NATIONAL WEATHER SERVICE - MEDFORD, OREGON

Fall 2018

Volume 7, Issue 3

The Crater Chronicle

Fall Began September 22nd at 6:54 pm PDT.

Daylight Savings Time Ends November 4th! -

Remember to Set Your Clocks Back One Hour!

INSIDE THIS ISSUE

Sneaker Wave Season Begins

Ryan Sandler, *Warning Coordination Meteorologist*

Sneaker waves kill more people in Oregon than lightning, high winds, flooding, cold, and severe storms combined! Since 2000, sneaker waves have killed more than 20 people along the Oregon coast, and nearly every death was between October and April. All of these deaths were preventable.

So what is a sneaker wave? A sneaker wave is an unexpectedly large wave that is higher, stronger, and reaches up the beach (runup) to levels beyond where normal waves reach. They can appear suddenly with no warning. Some people call them sleeper waves, rogue waves, and even freak waves. Most people killed by sneaker waves were simply walking or playing on the beach and not paying attention to the ocean when a sneaker wave knocked them down and swept them into the cold ocean. In some cases, a family member or friend went into the ocean to rescue them and both people were killed. People have gone into the ocean to rescue their dog only to lose their own life while the dog makes it back to shore.

As this sign shows, there are many ways to say sneaker wave.

Until recently there had been no scientific studies on sneaker waves. In 2015, Oregon State University received a National Science Foundation grant to study sneaker waves. Their study was published this past year with the following conclusions, which I have paraphrased:

- ✓ Water overtopping a jetty, rocks, or other man-made structure can be associated with long period swell (>12 seconds) and/or a rising tide. Just a small increase in tide can result in a large increase in overtopping the structure or rocks.

- ✓ Sneaker waves occur over a wide range of wave heights. In fact, very large waves and breakers tend keep people away from the ocean.
- ✓ Sneaker wave deaths occurred on many types of beach slopes so it doesn't matter if the beach is nearly flat or rises sharply.
- ✓ Most sneaker waves occurred with primary long period swells greater than 12 seconds.
- ✓ Long period swells are related to a longer time between runups meaning "normal" beach waves could be seen for 30 minutes or more when suddenly a much larger sneaker wave occurs. This tends to lull beachgoers into a sense of security and they are surprised by the much larger beach runup.

A rising tide and/or long period swell can cause overtopping on rocks and jetties.

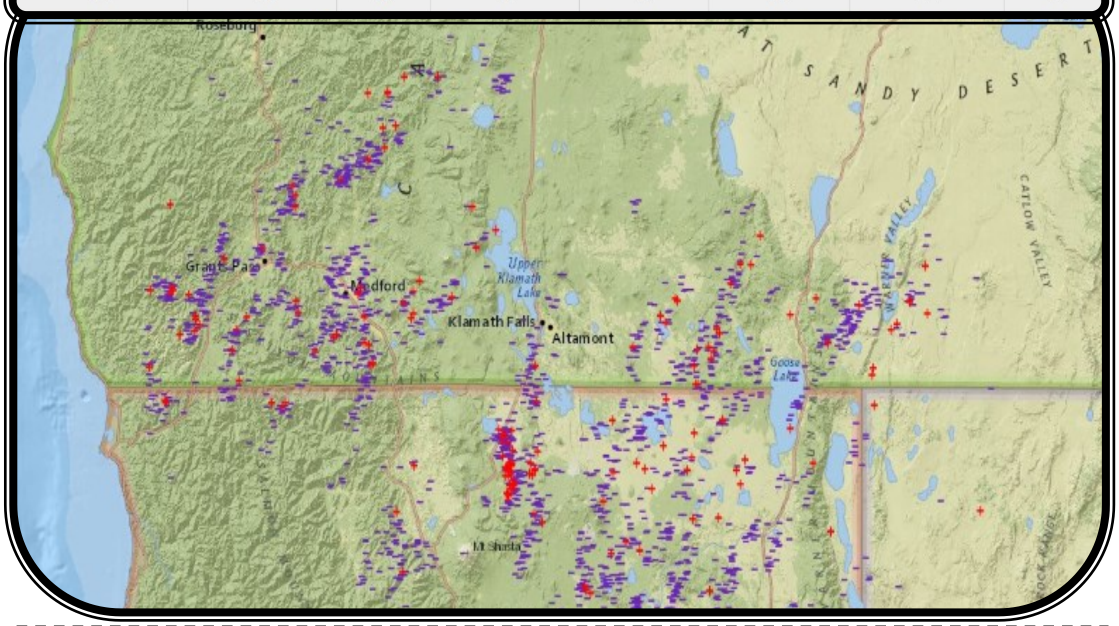
The OSU scientific study revealed that these sneaker waves were expected to reach the beachgoers for the majority of the cases indicating that a forecasting and warning system is possible. This is good news but it will probably be years before a reliable warning system is in place because this was just one small study with only 25 cases. Much more research is needed. In the meantime, education is the best way to mitigate sneaker wave deaths. Always respect the water and never turn your back on the ocean.

