NATIONAL WEATHER SERVICE - MEDFORD, OREGON

Winter 2019
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The Crater Chronicle

Have a question you'd like to see answered in the next edition? Send it our way! The next issue will be published in March 2020 for the Spring edition.

Submit a Question for the Next Issue of the Crater Chronicle's "Ask A Meteorologist" Column!

E-mail: Misty.Firmin@noaa.gov

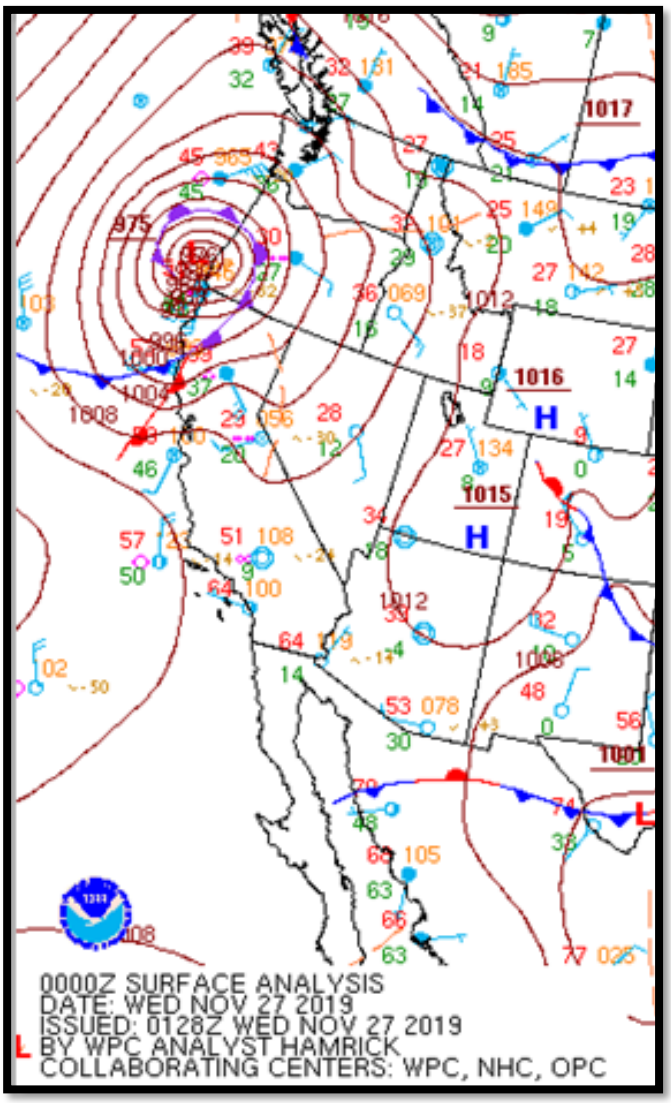
INSIDE THIS ISSUE

"Bomb Cyclone" explodes and lashes portions of the West Coast just before Thanksgiving 2019, one of the busiest travel weeks of the year.

Marc Spilde, *Forecaster* & Shad Keene, *Lead Forecaster*

On November 25th and 26th, a "bomb cyclone" moved into the area, bringing wide ranging impacts from high winds to heavy snow. This low was unique because of it's track and it's depth. Our typical strong systems move from the southwest to the northeast, whereas this system tracked from the northwest to southeast.

It was also one of the deepest lows to ever impact the southern Oregon coastline. The lowest sea-level pressure measured was 971.2 mb (28.68 inches) at Buoy 46027 just off Point Saint George, CA. The storm set an all-time record for the lowest sea-level pressure observed in California at Crescent City with 973.6 mb (28.75 inches). Also, a new record for lowest sea level pressure for the month of November was set for the Medford Airport, 981.4 mb.



