2021 FIRE WEATHER REPORT – WFO PQR

BAGBY HOT SPRINGS DURING THE BULL COMPLEX – PHOTO BY SCOTT WEISHAAR

2021 Fire Weather Summary

The 2021 fire season was far less catastrophic compared to the destructive 2020 season. In 2020, the forecast area experienced several catastrophic and deadly wildfires in early September. Communities were devastated and several lives lost. These deadly wildfires were not confined to the Cascades. The Echo Mountain Complex, just a few miles east of Lincoln City devastated the coastal community of Otis. It is extremely rare to have a 100,000 acre fire within the forecast area. In 2020 the Beachie Creek and Riverside Fires each scorched over 175,000 acres. The Holiday Farm fire ravaged the McKenzie River corridor, burning over 173,000 acres and destroying over 400 structures, including the entire community of Blue River. The Echo Mountain Complex, although much smaller at around 2500 acres, destroyed hundreds of homes in the community of Otis. Spot forecast requests were a little above average. Wildfire spot requests were the second highest since 2003. Fire season 2017 had the highest number of wildfire spot requests at 240. The majority of wildfire spots occurred in July and August. There were six Red Flag events during the 2021 season. Overall, national IMET support was the highest on record. There were 217 missions in 2021, well above the average of 113. The Portland office fulfilled seven IMET dispatch requests, two in California, one in Central Washington, three in Western Oregon and one remote dispatch for Washington DNR conducted from the Portland Forecast Office. The COVID-19 pandemic presented additional complications from firefighting efforts, incident management to forecast office operations and much more.

Contents

Lightning Days

Table one shows the lightning frequency, by area, for the 2021 season.

TABLE 1 - 2021 LIGHTNING DATA

(MAY THROUGH OCTOBER)

AREA	# LIGHTNING DAYS 2021	AVE. # DAYS (LAST 26 YEARS)	PERCENT AVE.
ZONES 601/612/664	2	5.54	36.1%
ZONES 602/603/665	2	6.92	28.9%
ZONES 604/667	3	8.14*	36.9%
ZONES 605/607/660/663	7	11.50	60.9%
ZONES 606/608	8	12.85	62.3%

***** Average over 28-year period.***

DATA OBTAINED FROM NATIONAL WEATHER SERVICE AND NORTHWEST COORDINATION CENTER

Examination of the above lightning table shows a general pattern of well below-normal lightning frequency for the Portland Fire Weather area. This has been the trend for the past couple of seasons. There were two main lightning periods. The first occurred in mid-June, before the historic heat wave. The second was during the first 10 days of August. Overall fuel conditions, based on zone-average Energy Release Component (ERC), reached critical levels around mid-July and remained at or above the 80th percentile through mid-September. The duration of critical fuel conditions during the 2021 season was 150 to 200 percent longer compared to the 2020 season. It was fortunate that below-normal lightning frequency occurred during the peak portion of fire season. Spring precipitation (March-May) was generally below normal, especially April and May 2021. All areas received well-below normal precipitation in April, in the bottom 10% percentile range (see figure 1 next page), with some locations recording the driest April on record. The

Portland and Eugene Airport sites received around one-third of an inch for the entire month. The extremely dry pattern continued through May, with many areas receiving 50 percent or less of normal rainfall. The Cascades fared better, generally 60 to 80 percent of normal. Another way to analyze the lack of precipitation is to use the Standardized Precipitation Index (SPI). Figure 2 (next page) shows the two-month SPI for the April through May period. The entire fire weather forecast area exhibited SPI values of at least 1.5 standard deviations below normal, with a large portion at 2 or more standard deviations below normal.

A relatively wet period in early June helped to ease fire danger concerns, but was short-lived. The main 2021 summer weather event was the historical heat wave at the end of June. All-time high temperature records occurred at numerous locations. The only saving grace was the timing of the record hot spell. Had this event occurred in mid-July or later, when ERC values were at or above the 90th percentile, things would have been much more concerning regarding the threat of wildfires.

