NWS Seattle 2021 Fire Weather Annual Summary

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This report summarizes NWS Seattle's Fire Weather products and services in support of Western Washington land management agencies and public safety partners in the 2021 calendar year. This report addresses verification of Red Flag Warnings; Spot Forecast statistics; IMET dispatch information; and detailed information on fire weather training, liaison, and outreach activities.

2021 Weather Synopsis

Although the fire season in Western Washington typically runs through the months of July, August and September, the story of the 2021 fire season starts as early as March, where the majority of the region received well below normal precipitation. April would continue this trend, with the region reporting precipitation ranging from below normal to record/near record dryness. Not helping matters would be the increasing trend in recent years for April to see warmer than normal temperatures, with most climate sites reaching record high temperatures at some point during the month. Recent years have also shown May typically following suit with April and while this was certainly the case with regards to precipitation, as abnormally dry to moderate drought conditions started spread throughout the area, temperatures were a bit more moderate coming in closer to normal. June would be the stand-out month leading into fire season although it wouldn't start off that way, with cool temperatures and precipitation being present at the start of the month. By mid-month, however, precipitation was long gone and the furnace kicked on, allowing for a record-breaking heatwave to close out the month with widespread temperatures ranging from 90 to 100+ degrees. Abnormally dry to moderate drought conditions would persist as the start of fire season approached.

By this point, fuels in Western Washington were reaching above normal ERC values with some locations starting to encroach on record territory…so to say that fire season essentially started with the area primed and ready to go would indeed be an understatement. The fact that no precipitation fell throughout the entire month of July would only serve to exacerbate things. Fortunately, temperatures would moderate some with values ranging from near normal to above normal. August would bring another heat wave, though pale in comparison to June's, and while some precipitation would fall, climate sites in Tacoma, Seattle and Olympia would see values putting them in the top 10 driest Augusts on record. September would bring relief with near to below normal temperatures and above normal precipitation, heralding the wet fall season to come.

The fact that Western Washington manage to make it out of these months without any large incidents is a credit to the messaging coming from the WFO regarding these very unusual conditions, how the local and regional fire agencies took that message and ran with it, the public that took the message to heart, and maybe just a little luck. While the WFO continued to field spot requests for smaller incidents and

prescribed burns, the brunt of major wildfire activity remained to our south and east.

2021 Fire Weather Watch / Red Flag Warning Verification

Red Flag events consist of **1)** scattered lightning, **2)** a combination of a moderate breeze and low relative humidity, or **3)** a dry and unstable atmosphere – in combination with dry fuels. When fuels have reached a pre-requisite level of dryness, Red Flag events are determined using lightning data, surface observations (mainly RAWS and ASOS sites), and upper air data. Impacts - such as growth on existing fires and new ignitions - are strongly considered.

The numbers of warnings was down significantly from 2020. Even though fuels were at or near record lows for much of the 2021 season, critical fire weather elements had difficulty lining up. This diminished amount of warnings issued coupled with a single missed lightning event in early August would bring WFO Seattle skill scores down slightly from 0.68 in 2020 to 0.62 in 2021. The False Alarm Rate would see a slim improvement from 30% in 2020 to 29% in 2021. Average lead times would take a significant hit in 2021 falling from 41 hours in 2020 to just 20.5 hours this year. However, this falls more in line with 2019's average lead time, as the 2020 value was heavily skewed by an easily forecast event in September of that year.

JUNE 28, 2021 - Dry and Unstable
656 (Northeast Puget Sound Lowlands below 1500 feet), 657 (SE Puget Sound Lowlands below 1500 feet), 658 (North Cascades above 1500 feet) & Zone 659 (Central Cascades above 1500 feet):
RFW issued for dry and unstable conditions. While zone 656 would not meet criteria, the remaining zones did, especially in zones 658 and 659 where all stations would meet criteria. *Warning verified with 20 hours of lead time from the issuance of the Red Flag Warning for zone 659 and 8 hours of lead time for the remaining zones.*

AUGUST 3, 2021 - Lightning
658 (North Cascades above 1500 feet):
A lightning outbreak would occur over zone 658, dropping 176 strikes within the zone. No RFW issued. *Missed Event.*