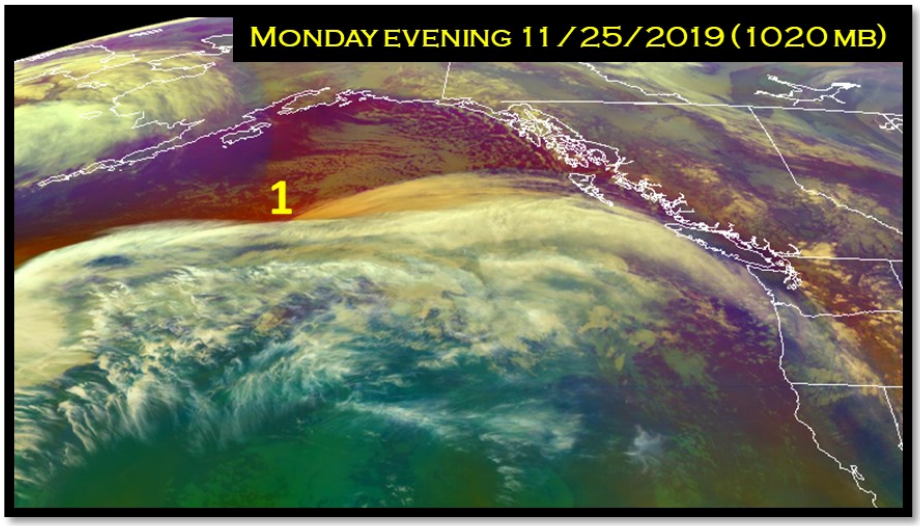
Impacts were severe. Wind gusts of 60 to 80 mph were common along the coast and at elevation just inland in SW Oregon and NW California, where widespread reports of downed trees and power lines caused power outages. A top instantaneous wind gust of 106 mph was measured at Cape Blanco Coast Guard station. It also brought 1-2 feet of snow to the higher passes along Interstate 5, which closed the road in both directions Monday night. *Cont.*

Evolution of a "Bomb Cyclone"

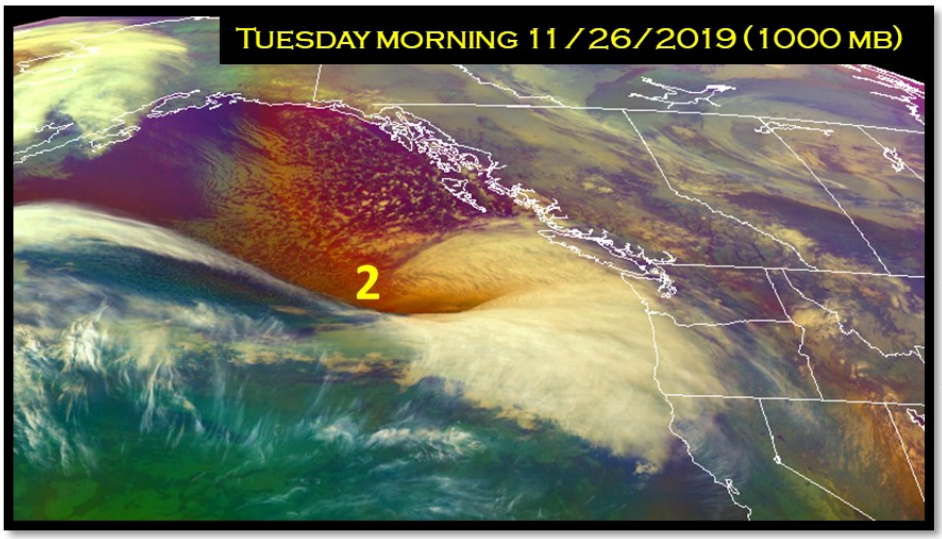
-Marc Spilde, *Forecaster*

Satellite Images credit: NOAA CIRA

It sounds scary and sometimes it can be, but "bomb cyclone" simply refers to a storm that strengthens rapidly, with the barometric pressure falling at least 24 millibars (mb) or (0.71 inches of mercury) in less than 24 hours. These storm systems are often associated with strong winds and heavy precipitation and can cause significant weather hazards at sea and on land.



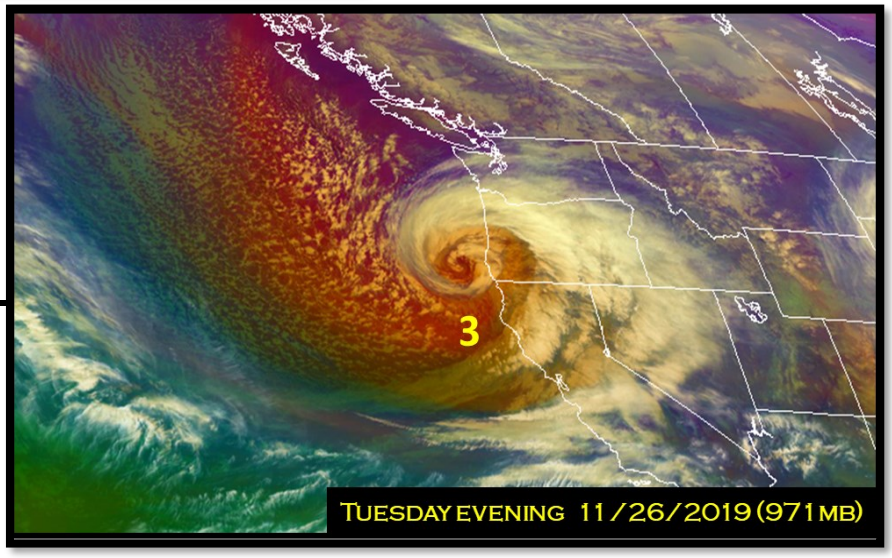
On Monday evening, November 25th, 2019, at its infancy (annotated as **"1"** in the image to the right), the low is only 1020 mb (30.12 inches). This GOES-West Air Mass RGB image shows a jet streak (denoted by the reddish colors) advancing quickly eastward through the north Pacific Ocean. The blue/purple colors to the north and west of the jet streak (near the Aleutians) indicate a cold air mass. The olive/green colors to the south indicate a warm air mass.