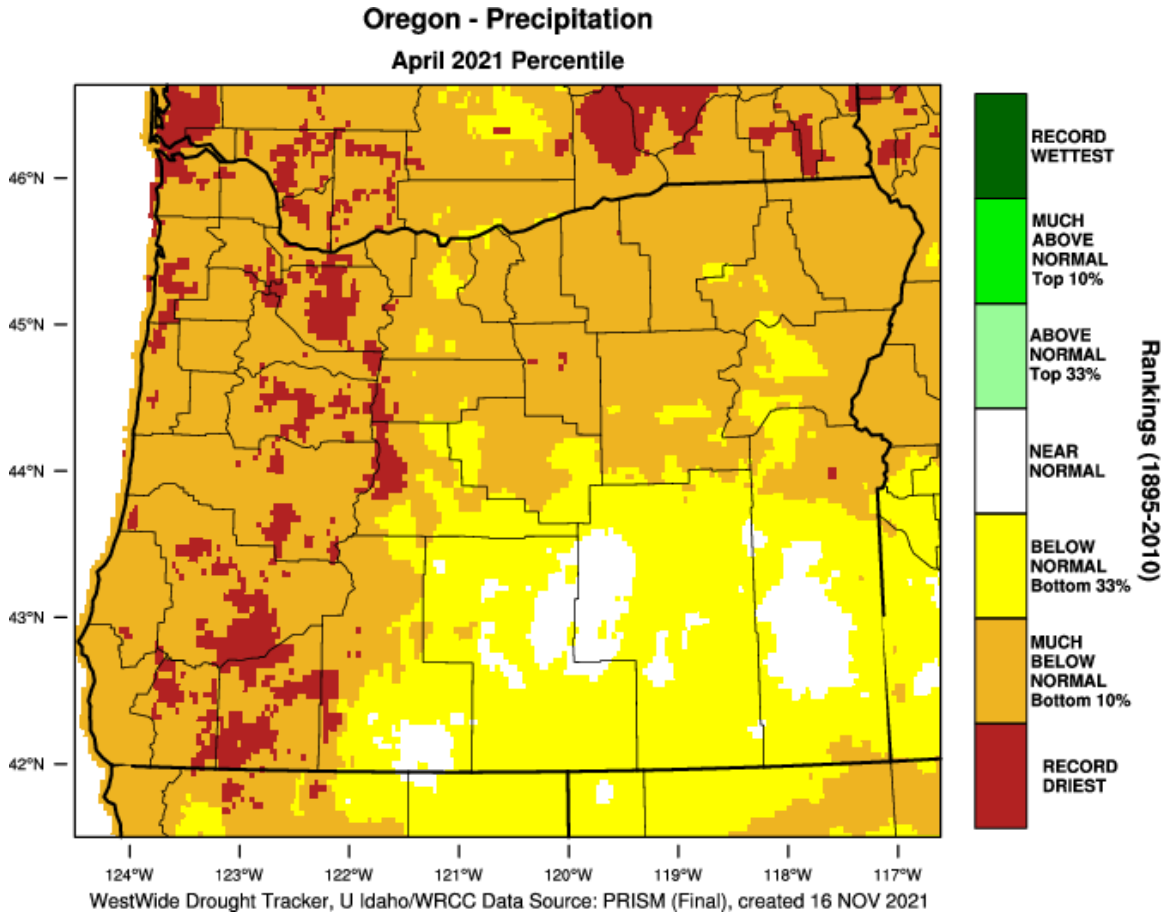

Figure 1 – April 2021 Precipitation Percentile

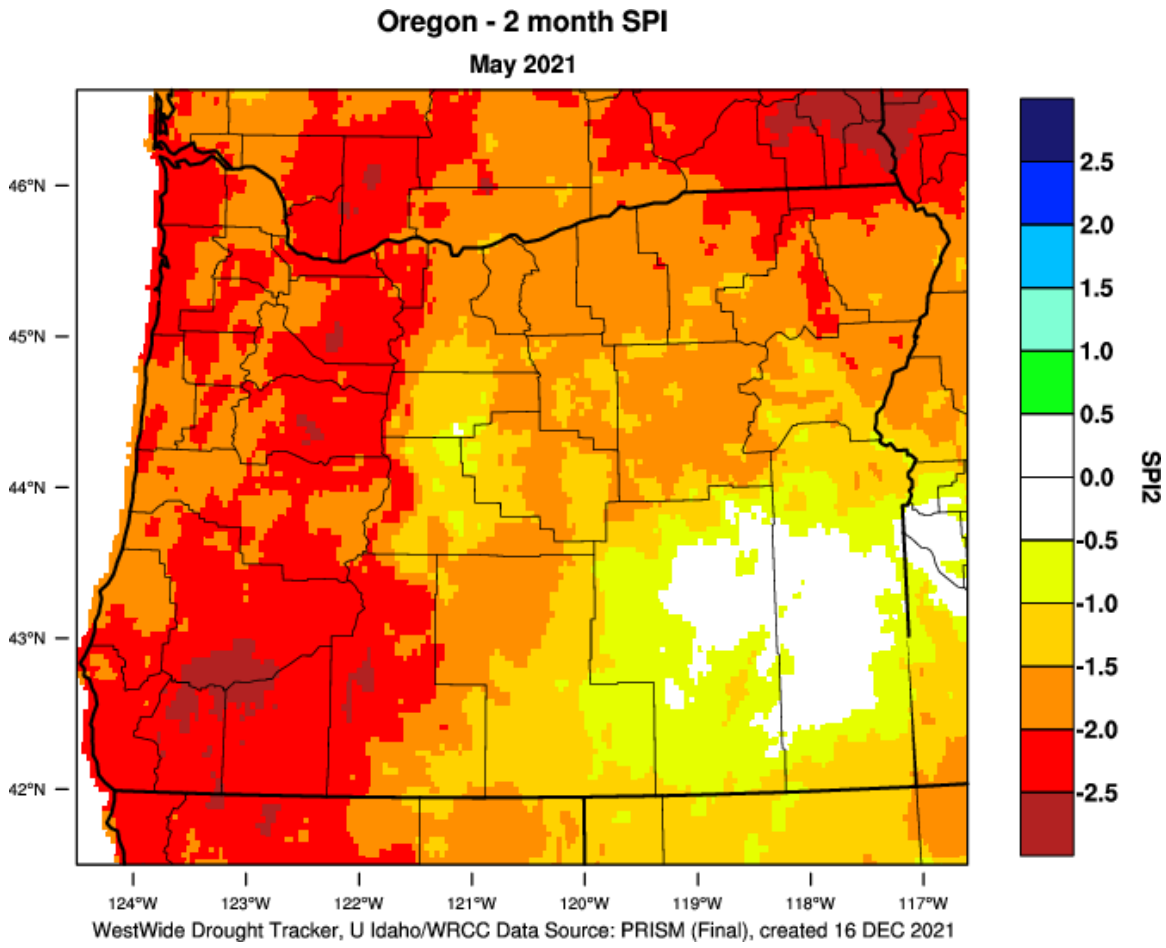

Figure 2 – April-May 2021 Standardized Precipitation Index (SPI)

Cascade Snow Depth and Pre-Season Precipitation

GOVERNMENT CAMP SNOW DEPTH: The 2020-21 North Oregon Cascade snowfall season got off to an early start. The first day of measured snow depth at Government Camp was November 8th. A 16-inch snow depth was measured by the middle of November. The November snow depth decreased to 7 inches by the 21st, but rebounded to 14 inches by the end of the month. Snow depth steadily increased during December, reaching 24 inches on the 18th, decreasing to 17 inches on the 21st and then rising to 28 inches at the end of the month. December 2020 Snow Water Equivalent (SWE) values for the Mt. Hood Basin were at 99 percent of normal. Overall snowpack and SWE conditions diminished in January 2021. Figure 3 (next page) shows the SWE on January 31, 2021. Note that SWE values across the area were generally 70-89 percent of normal. Government Camp snow depth fell to 12 inches on January 19th then hovered in the 13-18 inch range through the remainder of January. Significant snowpack improvement occurred in February 2021. The snow depth was 12 inches on February 2, but jumped to 74 inches by the 20th and peaked at 88 inches at the end of the month, which was the highest reading for the season. Snow depth exhibited a slow decline during the first three weeks of March, falling to 63 inches on the

18th. There was some improvement late in the month. Snow depth rose to 76 inches on March 30th. Typically, snowpack reaches a seasonal peak in March. Warm and extremely dry April 2021 conditions resulted in rapid snow melt throughout the Cascades. The Government Camp snow depth was 70 inches on April 1st, but dwindled to 0 inches on the 23rd. Government Camp snowpack usually holds through May. The largest single-day jump was 12 inches on February 26th.