Wildfires of 2018

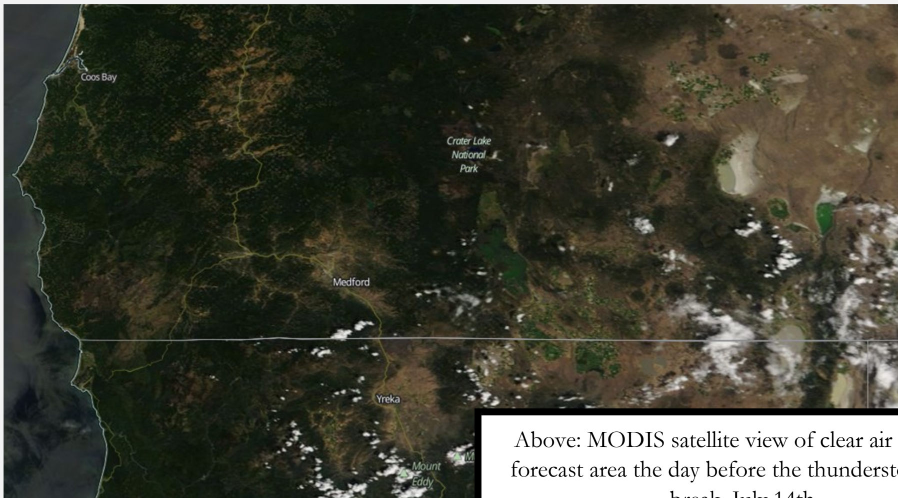
Misty Firmin, *Meteorologist*

Summer 2018 has been a long and busy fire season, that, at the end of September, still has yet to come to an end. Most of the wildfires in the area were sparked by a lightning outbreak that occurred on July 15th. Morning thunderstorms west of the Cascades, which are pretty rare to begin with, brought over 600 lightning strikes to the counties of southwest Oregon. The strikes sparked dozens of wildfires as fuels were already very dry and receptive to fire starts. Thankfully, fire crews were able to get the majority of those fires

Josephine	Siskiyou	Lake	Douglas	Modoc	Jackson	Klamath	Curry
189	403	217	60	427	358	171	53



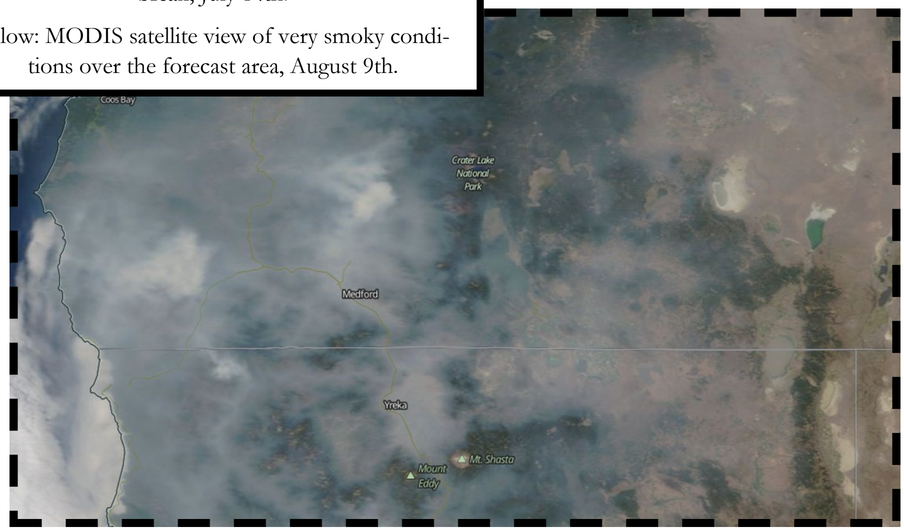
Lightning strike count from July 15th. Blue=negative strikes, Red=positive strikes. Data courtesy: Earth Networks