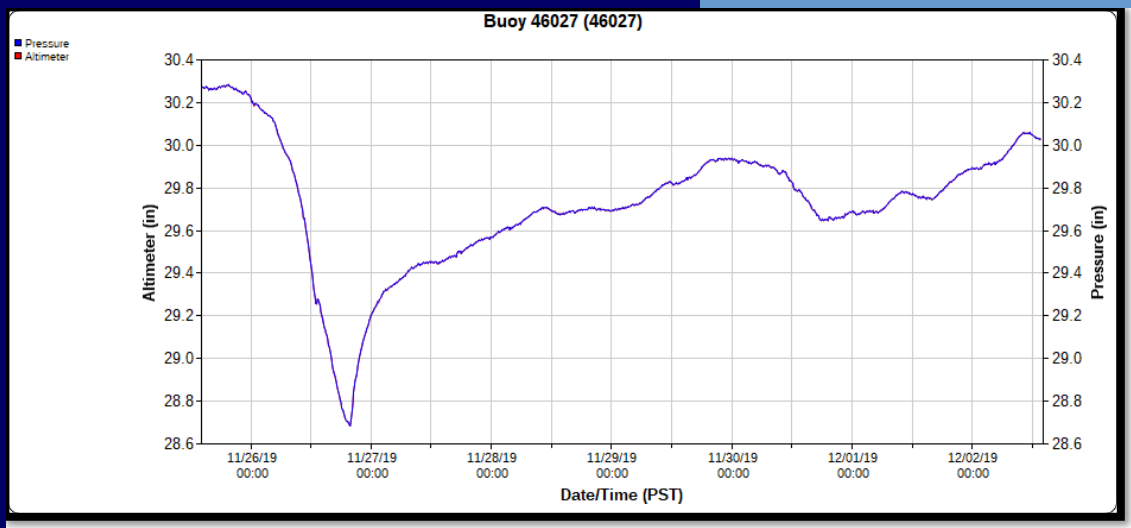
By early Tuesday morning, November 26th, 2019 (**"2"** in the image to the left), increasing temperature gradients in the troposphere (reds very close to greens) and high-speed air associated with the jet streak aid in the formation of a baroclinic leaf (clouds aimed at Oregon), and, in this case, induce rapid cyclogenesis. At this point, the pressure is around 1000 mb (29.53 inches).

At maturity, by Tuesday evening (**"3"** in the lower image), the low deepens into its classic "comma-head" shape and develops an eye-like feature as it undergoes warm seclusion just prior to moving onshore.