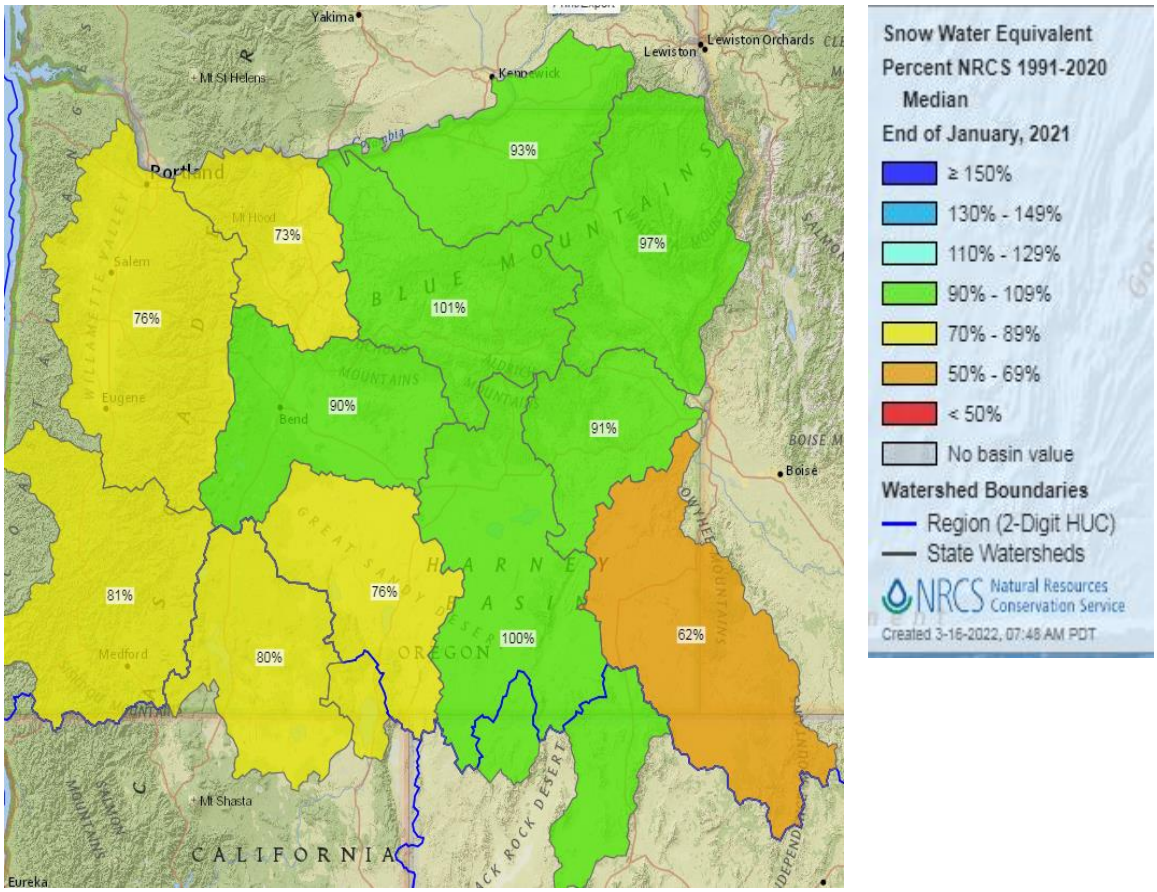

Figure 3 – January 2021 Snow Water Equivalent Percent of Normal

GOVERNMENT CAMP PRECIPITATION: The overall pre-season precipitation (November through May) was 95% of average. This was the fourth consecutive year of below-normal pre-season precipitation. Precipitation for the period November through January ended up close to normal. February 2021 was extremely wet, with nearly 200 percent of normal precipitation. As stated earlier, snowpack improved dramatically during February. Basin SWE values by the end of February had improved to 120 percent of normal. The improved SWE during February provided some hope that fire season 2021 would start on time or even be slightly delayed. Unfortunately, overall conditions changed abruptly during the April through May time period. SWE values remained around 120 percent of normal at the end of March 2021, but declined to just under 100 percent of normal by the end of April. After well above-normal precipitation in February,

Government Camp received 65 percent of normal precipitation in March, 26 percent of normal in April and 75 percent of normal in May.

Above-normal precipitation was noted in December 2020 and February 2021. The remaining wet-season months had below normal precipitation. Figure 4 (below) shows the 2020-21 precipitation summary for Government Camp.

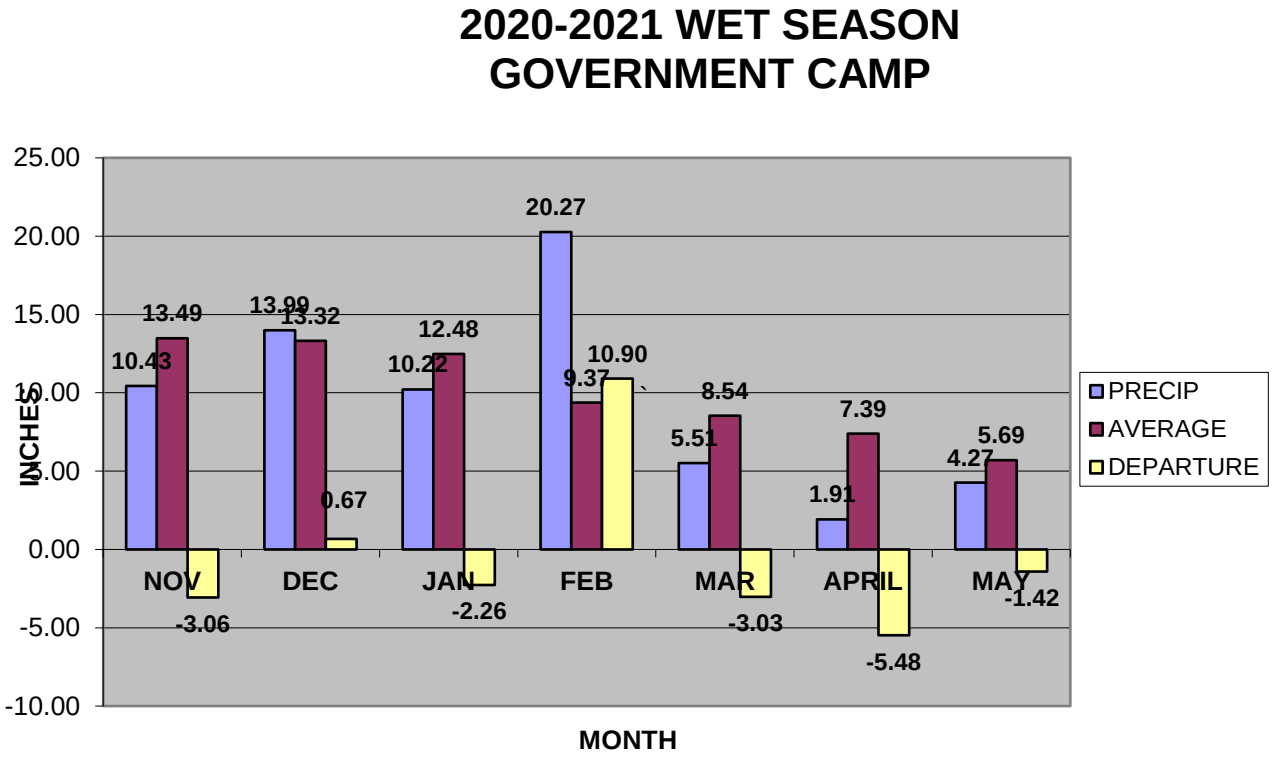

Figure 4 – Government Camp Precipitation Nov 2020 through May 2021

OTHER NOTES: The Astoria and Newport reporting sites recorded just under 100 percent of average winter and spring precipitation. January through February rainfall was well-above normal. However, rainfall for the March through May period ended up 47.0 percent of normal for Astoria and 56.4 percent of normal at Newport.