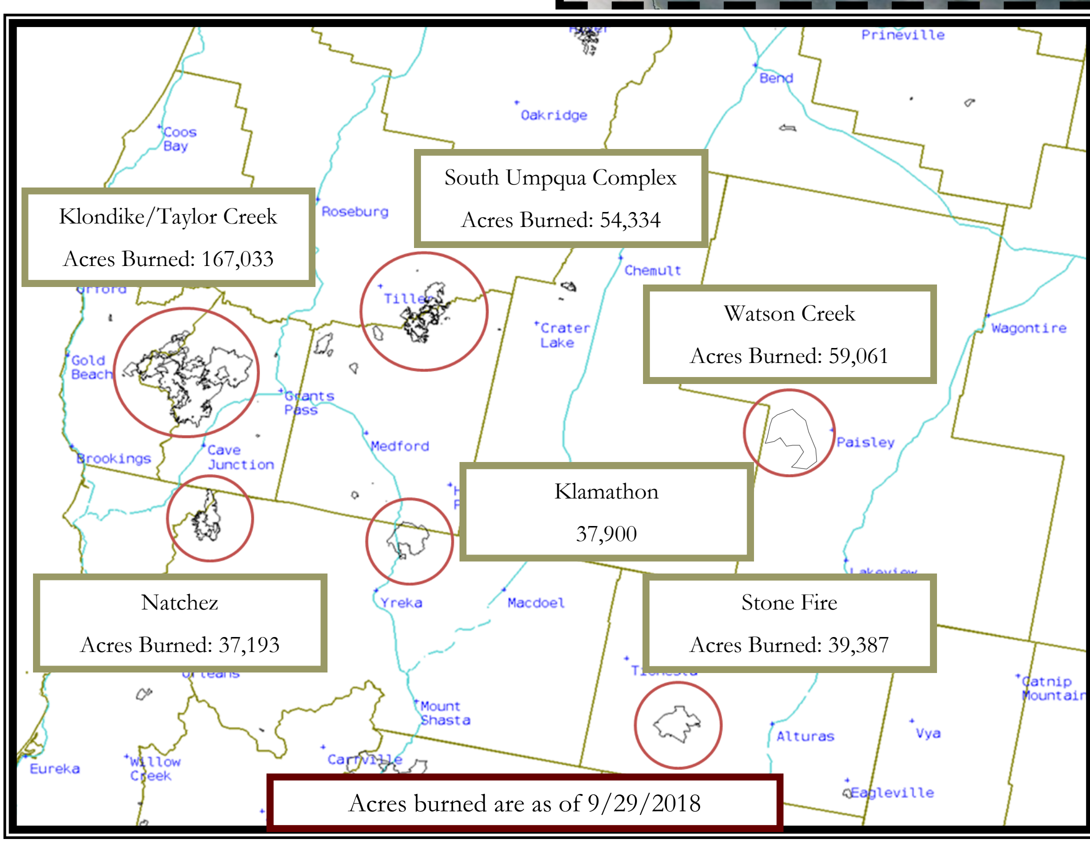


knocked down, but a few of them grew into much larger fires and continued to burn throughout the summer. These included: Klondike/Taylor Creek, Natchez, South Umpqua Complex, and the Garner Complex. Conditions after the lightning outbreak were about as ideal for significant fire growth as could be, and those fires produced ample amounts of smoke over the next several weeks. Not only did residents of southern Oregon and northern California suffer for weeks due to poor air quality, the local economy took a major hit as many outdoor recreation events were canceled and venues were closed due to the thick smoke. A few weak systems moved through the area during August, bringing a bit of a reprieve from the smoky conditions, but improvements were short-lived with smoke often returning shortly after. Although smoke was a nuisance, there were some benefits as well. For one, the thick smoke moderated temperatures so conditions weren't as hot as they would have without the smoke. This also helped to limit instability, which significantly limited thunderstorm develop during the month of August, which is typically the peak of lightning activity. Around mid-August, two more wildfires ignited east of the Cascades: Watson Creek and the Stone Fire. Although fire season has yet to end, fire activity was significantly diminished when upper level troughing settled over the Pacific Northwest after the first week of September. Cooler temperatures and higher relative humidities dampened fire activity and smoke production was greatly reduced. However, we're still waiting on that season-ending rainfall, so the smell of wildfire smoke will linger in the air for a little while longer.

