's not possible, again, try to find the cleanest air that you can in an indoor environment.

So, this here is just a map created by the Missoula City County Health Department, this is just a map showing different points from the Orange Street bridge and this is just another tool that you can create in your own community. But if you know some of those points of distance then that works as well, but this is just kind of another way that you can help illustrate that. In our last example here that I'll share, I'll go quickly through this, this is just if we looked at our NowCast concentrations we're at 140 micrograms, 40 micrograms per cubic meter, and we're considering having a sporting event outdoors that's two to four hours of vigorous activity, then you can trace that over to your health category and see that we would recommend rescheduling or relocating that event, we can add rest breaks or substitutions to lower breathing rates, and then people with chronic conditions should be medically managing their condition at that point.

If you're unsure still of how to use the air quality and activity guidelines, the backside of the guidelines includes instructions that I shared with you today, and there are also some questions for your schools to consider in regards to wildfire smoke in the early part of the school year.

Then just to finish up here, here's some areas, some places, that you can go for assistance, if it's sporting events in schools you want to speak with your athletic directors at the district or school level, if there's still some worry that they're not really following guidelines then you can also contact the Montana High School Association and they're happy to speak with those athletic directors. Local county health departments can provide your general health and safety information. The Today's Air page that we already mentioned, the DPHHS, here at DPHHS, Department of Public Health, we do have an air quality page which has some general health and safety questions and tips, and then as I mentioned the Department of Commerce has a fire information page which includes webcams via activity and potential impacts, travel restrictions, and they also have very large list of indoor activities that communities all throughout the state can use, and then the Department of Transportation finally, they do have travel conditions, incident reports, road closures.

The one that I don't have on that I should mention, in addition to FireSafeMT.org, is readyandsafe.mt.gov, and that just serves as a landing page for a lot of these governmental organizations and the resources we have to offer also.

MACP Host: So, we have a couple minutes here, I'm going to put up this webinar slide just reminding you guys that if you're in a group watching this together that I will be sending out a brief evaluation link, if you're able to then share that with the other people in your group that might be watching this, that would be great, so only one person who registered will receive that email.

If there are any other questions we have just about two minutes left here, feel free to type them into the chat box for either Marcy or BJ. I will send out the resources that both of them referred to, specifically how to access the database that Marcy is putting together with the ALA regarding air filter units and getting those out to people in need, and then also the websites, that list of websites that BJ just shared that might be able to provide you with some good information specific to Montana and resources that might be near you for dealing with whatever the season throws at us.

I'm not seeing anything pop into the chat box, you can also unmute yourself, feel free, but otherwise that's all that we have for you guys today! Thank you so much for joining us, and thank you so much Marcy and BJ, we really appreciate you, along with Dr. Smith who I think has already left us, but that was really helpful information and hopefully we don't have to use all of it! Thank you, everybody.