2021 FUEL CONDITIONS NOTES

The highest ERC values generally occurred in mid-August (see Appendix 1). Fuel conditions for the 2021 fire season, as measured by ERC values, did not reach the extreme values of 2020. However, zone-average ERC values were at or above the 80th percentile for a much longer duration compared to 2020. Critical ERC values (80th percentile or greater) occurred in excess of 60 days in several fire weather zones. For example, fire zone 602, recorded zone-average ERC values above the 80th percentile on 82 days. Rye Mountain RAWS recorded ERC values at or above the 80th percentile of 29 on a staggering 91 days. The daily maximum of 54 on June

27th was well above the 97th percentile value of 43. Critical fuel conditions exceeded 75 days in zones 604, 605, 606 and 608. Zones 607 and 660 had 32 and 37 critical days respectively. This frequency was much lower compared to the Lane County Cascade zone and can likely be attributed to the fact the Mt. Hood and Gifford Pinchot NF switched to NFDRS2016. It was found that ERC values for the new fuel model Y were a little lower than those in the legacy fuel model G. The highest ERC values generally occurred from mid-July through mid-September. There was a brief decline in late August, followed by a secondary peak during the first half of September. Zones 608, 612 and 660 recorded the highest 10-day average ERC values during September 1-10. Zone-average ERC values showed a considerable drop beginning in mid-September. Off-season Red Flag fuel criteria were established in 2019 and continued to be used for the 2021 season. Per user input, primarily NWCC, DNR and ODF, it was decided to use 100-hr fuel moisture values of 10% or less for off-season Red Flag criteria.

The overall fuel condition severity during the 2021 season cannot be understated. The combination of severe to extreme drought conditions and long-duration critical fuel conditions during peak fire season created an environment that was a disaster waiting to happen. Fortunately, below-normal lightning frequency during the most critical portion of the fire season helped to prevent a significant wildfire event. The peak summer fire season was relatively long, generally on the order of two and a half months. Typically, critical fuel conditions can linger well into September and 2021 was no exception. A mid-September major atmospheric river event resulted in a significant decrease in fuel severity.

A historical heat wave occurred at the end of June. Many locations set all-time daily high temperature records, with some sites exceeding 115 degrees. Despite the extreme heat, zone-average ERC values were generally below the 70th percentile. However, a look at the 100-hour fuel moisture values paints a different picture. For many zones, the lowest 10-day average 100-hour fuel moisture values occurred during the June 21-30 time period. ERC is a long-term measure of fuel potential, while 100-hour fuel moisture values exhibit greater shorter term variation.

The newest fire zone 663 that covers much of the Mt. Adams district of the Gifford Pinchot NF contains one RAWS station, Buck Creek. The 90th percentile ERC value for this site is 67. Zone 660, that covers much of the western portion of the Gifford Pinchot NF, has a 90th percentile ERC of 42. There is a large climatological contrast between zones 660 and 663 and this is clearly noted in the vastly different 90th percentile values. In 2021, Buck Creek RAWS exceeded its 90th percentile ERC value of 67 on just 12 days, compared to 26 days in 2020. The peak 2020 daily ERC value was 76.3 on September 9th. In 2021, the peak daily ERC value was 73.4. There were 65 days when the average 100-hour fuel moisture value was less than 10 percent. The lowest reading was 6.6 on August 16th. Zone 608 had the second-highest number of days with 100-hour fuel moisture values at or below 10 percent at 41 days.

Fire zone 602, the North Oregon Coast Range, recorded 80th-percentile zone-average ERC values on 82 days, with 56 days above the zone-average 90th percentile. Miller, South Fork and Rye Mountain ERC values exceeded their respective 80th percentile values over 70 days. In Zone

608, the Willamette NF, Boulder Creek RAWS exceeded its 80th percentile ERC value of 33 on 81 days.

The 1000-hr fuel moisture values generally reach a minimum of 12-14% in late August or early September. It is rare to have 1000-hr values as low as 10%. However, in zone 663, the 1000-hr fuel moisture values dropped to 9.10% in mid-August. The 1000-hr fuel moisture values in Zone 663 were at or below 10 percent from July 21st to September 10th. No other zone recorded a 10-day 1000 fuel moisture value average below 10 percent. Zone 608 showed a minimum 10-day 1000-hr average of 11.71 in mid-August.

Red Flag Warning Statistics for 2021

Table two shows the Red Flag verification statistics for the 2021 fire season.

TABLE 2 (ALL WARNINGS)

ZONE	# RFW	CORRECT RFW (A)	INCORRECT RFW (B)	MISSED EVENTS (C)	POD A/(A+C)	CSI A/(A+B+C)	FAR (1-[A/(A+B)])
601	0	0	0	0	0.000	0.000	0.000
664	0	0	0	0	0.000	0.000	0.000
612	1	1	0	0	1.000	1.000	0.000
602	2	1	1	0	1.000	0.500	0.500
665	0	0	0	0	0.000	0.000	0.000
603	2	2	0	0	1.000	1.000	0.000
604	2	2	0	1	0.667	0.667	0.000
667	0	0	0	0	0.000	0.000	0.000
605	2	1	1	0	1.000	0.500	0.500
606	3	2	1	0	1.000	0.667	0.333
607	2	1	1	2	0.333	0.250	0.500
608	5	2	3	1	0.667	0.333	0.600
660	1	1	0	1	0.500	0.500	0.000
663	1	1	0	1	0.500	0.500	0.000
TOTALS (ALL)	21	14	7	6	0.700	0.519	0.333
LIGHTNING	6	0	6	2	0.000	0.000	1.000
WIND/RH	8	8	0	1	0.889	0.889	0.000
HAINES 6	7	6	1	3	0.667	0.600	0.143

NUMBER OF WARNED EVENTS: 6

EVENTS PRECEEDED BY A WATCH: 2
MISSED EVENTS: 4

NOTE: Refer to the Annual Operating Plan for complete Red Flag criteria.

WARNING NOTES – The number of Red Flag events during the 2021 fire season was typical of any given year. There were a total of 6 events comprising 21 warnings. Each warned zone counts as an individual warning. There are usually 2-3 Red Flag events in any given fire season. In 2021, there were two wind/RH events, one Dry/Unstable event and three lightning events. Two of the lightning events were confined to Zone 608, the Willamette NF. None of the lightning events verified. The last event occurred August 28th. Typically, there is at least one September wind/RH event. The Labor Day 2020 Firestorm was a historic wind/RH episode, resulting in multiple mega-fires.