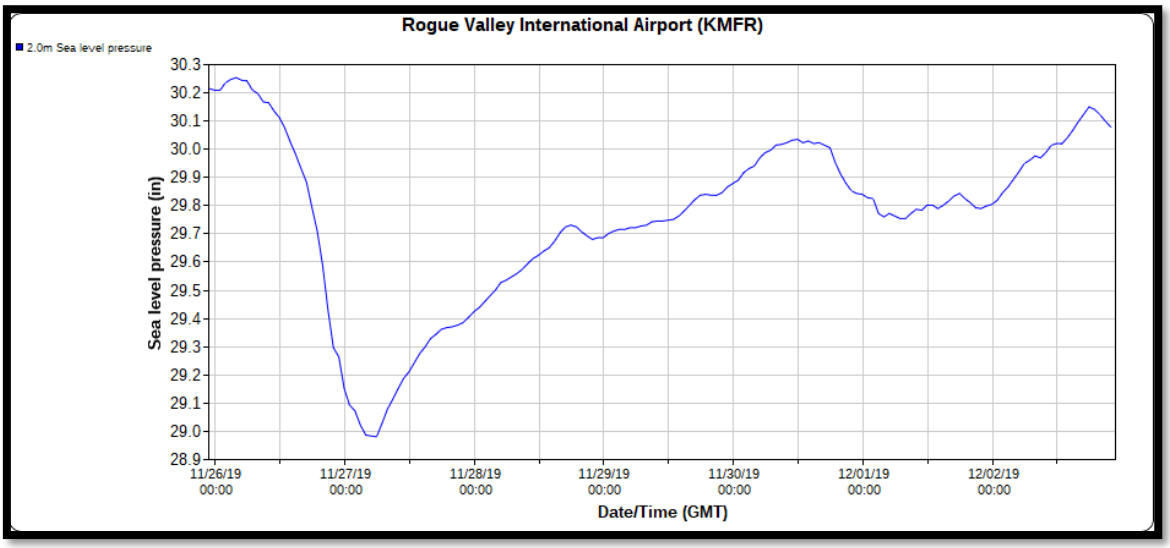
"Pressure Drop: ~49mb in 24 hours"



The lowest sea-level pressure measured for this storm was 971.2 mb (28.68 inches) at Buoy



46027 just off Point Saint George, CA. The pressure drop of more than 49 millibars in under 24 hours was more than double the necessary rate at which "bomb cyclones" are classified. The storm set an all-time record for the lowest sea-level pressure observed in California at Crescent City with 973.6 mb (28.75 inches). A record lowest November sea-level pressure was recorded at Medford with 981.4 mb (28.98 inches) and it was the second lowest pressure ever recorded at Medford (lowest was 978.0 mb or 28.88 inches set on January 20, 2010).



For more information about "bomb cyclones" and warm seclusions:

⇒ https://en.wikipedia.org/wiki/Explosive_cyclogenesis

⇒ https://en.wikipedia.org/wiki/Extratropical_cyclone

For more information about GOES-West (17):

⇒ https://www.goes-r.gov/multimedia/dataAndImageryImagesGoes-17.html

For more on the Air Mass RGB originally developed by EUMETSAT:

⇒ http://rammb.cira.colostate.edu/training/visit/quick_guides/QuickGuide_GOESR_AirMassRGB_final.pdf

Traveling this Winter?

Shad Keene, *Lead Forecaster*

As we head into winter, here's a general checklist I follow before taking my family into the mountains.

- Winterize your vehicle. Here's a link to some tips for preparing your vehicle for winter weather driving.
- Practice putting on your tire chains ahead of time. It's sometimes difficult to put these on in good conditions, but in a real situation you may have to install chains in cold, snowy conditions, so you'll want to be practiced.
- Check the forecast, early and often. I'll look at the forecast several days before traveling, and I'll check it every day until the day we leave. I'll read the forecast discussion to get an idea on the whole weather situation.
- We've collected the major mountain passes on a single website so you can quickly access them. https://www.weather.gov/mfr/pass_forecasts

Detailed Forecast

Today	Mostly sunny, with a high near 41. South southeast wind 5 to 7 mph.
Tonight	Mostly cloudy, with a low around 31. South southeast wind around 8 mph.
Tuesday	Rain likely, possibly mixed with snow, mainly after 4pm. Mostly cloudy, with a high near 41. Southeast wind 5 to 8 mph becoming northwest in the afternoon. Chance of precipitation is 60%. Little or no snow accumulation expected.
Tuesday Night	Rain likely before 10pm, then a chance of showers after 10pm. Snow level 5500 feet. Mostly cloudy, with a low around 33. South wind around 6 mph. Chance of precipitation is 70%. New precipitation amounts of less than a tenth of an inch possible.

- Make sure to pay attention to snow levels in this forecast. For instance, in the forecast to the left, if I wanted to travel Tuesday night the snow level is expected to be 5500 feet. That's more than 1000 feet above Siskiyou Summit, so I would feel pretty confident in rain at the pass.
- If I wasn't a meteorologist, and I was having a really tough time making a decision, I'd call the NWS Office in Medford at 541-773-1067. There's always a meteorologist on shift to take your call.
- Once you make a decision to travel in the winter, pack a basic winter survival kit, including tire chains, food, water, blankets, any medications, flashlight, fully charged phone, and phone charger.
- Just before traveling, check ODOT or Caltrans for latest road cameras and road conditions.
- Be ready to receive any weather alerts along your travel route. Wherever you are, you can get the local weather forecast from the National Weather Service with one click on your home screen by visiting mobile.weather.gov and bookmark it to your phone.