AUGUST 12-13, 2021 – Dry and Unstable (658, 659), Wind and RH (656)
656 (Northeast Puget Sound Lowlands below 1500 feet), 658 (North Cascades above 1500 feet) & 659 (Central Cascades above 1500 feet):
RFW Issued for Dry and Unstable conditions in zone 658 would verify on the 12th but not the 13th while it would verify for zone 659 on both days. The RFW for wind and RH for zone 656 would not verify either day. However, since both RFWs were issued as one long warning including the overnight period, the verification on the 12th would end up verifying the entire warning for both 658 and 659. *Lead time was approximately 31 hours from the issuance of the Fire Weather Watch for Zones 658 and 659, 21 hours from the upgrade to a Red Flag Warning.*

2021 Stats

Red Flag Warnings	- 7 issued - 5 verified - 1 unwarned events
Average lead-time of Red Flag events	- 20.5 hours
# Of Red Flag Warnings issued = a + c	= 7
# Of Red Flag Warnings that verified = a	= 5
# Of Red Flag Warnings that did not verify = c	= 2
# Of observed events with no RFW issued = b	= 1

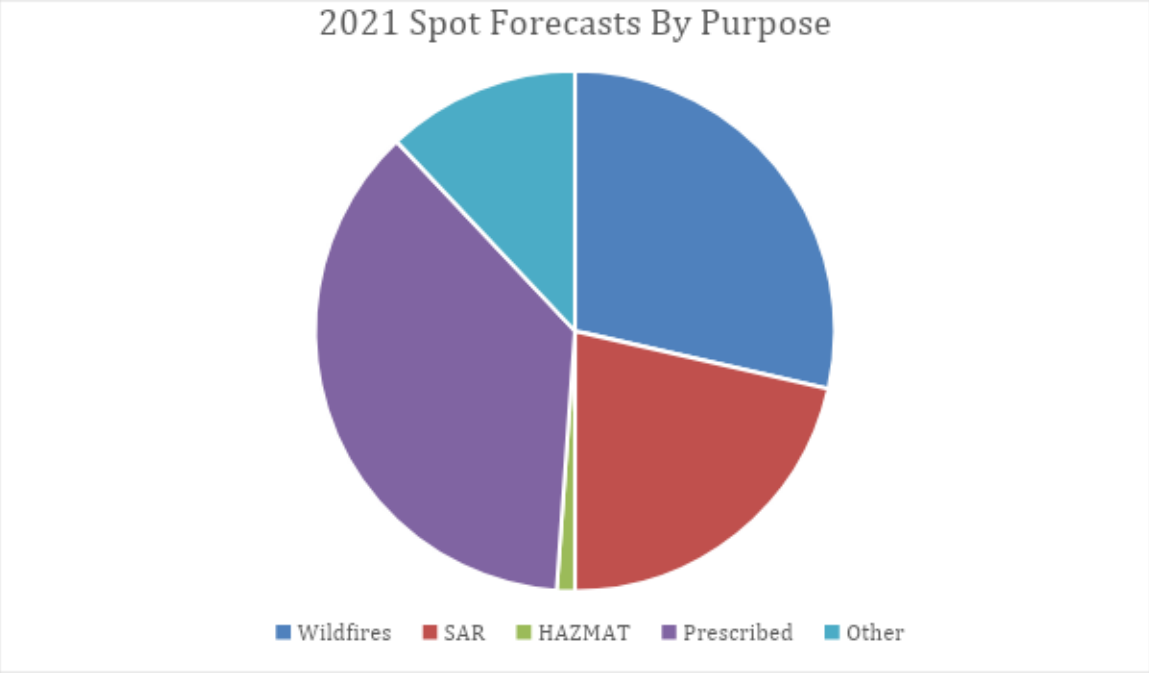
Probability of Detection (POD)	= a/(a+b)	= 5 / (5+1)	= 0.83 = 83%
False Alarm Rate (FAR)	= 1 - (a/(a+c))	= 1 – (5 / (5+2))	= 0.29 = 29%
Critical Success Index (CSI)	= a/(a+b+c)	= 5 / (5+2+1)	= **0.62**