The Beachie Creek, Riverside and Holiday Farm fires of 2020 burned thousands of structures, resulted in several fatalities and caused tens of thousands evacuations. Entire communities, such as Blue River, Gates and Otis suffered complete devastation. There were two notable wildfire incidents during the 2021 season: 1) The Bull Complex and 2) The Middle Fork Complex. These were the result of several lightning strikes in remote, inaccessible terrain of the Mt. Hood and Willamette NF. The Middle Fork Complex was detected July 29th. The Bull Complex was discovered August 2nd. The Bruler Fire, a smaller incident, started July 12th. The cause has yet to be determined, but there has been some conjecture that it was a lightning hold-over.

The August 12-14 Dry/Unstable event was an interesting case. Red Flag Warnings for Zones 607, 660 and 663 were issued nearly two days in advance and valid 1100 to 2200 PDT August 13th. Red Flag conditions were met late-afternoon August 12th and again late-morning through the evening of August 13th. Therefore, this constituted a correct warning, but also a missed event for each zone. Dry/Unstable events are difficult to verify. The Salem and Medford upper air soundings are used to verify the Haines component. Data on incidents with IMET support and upper air capability is also used. There is a reasonable chance that stability conditions on incidents is vastly different from those at Salem and Medford. This results in a high degree of subjectivity when verifying Dry/Unstable events. The fuels component of Red Flag criteria is based on zone-average ERC. The full conversion to NFDRS2016 in 2022 will require adjustments to the zone-average 80th percentile ERC values.

Event Lead Times

Tables 3 and 4 show the respective warning and watch lead times for all events in 2021.

TABLE 3 – WARNING LEAD TIMES

EVENT	# ZONES WARNED	AVE. ZONE LEAD TIME
April 16 (Wind/RH)	7	22 HRS 28 MINS
July 29 (Lightning)	1	DID NOT VERIFY
July 30 (Lightning)	4	DID NOT VERIFY
August 2 (Lightning)	1	DID NOT VERIFY
August 12-14 (Dry/Unstable)	7	23 HRS 55 MINS
August 28 (Wind/RH)	1	7 HRS 06 MINS
OVERALL AVE. LEAD TIME		22 HRS 00 MINS

TABLE 4 – WATCH LEAD TIMES

EVENT	# ZONES IN WATCH	AVE. ZONE LEAD TIME
April 16 (Wind/RH)	NO WATCH ISSUED	NA
June 26 (Wind/RH)	3	CANCELED
July 29 (Lightning)	1	DID NOT VERIFY
July 30 (Lightning)	4	DID NOT VERIFY
August 2 (Lightning)	NO WATCH ISSUED	DID NOT VERIFY
August 12-14 (Dry/Unstable)	NO WATCH ISSUED	NA
August 28 (Wind/RH)	NO WATCH ISSUED	NA
OVERALL AVE. LEAD TIME		NA

Bagby Hot Springs – Mt. Hood NF (photo by Scott Weishaar)

***April 16 Event*:** **WIND/RH**

- **1325 PDT April 15** – Warning issued for zones 602, 603, 604, 605, 606, 608 and 612. Valid 1100 to 2200 April 16.
- **ALL 7 ZONES VERIFIED**

***April 20*:** **MISSED EVENT – WIND/RH ZONE 604**

- **Multiple airport stations in the central and south portions of Zone 604 recorded several hours of 15 mph and/or gusts 25 mph with RH below 25%. Willow Creek RAWS met criteria as well. Off-season fuel criteria (FM100 at or below 10%) was met.**

July 27: **MISSED EVENT – LIGHTNING ZONE 608**

- **SEVERAL STARTS VIA WILDCAD OVERNIGHT**
- **AT LEAST 11 NEW SMALL FIRES NEAR OAKRIDGE. THE JUL 30 NWCC MORNING BRIEF INDICATED A TYPE 2 TEAM WAS ON ORDER FOR THE MIDDLE FORK COMPLEX.**

July 29 Event: **LIGHTNING**

- **1513 PDT July 27 –** Watch issued for zone 608. Valid time afternoon through late-evening July 29.
- **1316 PDT July 28 -** Watch upgraded to Warning. Valid 1400 to 2100 July 29.
- **VERIFICATION: Did not verify according to established criteria. Only a couple of strikes per lightning detection. Several pulses. Two starts via Wildcad.**

July 30 Event: **LIGHTNING**

- **1316 PDT July 28 –** New Watch issued for zones 605, 606, 607 and 608. Valid time late-morning July 30 through midnight July 31.
- **1420 PDT July 29 -** Watch upgraded to Warning. Valid 1100 to 2359 July 30.
- **VERIFICATION: Did not verify according to established criteria. Little to no lightning detected. There were a couple strikes in the far west portion of Zone 606 between Lebanon and Sweet Home.**

August 2 Event: **LIGHTNING**

- **0457 PDT August 2 –** Warning issued for Zone 608. Valid time 1200 through 2300 August 2.
- **VERIFICATION: Did not verify according to established criteria. Only 3 strikes per NWCC lightning data.**

August 2: **MISSED EVENT – LIGHTNING ZONE 607**

- **SEVERAL STRIKES RESULTING IN MULTIPLE STARTS THAT EVENTUALLY BECAME THE BULL COMPLEX.**

August 12-14 Event: **DRY/UNSTABLE**

- **1253 PDT August 11 –** Warning issued for Zones 603, 606 (above 2500 feet) and 608. Valid time 1100 August 12 through 2200 August 13.
- **1253 PDT August 11 –** Warning issued for Zones 607, 660 and 663 above 2500 feet. Valid time 1100 August 13 through 2200 August 13.
- **0856 PDT August 12 –** Warning issued for Zone 602 above 2500 feet. Valid time 1100 August 13 through 2200 August 13.
- **VERIFICATION: The August 12th 0500 Salem sounding yielded a mid-level Haines of 6 and a high-level Haines 5. This meets the Haines criteria. A surface analysis revealed a thermal trough centered over the Oregon Coast Range at 1700 PDT August 12. One station must record 25 percent RH or lower per established criteria.**
- **Zone 603 – Rockhouse RAWS registered 23% RH at 1612 PDT August 12. This established the event start time. Thus, this zone VERIFIED.**
- **Zone 606 – Green Mountain RAWS recorded 26% RH at 1613 PDT August 12. Although this did not technically meet the 25% threshold, it was counted as correct. This zone VERIFIED.**
- **Zone 608 – Boulder Creek, Emigrant and Pebble RAWS all recorded RH below 25%. The earliest occurrence was 1153 PDT August 12. This zone VERIFIED.**
- **Zone 602 – Minimum RH values on August 13th were above 25%. However, RH values below 25% occurred on August 12. Salem upper air data for August 13 did not meet established criteria. This warning DID NOT VERIFY.**

- **Zone 607 – Log Creek, Red Box and Wanderer's Peak RAWS all recorded RH below 25% August 13. However, Salem upper air data did not meet the Haines criteria. The Bull Complex exhibited significant growth on the 13th. This was used to establish the instability factor. Thus, the warning VERIFIED. Dry/Unstable criteria also occurred August 12th. The warning was not valid at that time. Therefore, this constituted a missed event.**
- **Zone 660 – Same situation as Zone 607. Dry/Unstable conditions were noted August 12th, but the warning was not valid at that time. Criteria were met on the 13th. This counted as a correct warning AND missed event.**
- **Zone 663 – Same situation as Zones 607 and 660. This counted as a correct warning AND missed event.**