Above: MODIS satellite view of clear air over the forecast area the day before the thunderstorm outbreak, July 14th.

Below: MODIS satellite view of very smoky conditions over the forecast area, August 9th.



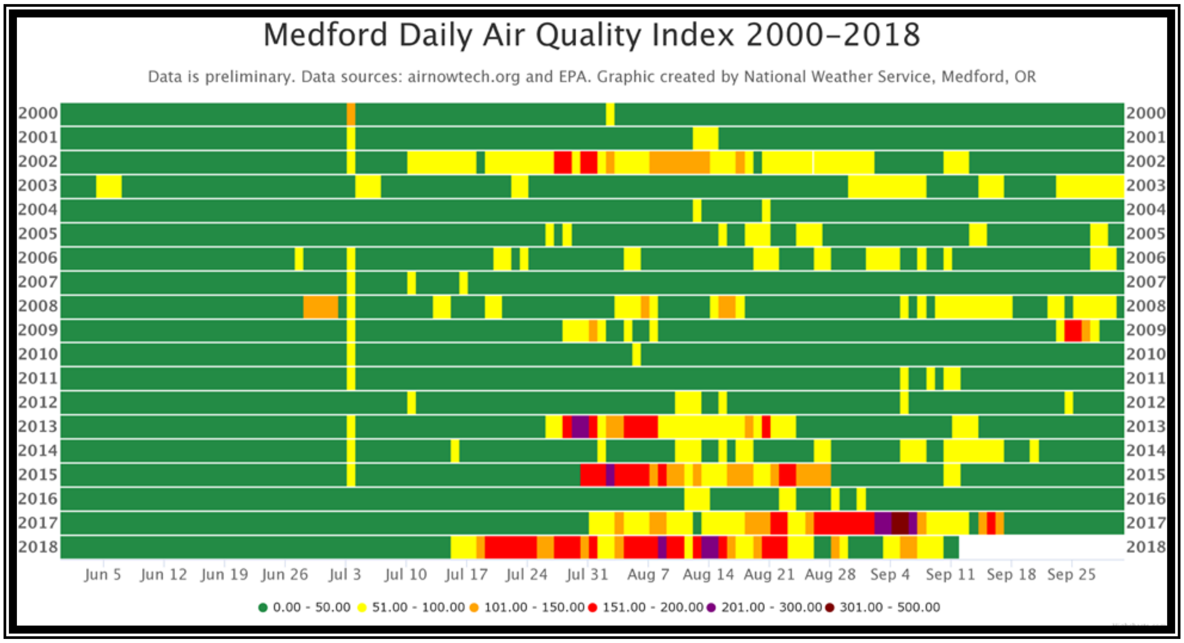


What Does Medford's Air Quality Look Like Since 2000??