All these steps may seem like a lot of work, but doing this will increase your probability of having a safe travel experience.

Know Where to Find Road Conditions when Snow Impacts Roads

Misty Firmin, *Meteorologist*

When snow is occurring or has just ended, we receive A LOT of calls at the office from people asking what the road conditions are like. As much as we would like to be able to tell callers about road conditions, we simply can not. This is because we are meteorologists; we forecast the weather. If we were to give road conditions, that would be the equivalent of calling the Department of Transportation for a weather forecast. We can give you a forecast for an ideal window when snow will be less likely to impact travel, but we simply can not judge what ideal road conditions are. What may seem like ok or ideal road conditions for one of us in the office, may be considered highly treacherous for the caller. Aside from that, we will just simply look at area webcams for an idea on what road conditions are, which are the same sources available to the public. So when we receive a call inquiring about road conditions, we refer the callers to either tripcheck.com or 511 if they are looking for Oregon road conditions. If they are looking for California road conditions, we refer them to the Caltrans website, dot.ca.gov.

For a weather forecast:

www.weather.gov/mfr

541-773-1067 , we're here 24/7/365

For Oregon Road Conditions:

www.tripcheck.com

Call: 511 (while in OR)

For California Road Conditions:

www.dot.ca.gov/

Call: 511 (while in CA) or 1-800-427-ROAD (7623)

Stock your travel emergency kit:

- Blankets/warm clothes
- Flashlight w/extra batteries
- First aid kit
- Water/Food
- Shovel
- Cat litter or sand
- Tire chains
- Cell phone and charger
- Necessary Medications

Know Before You Go!

Weather Forecast/Hazards:

- www.weather.gov/medford
- NOAA Weather Radio
- Useful Apps:
  - mobile.weather.gov
  - www.fema.gov/mobile-app
  - www.redcross.org/mobile-apps/emergency-app

Road Conditions:

- Oregon: Tripcheck.com or dial 511
- California: quickmap.dot.ca.gov or dial 800-427-ROAD (7623)

Tsunami Scenario: How a Tsunami Watch/Warning/Advisory Gets to You

Brian Nieuwenhuis, *Forecaster*

It is 3 AM on a cool, mid-winter night in Medford, Oregon. Though most people are asleep, two sleepy National Weather Service forecasters are on duty, just finishing up the daily early morning forecast package. Suddenly, computer screens begin flashing and a shrill alarm pierces the early morning tranquility! The forecasters' nodding heads jerk upwards in sudden full awareness as crucial information streams into view. A large earthquake has struck just offshore of Alaska, and even more pertinent, a tsunami may be on the way! The forecasters, now fully awake, immediately jump to action.

Within seconds of that first alarm, the National Tsunami Warning Center (NTWC) confirms their issuance of a Tsunami Watch for the Oregon coast during a call on the National Warning System. With the push of just a few keys, and a quick read-through of the product, the forecasters transmit the Watch to the communities along the coast, the media, and all responding agencies. It has been less than a minute since the first alarm sounded on the computers, and less than two minutes since the earthquake occurred.

The Watch is out, but the job is not done. The phones begin ringing, and there is a conference call scheduled soon with the warning center, the states, and the local NWS forecast offices. Data is still streaming into the system, and this information, including arrival times and possible wave heights, must be passed on to responders and others that lie in the path of the possible tsunami. The forecasters make a call to bring in additional staff, then set to work calling emergency managers, issuing relevant statements, updating the local website, and posting information to social media outlets.

The conference call begins, with discussion ranging from offshore tsunami buoys and coastal sea level measurements, to model runs and possible wave arrival times and heights. According to the data, it appears a small tsunami will sweep south along the Pacific coast, reaching Oregon roughly 4 hours after the initial earthquake. The NTWC upgrades the event to an Advisory, and the forecasters quickly step up their efforts, calling responders and communities along the coast with updates, as well as updating the previous products, websites, and social media posts.

For the next several hours, the Weather Service continues to support responders and communities along the affected coastline, working to prevent loss of life and mitigate property and infrastructure damage until the waves recede and the event is over.