***August 28 Event*:** **WIND/RH**

- **0840 PDT August 28** – Warning issued for south half of zone 604. Valid 1300 to 2000 August 28.
- **Salem ASOS and West Zone Portable RAWS met criteria. Warning VERIFIED.**

NFDRS Verification

The Portland office switched to all-points NFDRS forecast in 2009, instead of zone trend forecasts. It was shown by neighboring forecast offices that individual point forecasts yielded higher verification scores versus zone trend forecasts. Prior to 2009, the Portland office provided individual NFDRS forecasts for eight sites: Village Creek, Pebble, Fields, South Fork, Wanderer's Peak, Horse Creek, Yellowstone, and Canyon Creek. Table five (next page) shows the 2021 NFDRS verification statistics for the above listed sites. The values in red indicate improvement over the 2020 scores.

NFDRS has undergone a significant change and a new version was implemented in test mode for the 2020 fire season. The majority of the program, including many algorithms were changed. One of the most significant changes was a vast reduction in the number of fuel models used in the new NFDRS system. Another major change was the production of 7-day NFDRS forecasts. The Portland office provided forecaster input into the day-one NFDRS forecast, similar to the legacy NFDRS forecasts. No forecaster manipulation was provided for the automated days 2-7 output. Agency Fire staff continue to make some NFDRS modifications in WIMS for their RAWS stations. The primary change will be to re-examine and establish new ERC break points. This, in turn, will impact the fuels portion of Red Flag Warning criteria for some NWS sites. The new NFDRS version, NFDRS2016, will become fully operational for the 2022 season. The NFDRS2016 Fuel model Y will be the primary choice, replacing the legacy fuel model G.

NFDRS verification continues to be based on persistence. Locally-established performance goals are 40 percent improvement over persistence for temperature, 30 percent for RH and 10 percent for wind.

TABLE 5 – 2021 SITE-SPECIFIC NFDRS VERIFICATION

SITE	TEMPERATURE			HUMIDITY			WIND		
	FCST MAE	PERS. MAE	SCORE	FCST MAE	PERS. MAE	SCORE	FCST MAE	PERS. MAE	SCORE
Village Creek	*4.05*	*6.31*	*35.82%*	*9.41*	*13.36*	*29.57%*	*1.01*	*1.01*	*0.00%*
Pebble	*3.71*	*7.48*	*50.40%*	*9.93*	*16.91*	*41.28%*	*1.21*	*1.01*	*-19.80%*
Fields	*3.80*	*7.43*	*48.86%*	*10.14*	*16.27*	*37.68%*	*1.53*	*1.58*	*3.16%*
South Fork	*4.02*	*6.68*	*39.82%*	*10.40*	*16.83*	*38.21%*	*1.18*	*1.22*	*3.28%*
*Wanderer's Peak**	*4.57*	*7.91*	*42.23%*	*12.59*	*20.37*	*38.19%*	*1.75*	*1.68*	*-4.17%*
Horse Creek	*3.63*	*6.81*	*46.70%*	*11.32*	*16.69*	*32.17%*	*0.97*	*0.85*	*-14.12%*
Yellowstone	*3.93*	*7.55*	*47.95%*	*9.45*	*15.35*	*38.44%*	*1.38*	*1.60*	*13.75%*
Canyon Creek	*4.62*	*7.96*	*41.96%*	*11.06*	*19.41*	*43.02%*	*1.54*	*1.60*	*3.75%*

NOTES: Wanderer's Peak RAWS was returned to service June 24th. It had been burned over by the 2020 Riverside Fire. Canyon Creek RAWS suffered a lengthy outage. A total of 103 NFDRS forecasts were issued for Wanderer's Peak and 100 forecasts for Canyon Creek, which was well below the average of 145 for all stations.

Table six (next page) shows the 2021 NFDRS verification statistics by zone. Improvement in temperature, RH and wind are shown in blue. Red values indicate lower scores. Overall, temperature scores were higher compared to 2020, but humidity scores were generally lower. The overall July RH score was 20.4 percent and was the lowest for any month. There were few big-change days during July. The July RH score for zone 601 was close to zero. Generally, persistence fares better during July and August with high pressure and fewer big-change days. Wind scores were lower for most zones when compared to 2020. The 2021 overall wind score

continued a decreasing trend from a peak of just over 10 percent in 2019. Table seven (next page) shows prior year's overall scores. Considerable forecaster effort has been taken to improve wind scores. Roughly one-third of the Portland fire weather area RAWS sites exhibit minimal daily wind speed variation at NFDRS observation time, with 10-minute average wind speeds 3 mph or less. This makes persistence difficult to beat. Prior to 2014, the average overall wind score was at or slightly above 0 percent. Forecasters have achieved a wind score of 10 percent or better 5 times since 2013.

TABLE 6 – 2021 NFDRS VERIFICATION

ZONE	TEMPERATURE	HUMIDITY	WIND
601	28.03%	22.27%	2.68%
664	36.65%	36.69%	2.03%
602	39.97%	34.86%	2.67%
665	34.80%	28.79%	9.69%
603	35.94%	31.24%	2.87%
604	42.39%	23.55%	-0.50%
667	32.92%	19.63%	14.55%
605	46.88%	33.33%	-12.75%
606	39.85%	29.26%	-8.05%
607	46.75%	40.24%	-2.54%
608	48.54%	37.16%	-9.70%
612	32.01%	28.15%	-13.64%
660	44.44%	40.51%	-6.88%
663	47.73%	33.72%	1.81%
ALL	41.28%	33.31%	-0.57%

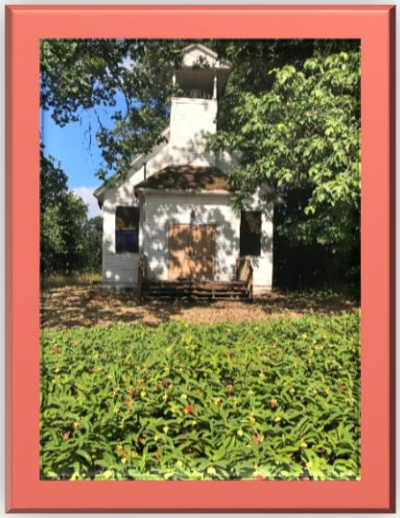

TABLE 7 – OVERALL NFDRS VERIFICATION PRIOR YEARS

2020 ALL	**38.04%**	**35.43%**	**7.61%**
2019 ALL	**33.22%**	**28.64%**	**12.50%**
2018 ALL	**36.61%**	**29.56%**	**15.20%**
2017 ALL	**40.26%**	**31.99%**	**13.83%**
2016 ALL	**44.29%**	**35.33%**	**14.06%**
2015 ALL	**37.95%**	**31.42%**	**7.37%**
2014 ALL	**39.43%**	**34.64%**	**10.66%**
2013 ALL	**32.92%**	**31.07%**	**1.00%**
2012 ALL	**36.2%**	**30.2%**	**-2.2%**
2011 ALL	**37.4%**	**32.2%**	**7.5%**
2010 ALL	**38.5%**	**28.1%**	**5.5%**
2009 ALL	**40.5%**	**33.7%**	**4.0%**