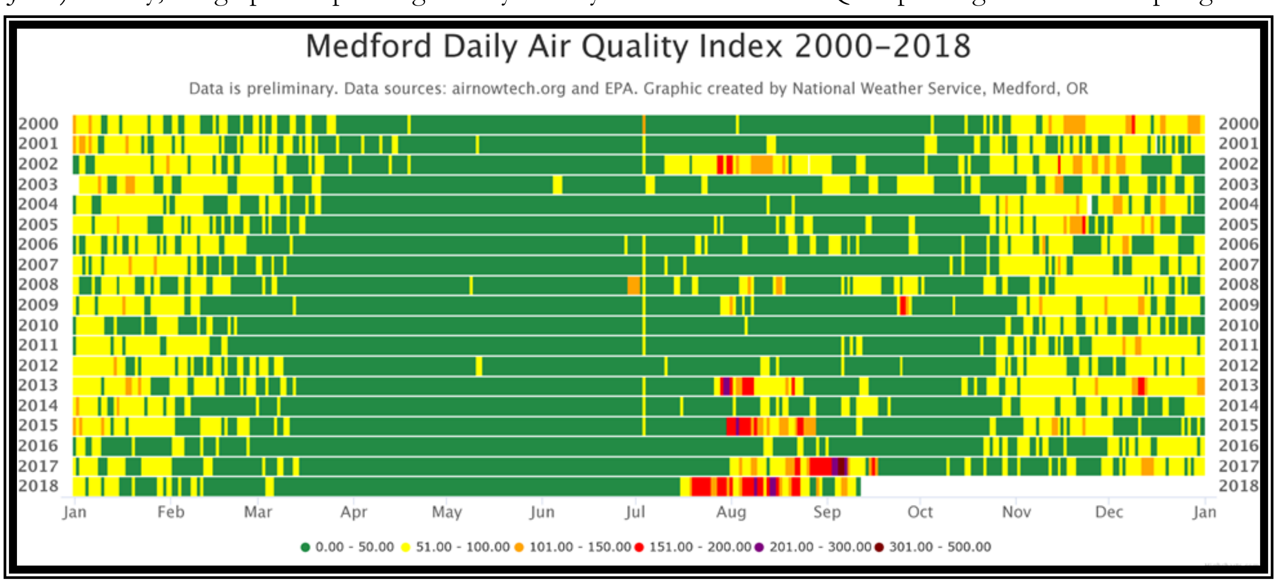
Shad Keene, *Meteorologist*

Four out of the past six years in southwestern Oregon have featured significant smoke impacts from wildfires. One of our jobs as forecasters and as communicators is to put weather or weather-related events into historical context. While we're not air quality forecasters, we do forecast, understand, and frequently respond to questions about the weather variables that affect smoke coverage and magnitude, ultimately contributing to poor air quality.

In trying to put this year's smoke event into historical context, we created a graphic that visualizes daily air quality index (AQI) values since 2000. This is as far back as we could find AQI data for our area. The first graphic below highlights a few important points about the warm season air quality. First, the image clearly shows that this season's "Unhealthy" AQIs (151 or higher) began much earlier than any year since 2000. Second, the number of "Unhealthy" AQIs far surpassed any other year. Third, one can notice that this season's "Unhealthy" AQIs did not extend into September like in 2017, thankfully. Fourth, as an interesting but less impactful point, 4th of July fireworks frequently sends Medford into the "Moderate" AQI.



The second image below shows the entire year, and it's worth noting that AQI is significantly better during the winter compared to the worst summer smoke events. It's also interesting to observe the months with the very best AQI (March to June). Lastly, the graphic depicts a general year-to-year trend towards AQI improving earlier in the springtime. That's got us puzzled. Please share if you have ideas on that one. This fall, we hope to develop and share these charts for other locations in our forecast area.



My Favorite Weather: Snow!

Michelle McAulley, *Meteorologist*

While multiple fires in our area continue to burn, fall is here and the days are getting shorter. Before we know it, it will be time to start talking about snow in the mountains. So, how does snow form anyway? Believe it or not, most precipitation we get starts as snow, way up in the atmosphere, then melts into raindrops. This formation of ice crystals is called the Bergeron-Findeisen process. Often, clouds start as a mix of ice crystals and water droplets that are below freezing, or "supercooled." In a cloud, ice crystals will grow into snowflakes for a few reasons. Below freezing, the saturation vapor pressure is lower over ice, than over water. Vapor pressure describes how much moisture is in the air, and saturation vapor pressure is the pressure at which moisture in the air will condense. For example, think of taking a hot shower; when the mirror fogs up, that's because the amount of moisture introduced to the air in your bathroom exceeds the saturation vapor pressure of that air and causes droplets to condense on your mirror. Another example is the inside of your car's windshield. Have you noticed that the windshield fogs up more often when it's cold, and turning on the heater solves the problem? That's because saturation vapor pressure increases as temperature increases. So, since saturation vapor pressure is lower over ice than water, ice crystals in a cloud will grow while water droplets evaporate. In addition, water molecules evaporate from droplets more quickly than from ice crystals due to differences in molecular bonds. To summarize, ice crystals grow at the expense of supercooled water droplets.