Winter's Nuisance: Air Stagnation

Miles Bliss, *Forecaster*

Just when we think the time of year has passed when air quality can be at its worst, we enter a time of year when poor air quality can still plague our valleys. During summer, the source of poor air quality is quite simple: wildfires. In non-summer months, it is not as obvious. The cause is more subtle, and surprisingly straightforward: a persistent inversion and the accumulation of pollutants. For some, this may raise the question, what's an inversion and where are the pollutants originating from?

In the simplest terms, an inversion is when a layer of warm air is bounded by colder air above and below it. Normally, temperature decreases with height, but not when an inversion is present. Instead, there is a layer of cold air at the surface from which temperatures rise with height. Air near the ground can cool when clear night skies allow heat to radiate from the earth's surface. The denser cold air will sink during the night and pool in the local valleys. The cold air will be resistant to mixing and trapped in the valleys because cold air is more dense than the warmer air above it. These conditions typically occur when high surface pressure builds and persist over an area for an extended period of time.

Taken on Nov. 8, 2019 from Pilot Rock peak looking south toward Mt. Shasta.

As for the pollutants that become trapped, their accumulation is tracked by the Department of Environmental Quality (DEQ). Some of common sources are:

⇒ Wood burning/Pellet stoves

⇒ Prescribed burns

⇒ Industrial exhaust

⇒ Vehicle emissions

The inversion and particulate accumulation can also cause areas of persistent fog and low level stratus in valleys, as in the image.

Often, the inversion will break briefly during the day as solar heating warms the earth, which warms the air near its surface. The National Weather Service provides further information on the strength of the inversion, mixing height, transport winds, and potential for rain. We coordinate this information with the DEQ, which supplies information on particulate concentrations and the potential for harm, to decide when and for how long to issue an Air Stagnation Advisory.

Our most recent air stagnation event occurred between November 3rd and November 18th. During this stretch, the Medford area had begun a stretch of twenty-nine days without recording any precipitation. By the end of this dry period, high pressure, clear skies, and weak transport winds led to a steady inversion, which even during the day struggled to mix out. This combination of factors resulted in an Air Stagnation Advisory for 15 days. During this period, the air was deemed unhealthy for sensitive groups, and in some areas, for everyone. While it is not uncommon for inversions to occur in the Pacific Northwest, Air Quality Advisories are thankfully not one of our more commonly issued products.

October Exercise Continues Cultivating Partnerships between NWS and Public Officials

Brad Schaaf, *Forecaster*

The National Weather Service has been working diligently for years transforming the way we provide weather information. One of our new cornerstones is working with partners like fire agencies, emergency managers, departments of transportation, and other public health agencies. Over the years, we have increased the frequency in which we reach out to our partnerships through phone calls, e-mails, webinars, and face to face meetings. As a result, we've grown rich partnerships with city, county, and even state officials across southern Oregon and northern California. One of our most successful programs is the incident meteorologist program. This is where meteorologists are deployed to fire camps and provide site specific weather information to firefighters in order to keep them safe while they work the front lines. As a result, the National Weather Service has been working to replicate this success with emergency managers. Instead of working at fire camps, however, meteorologists are deployed to emergency operations centers in order to support the response when other disasters strike.

NWS Staff collaborate during the exercise.

This application is not new. Meteorologists across the country, including those at our office, have been teaming up with emergency managers to help provide weather information for disasters for years. What is new, however, is the training that the meteorologists undergo in order to participate in real-time disaster deployment. Part of this training includes participating in real events in order to give weather briefings, media interviews, and written weather reports for our partners. Luckily, our particular forecast area tends to be light on the natural disasters (with the exception of fire). Consequently, we had to create our own exercise.

Various community partners who provided feedback to NWS Staff on their performances during the exercise.

Our office invited a whole suite of partners to attend including our Jackson and Josephine County emergency managers, the Oregon Department of Transportation, the Ashland emergency manager, Jackson County 9-1-1 dispatch, Jackson County Public Works and Public Health, and even the Chief Meteorologist for KDRV. We had one on one briefings, media interviews, and written briefings where real feedback was given in order to help us deliver important information effectively. Overall, the event was successful and all of our meteorologists were able to become deployment ready.

Ironically, the exercise had perfect timing. The very next week, one of our own meteorologists was deployed to a California county emergency operations center in order to support the response efforts for the public safety power shutoffs. Deployments like this help us fulfill our mission to save lives and property. And these types of exercises keep us sharp for whenever we are called upon to interact with our partners and provide direct support when disasters happen.

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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, hydrometeorological technicians, and administrative assistants, under the direction of Meteorologist-In-Charge John Lovegrove.