Forecasts and Services

SPOT FORECASTS

There were no mega-fires during the 2021 fire season, but it was active with a relatively long duration. COVID-19 continued to result in changes to fire-fighting strategies, namely Incident Command Posts (ICP) and public interaction. The pandemic was not as impactful to prescribed burning activities compared to 2020. There were 71 prescribed burn spot forecasts compared to 30 in 2020. Nearly half of the 2021 prescribed burn spot requests occurred in the April through May period. Wildfire spot requests in 2021 were well above the average of around 75. In 2021 there were 127 wildfire spot forecast requests. This number exceeded the total from the 2020 mega-fire year of 98. The 2021 total would have been much higher, but Incident Meteorologists

provided lengthy support on the Bull Complex and Middle Fork Complex. The USFS continued to be a major user of the spot forecast service. The USFS accounted for 43 of the 71 prescribed burn spot forecast requests. The Willamette NF tallied 39 of the 43 requests. The USFS had 98 wildfire spot requests, or roughly 75 percent of the wildfire spot total. The US Fish and Wildlife Service (USFWS) made 21 prescribed burn spot requests. Nearly all of these spots were for pile burning activities in the Finley NWR. Another interesting use of the spot forecast program pertained to a derelict barge removal operation on the Deep River just north of Greys Bay in southwest Washington. There were eight Hazmat requests for this operation in mid-December 2021.

The earliest prescribed burn spot request was January 26th, for the Horse1 prescribed burn project on the McKenzie district of the Willamette NF. The latest, December 9th, was from the USFWS for the Ankeny Piles burn. The earliest wildfire spot request was April 14th, from Washington Department of Natural Resources (DNR), for the Pine Creek Fire. The latest wildfire request occurred October 13th, from the Mt. Hood NF for the Bull Complex.

One-third of the total spot requests occurred in August. There were 73 spot forecasts issued in August. The second-highest monthly total occurred in July with 36 requests. December accounted for 13 requests. Eight were Hazmat, one for Public Safety and four for prescribed burning activities. February was the only month without a spot forecast request.

The use of spot forecasts continues to become more diverse. There were 26 non-fire related spot requests. There were eight Hazmat requests, eight training requests, five for public safety and 5 search and rescue (SAR) requests. Figure 5 (page 19) shows the 2021 spot breakdown by month.

Historically, the Willamette National Forest has been one of the primary users of the spot forecast program. The Willamette NF accounted for 104 of the 142 Forest Service spot forecast requests. The Mt. Hood/Gifford Pinchot had 34 spot requests, 33 of those for wildfire. The Siuslaw NF had one prescribed burn request and the Gifford Pinchot NF accounted for three spots. The US Forest Service had 64 percent of all spot requests. Typically, the Forest Service provides for nearly 50 percent of all spot requests. Other agencies that were prominent in the spot forecast program included the Oregon Department of Forestry (ODF) and USFWS. Mountain Rescue Units are becoming more familiar with the spot forecast program, accounting for several requests in 2021.

There were no large fires in 2019 that met Type 1 or Type 2 Incident Management Team (IMT) support thresholds. The 2020 season saw several extremely large wildfires necessitating the need for several IMTs. The larger fires, Beachie Creek, Riverside, Holiday Farm and Lionshead, had Type 1 or Type 2 team coverage for several weeks. A NIMO team was assigned to Beachie Creek in late August, followed by a Pacific Northwest Type 2 team, Southwest Area Type 1 team and another Northwest Type 2 team, before transitioning back to the local unit. These large and deadly wildfires were not confined to just the Cascades. The Echo Mountain Complex, a few miles east of the coastal town of Lincoln City, burned around 2,500 acres and virtually destroyed the community of Otis.

Three fires necessitated the need for IMT support in 2021. A Type 2 IMT was assigned to the Bruler Fire in the Detroit district of the Willamette NF. The fire was detected July 12th and the

Pacific Northwest Team 13 assumed command on July 16th. The Middle Fork Complex started on July 29th. Northwest Team 9 was assigned to the incident July 30th and managed the complex through August 6th. The Type 1 Pacific Northwest Team 3 took over on August 6th and maintained responsibility through August 21st. Type 2 Team 12 managed the fire from August 21st through September 3rd. Finally, Type 2 Team 6 took over September 4th through the 23rd. The fire transitioned to a Type 3 organization on September 24th.

The Bull Complex started August 2nd as a few separate starts in the Bull of the Woods Wilderness. The Mt. Hood NF submitted multiple orders for a Type 2 IMT, but these were unable to be filled due to numerous other higher-priority incidents. The Type 2 Southern Area Grey Team arrived on August 13th to take over management responsibility. The complex had grown to 836 acres by August 12th. The Great Basin Type 2 Team 4 assumed command August 23rd and managed the complex through September 4th. The Northern Rockies Type 2 Team 4 handled management operations from September 4th through the 16th and, finally, Pac NW Type 2 Team 13 managed the complex from the 16th through September 30th.