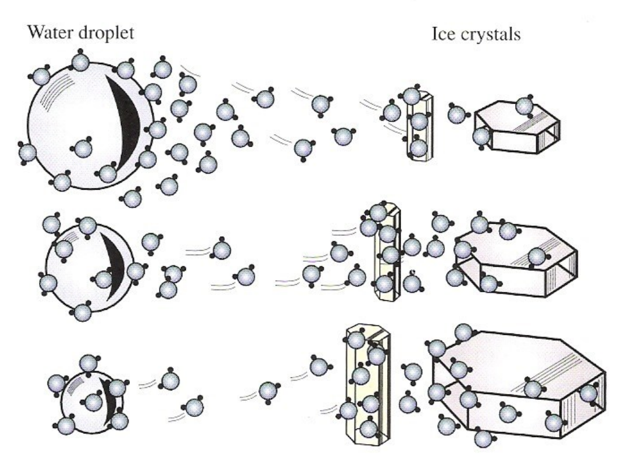
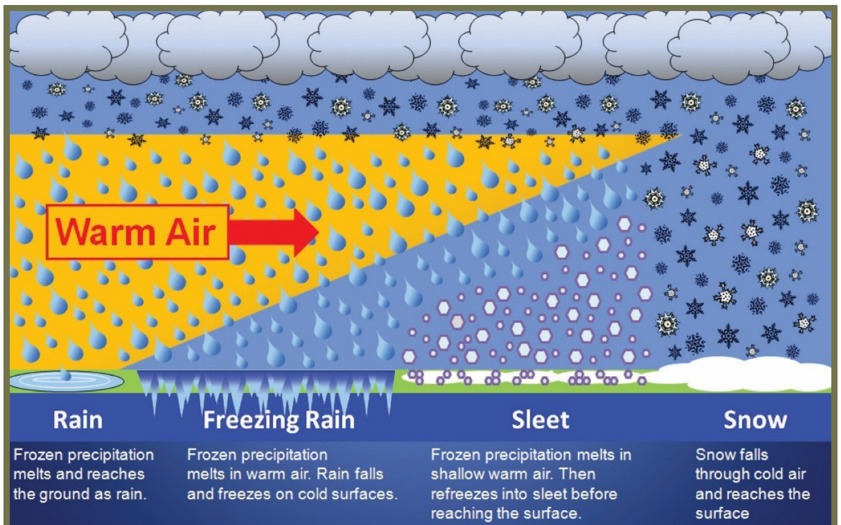


FIGURE 8.34 The Robin Hood code of conduct during the Bergeron-Findeisen process: Water vapor is robbed from vapor-rich cloud droplets in order to pay vapor-poor ice crystals. In this way, ice crystals grow at the expense of surrounding cloud droplets.

Image retrieved from www.meteo.psu.edu

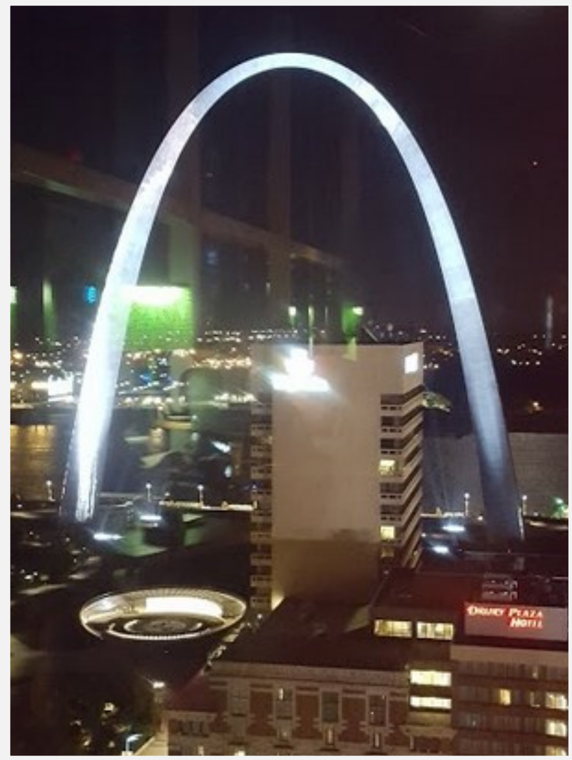
Once ice crystals get large enough that the updrafts, or rising air, in the cloud can no longer keep them suspended, they fall to Earth. If temperatures are below freezing during the whole journey down to the ground, then unless conditions below the cloud are so dry that everything evaporates, the surface will see snow. Unfortunately, forecasting snow here is rarely that simple. Often here in the valleys of southern Oregon and northern California, a snowflake will meet temperatures above freezing at some point between the cloud and the ground. If temperatures at and above the surface are warm enough, or the layer of warm temperatures is thick enough, then there will be rain. Warm or thick "enough" is hard to define. This is a big challenge in discriminating whether we'll get rain or snow. Picture yourself grabbing a popsicle on a hot summer day. Does the popsicle melt the second you take it out of the freezer? No, of course not. But, if it's 70 degrees, you've got a bit more time to eat that popsicle than when it's 100 degrees. Likewise, snow won't melt the second it reaches a temperature above 32 degrees, which is why we'll see snowflakes when surface temperatures are in the mid 30s or even pushing 40 degrees, though they won't stick. Sometimes, a snowflake will reach a layer of warm air during its path to Earth, then encounter sub-freezing conditions below. If the layer is warm and thick enough that the snow melts, this will lead to sleet or freezing rain.