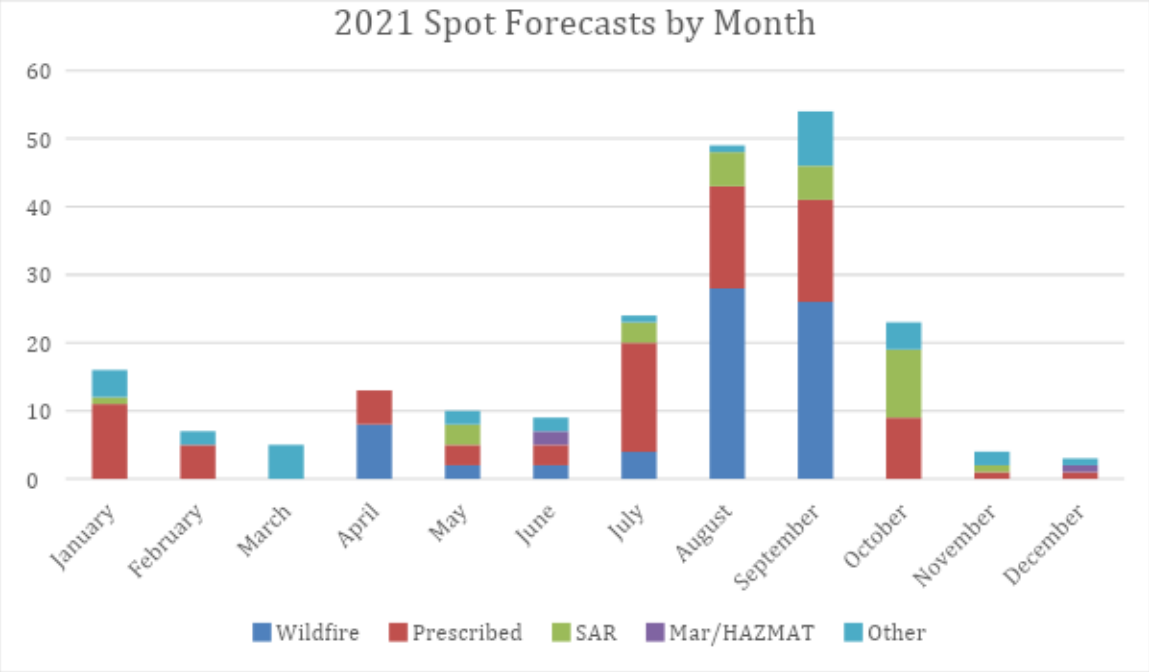
2021 Spot Forecasts

Spot Forecasts are intended to support tactical decision making on wildland fires, prescribed burns, Search and Rescue missions, HAZMAT incidents and public events.

NWS Seattle issued 266 Spot Forecasts in 2021. This was an increase from the 203 forecasts issued in 2020. Numbers for wildfire spots saw another year of increase, going from 69 in 2020 to 76 last year. Of course this increase is likely due to the extended period of heightened dryness that plagued Western Washington. Prescribed burn spots rebounded from 2020, going from 65 to 98 in 2021. This is likely due to the prolonged prime burning conditions. Search and Rescue spots nearly doubled thanks to a couple of locally high profile events, including a University of Washington professor who was never found.

Purpose	# of Spots
Wildfire	76
Prescribed Burns	98
Search and Rescue	57
Marine/HAZMAT	3
Other	32





2021 IMET Dispatches

In 2021, NWS Seattle **I**ncident **Met**eorologist (**IMET**) responded to **4 dispatches** totaling **41 days** of on-site weather support, including travel. They were:

Dates	IMET	Location	Incident
6/9 – 6/14	Bower	Panguich, UT	Mammoth Fire
7/14 – 7/17	Bower	Sunriver, OR	Grandview Fire
7/17 – 7/29	Bower	Wallowa, OR	Elbow Creek Fire
8/8 - 8/25	Bower	John Day, OR	Black Butte Fire

Training, Liaison, and Outreach Activities in 2021

The COVID-19 pandemic did not allow for any in person outreach activities this year. However, thanks to lessons learned from 2019, all outreach activities had shifted to using virtual tools such as Google Meetings, GoTo or Microsoft Teams. Thus NWS Seattle was able to resume providing weather instruction during local agency pre-season training and providing outlooks to local officials.

Date	Forecaster	Location	Activity
3/25	Reedy/Kovacik	Port Angeles	RT-130
3/30	Kovacik	North Bend	RT-130
4/14	Kristell	Port Angeles	RT-130
4/14	Wolcott/Kovacik	Joint Base Lewis McChord	State EOC Workday

4/22	**Kristell**	**Olympia**	**RT-130**
5/12	**Kristell**	**North Bend**	**RT-130**
5/13	**Kristell**	**Olympia**	**RT-130**
6/1	**Reedy**	**Port Angeles**	**RT-130**
6/3	**Kristell**	**King County EOC**	**Summer Hazard Seminar**
6/22	**Reedy/Kristell**	**North Bend**	**RT-130**