Different stages of precipitation. Note the difference in thickness of the cold air below the warm layer for freezing rain (thinner) vs. sleet (thicker). Photo courtesy: http://www.srh.noaa.gov/bmx/?n=outreach_wwaw2014

Brad's Adventure at the Gateway of New Meteorology

Brad Schaaf, *Meteorlogist*

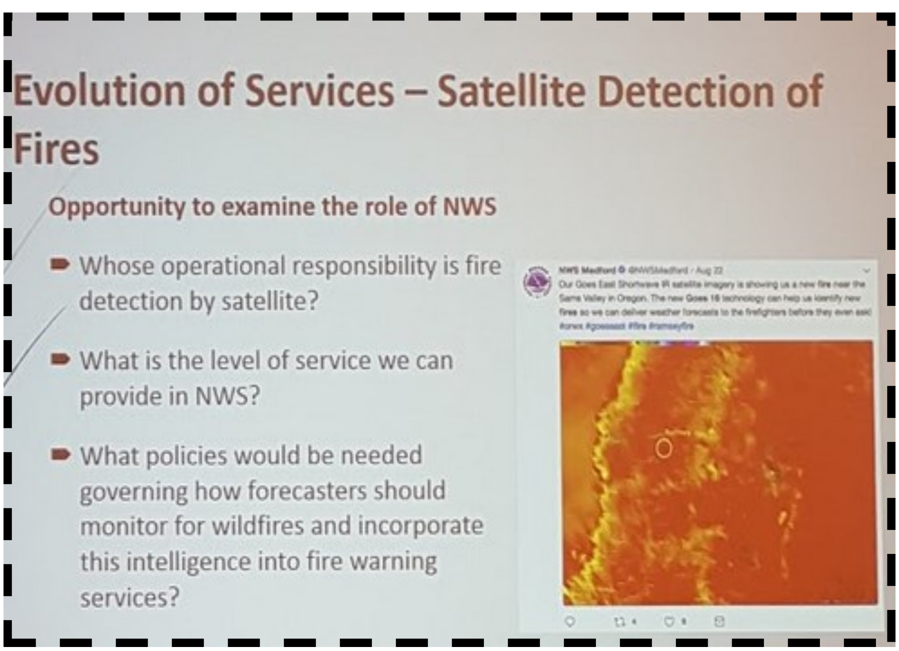


Recently, our meteorologist Brad Schaaf was sent to the 2018 National Weather Association Conference to learn about new meteorological research presented by his colleagues across the United States. The conference provided many opportunities for Brad to learn and bring back new information and methods to our office. The theme of the conference was "Diversity in People, Models, and Methods": something that is very near and dear to his heart. Thus, Brad set off to the "Gateway to the West" with his pen and notebook.

All of the presentations were full of new insights, but there were a few really hit close to home: How to message during a long-duration event like Hurricane Harvey, using our radar to help us better identify when a smoke plume may collapse and endanger firefighters, and finding new ways to help utilize satellites to determine whether or not a shower will become a thunderstorm, and if any lightning could result in fire detection.

Although we don't get hurricanes or tropical storms in southern Oregon or northern California, Brad did take away a few interesting ideas from this talk. The Houston, Texas office issued 217 different warnings for flash flooding, tornadoes, and severe thunderstorms during a 5 day stretch during Hurricane Harvey. Unfortunately, this amount of warnings caused the overall message got lost. This is due to message fatigue. We appreciated our friends and colleagues who tirelessly worked the radar, but by the 100th tornado warning (they issued 157 tornado warnings), Brad would have just turned his NOAA weather radio off--and he's a meteorologist.

Again, it is important to note that we don't have extreme storms like this, but he did draw a similarity to something we've been dealing with here: Smoke from all of the fires.



The main take-away from this talk is that when we're dealing with fire season, it's a marathon, not a sprint. We need to make sure our messaging isn't being lost in the smoke and haze of poor air quality--especially because these are very important concerns in our area.

Additionally, he also learned that different groups of people read our messages in different ways. Although this does seem obvious, it is difficult to write a single product and have it be effective at getting everyone to heed our advice. We are working toward moving to a more probabilistic approach of communicating risk which social science suggests will help us to accomplish our mission of protecting lives and property.

The next thing that Brad brought home to the office was a new study showing how to leverage RADAR data to help determine if a smoke plume is going to collapse. This is important because when a smoke plume collapses, it results in strong, erratic winds that will endanger the firefighters on the front lines. Although the study is not robust, it is still highly useful because we deal with several large fires and work with firefighters on the front lines. This study shows that we can use radar data to give firefighters 15 to 20 minutes lead time of a plume collapse. This will allow them valuable time to escape to safety.

Lastly, the conference held several talks about utilizing the new satellites to help us detect whether or not a thunderstorm cloud could develop lightning before it strikes. This is important because this can give the Medford Airport some lead time in getting everyone indoors to safety. It will also give us the ability to alert our partner agencies regarding which showers may produce lightning in order to help them narrow their search to put out new fire starts. Overall, this project still has a long way to go, but it is still one of the most exciting things we can look forward to utilizing in the coming years.

Overall, the conference was a complete success, and Brad learned a lot of new information and research that he is sharing with his office. The goal from this is to bring this research onto the operations floor, and improve our office capabilities, messaging, and partnerships.

Astronomy Highlights

Misty Firmin, *Meteorologist*

Meteor Showers Remaining in 2018

	Draconids	Orionids	South Taurids	North Taurids	Leonids	Geminids
Active Period	Oct. 6th – Oct. 10th	Oct. 4th – Nov. 14th	Sept. 7th – Nov. 19th	Oct. 19th – Dec. 10th	Nov. 5th – Nov. 30th	Dec. 4th – Dec. 16th
Peak Date	Oct. 7th & 8th	Oct. 21st	Nov. 4th	Nov 11th & Nov. 12th	Nov 17th & Nov 18th	Dec 13th & 14th
Best time to view	After sunset—just after nightfall	After midnight—just before dawn	After midnight—until dawn of the 5th	Late night on the 11th until dawn of the 12th	After midnight—just before dawn	Mid-evening Dec 13th—dawn of Dec 14th
# meteors per hour	~20… sometimes hundreds	~10 to 20	~5-10	~5-10	~10-15…can be many more	~50-100… rivaling the Perseids
Moon Phase	New	Waxing Gibbous	Waning Crescent	Waning Crescent	Waxing Gibbous	Waxing Crescent
Comet of Origin	Giacobini-Zinner	Halley	Encke	Encke	Tempel-Tuttle	Phaethon
Constellation of Origin/Radiant	Draco, near Eltanin & Rastaban	Orion, north of Betelgeuse	Taurus	Taurus	Leo	Gemini, near Castor & Pollox
Direction to Look	Northwest	Southeast	South	South	East	East

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Our Vision

Professionals focusing on science, teamwork, and customer service to design and deliver the best decision-support information to our community.

Our Mission

Our team at the National Weather Service Office in Medford strives to deliver the best observational, forecast, and warning information through exceptional customer service, extensive training and education, maintaining quality electronic systems, and relying upon an outstanding team of weather spotters and cooperative observers. We do this within the overall mission of the NWS to build a Weather-Ready Nation:

To provide weather, hydrologic, and climate forecasts and warnings for the United States, its territories, adjacent waters and ocean areas, for the protection of life and property and the enhancement of the national economy. NWS data and products form a national information database and infrastructure which can be used by other governmental agencies, the private sector, the public, and the global community.

Our Values

Trust, Integrity, Professionalism, Service, Teamwork, Ingenuity, Expertise, and Enthusiasm.

About Us

The Weather Forecast Office in Medford, Oregon, is one of more than 120 field offices of the National Weather Service, an agency under the National Oceanic and Atmospheric Administration and the United States Department of Commerce. The Weather Forecast Office in Medford serves 7 counties in southwestern Oregon and 2 counties in northern California, providing weather and water information to more than a half-million citizens. We are also responsible for the coastal waters of the Pacific Ocean from Florence, Oregon, to Point St. George, California, extending 60 miles offshore. The office is staffed 24 hours a day, 7 days a week, and 365 days a year by a team of 26 meteorologists, hydrologists, electronic technicians, hydro-meteorological technicians, and administrative assistants, under the direction of Meteorologist-In-Charge John Lovegrove.