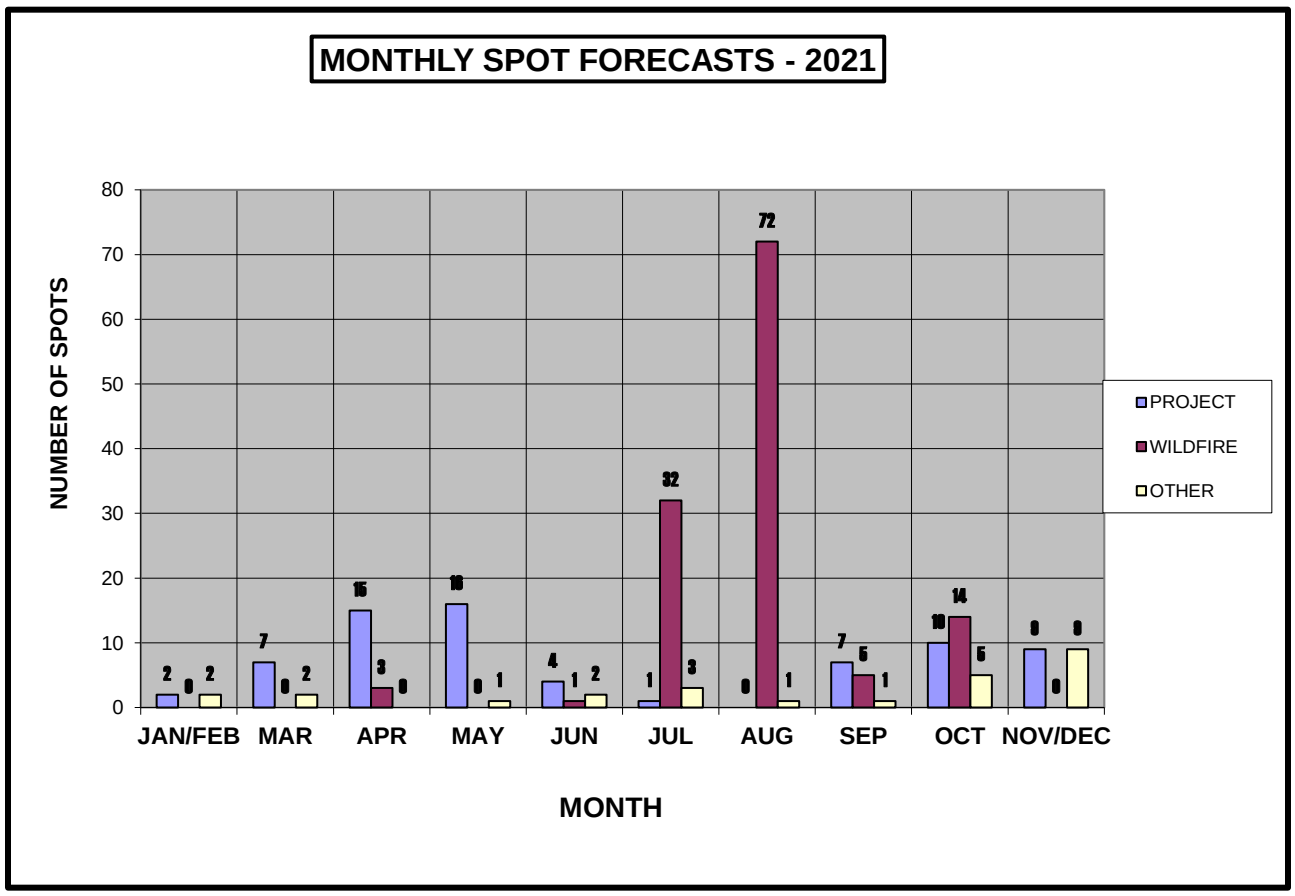

Figure 5 - 2021 SPOT FORECASTS (BY MONTH)

Table 8 (page 21) shows the annual spot forecast data from 1995 to 2021. Spot frequency showed a dramatic increase from 2000 to 2003, but due to the change in forecast area responsibility and agency requirements for prescribed burns, 2004 spot totals were much lower. Also, some units/districts curtailed prescribed burn activities starting in 2004 due to budget constraints, staffing concerns, or a number of other reasons. The number of prescribed burn spot requests in 2021 was the lowest since 2010. There were 145 non-wildfire spot requests in 2018, 117 in 2019 and 110 in 2020. This number fell to 97 for the 2021 season. The COVID-19 pandemic had a large role in reduced prescribed burn efforts. Fall burning activities tend to be more frequent compared to the spring. Prescribed burn spot requests were generally equally distributed throughout 2021. There were 31 prescribed burn requests during the April through May period and 22 from September through November. There are normally two annual BLM spray operations conducted in early spring. These are the Tyrell Seed Orchard and Horning Seed Orchard units. There were no spot forecast requests for these operations in 2021.

Most spots in one day – 7 on August 15th. 5 on multiple days. Last occurrence August 12th.

Non-fire spot requests: 8 HAZMAT requests

8 Training Exercise requests

5 SAR requests

5 Public Safety Requests

First prescribed spot request: Jan 26, 2021	***Horse1 Rx***	***Willamette NF***
Last prescribed spot request: Dec 9, 2021	***Ankeny Piles***	***USFWS***
First wildfire spot request: Apr 14, 2021	***Pine Creek Fire***	***WA DNR***
Last wildfire spot request: Oct 13, 2021	***Bull Complex***	***Mt. Hood NF***

Most Requests Single Incident/Project:	***Bull Complex***	***32 Spot Requests***
	Bruler Fire	***32 Spot Requests***

OTHER 2021 SPOT FORECAST TIDBITS:

The web-based spot forecast program continues to exhibit expanded use. Pre-2000, spot forecast requests were virtually 100 percent for prescribed or wildfire activities. Spot forecast requests have spread into many other areas. Search-and-Rescue, Public Safety, Local Training and Hazmat are just a few operations that have utilized the spot forecast program.

A couple of the more interesting 2021 requests include: 1) Hazmat operations for a derelict barge removal, 2) County Tax Auction on a foreclosure (deemed Public Safety) and 3) USFS request for work on the Spirit Lake Tunnel (deemed Public Safety).

Rarely does the Portland Forecast Office receive prescribed spot forecast requests beyond Thanksgiving. However, in 2021, there were four December prescribed burn requests.

TABLE 8 – ANNUAL SPOT FORECAST DATA

YEAR	PROJECT*	WILDFIRE	TOTAL
1995	104	15	119
1996	64	51	115
1997	58	9	67
1998	52	31	83
1999	58	54	112
2000	89	20	109
2001	125	70	195
2002	123	147	270
2003	117	132	249
2004	71	21	92
2005	55	29	84
2006	120	96	216
2007	70	25	95
2008	61	73	134
2009	57	58	115
2010	69	51	120
2011	128	93	221
2012	106	51	157
2013	128	25	153
2014	103	96	199
2015	87	84	171
2016	157	35	192
2017	126	240	366
2018	145	68	213
2019	117	40	157
2020	110	98	208
2021	97	127	224

**** = INCLUDES TRAINING SPOTS, SEARCH AND RESCUE, AND OTHER MISC. REQUESTS.***

Figure 6, page 22, shows the yearly spot forecast totals since 1995. Seasonal spot totals exhibited a consistent trend from 2008 to 2010, with an average of about 125 spots per season. The 2011 spot season was the busiest since the 2003 transfer of fire weather zones 609, 610, and 611 to the Pendleton office. The 2013 spot tally was a little unusual due to the low number of wildfire spots, but 2014 more than made up for the previous year's low number. The 2017 spot forecast distribution showed one primary peak period, from August through October. There were 258 spot requests during the 3-month period, which is nearly twice the normal seasonal average. Several large, lengthy and costly wildfires in 2017 resulted in a multitude of spot forecast requests. There were several days in 2017 when 6 or more wildfire spot requests were submitted. There

were 13 spot requests on September 8th, 2020 and 12 more on the 9th. Three or four spot requests constitute a typical busy spot forecast day for the Portland Forecast Office. The annual average for spot requests since 2008 is 185. The 2021 total was about 20% above the 12-year average.

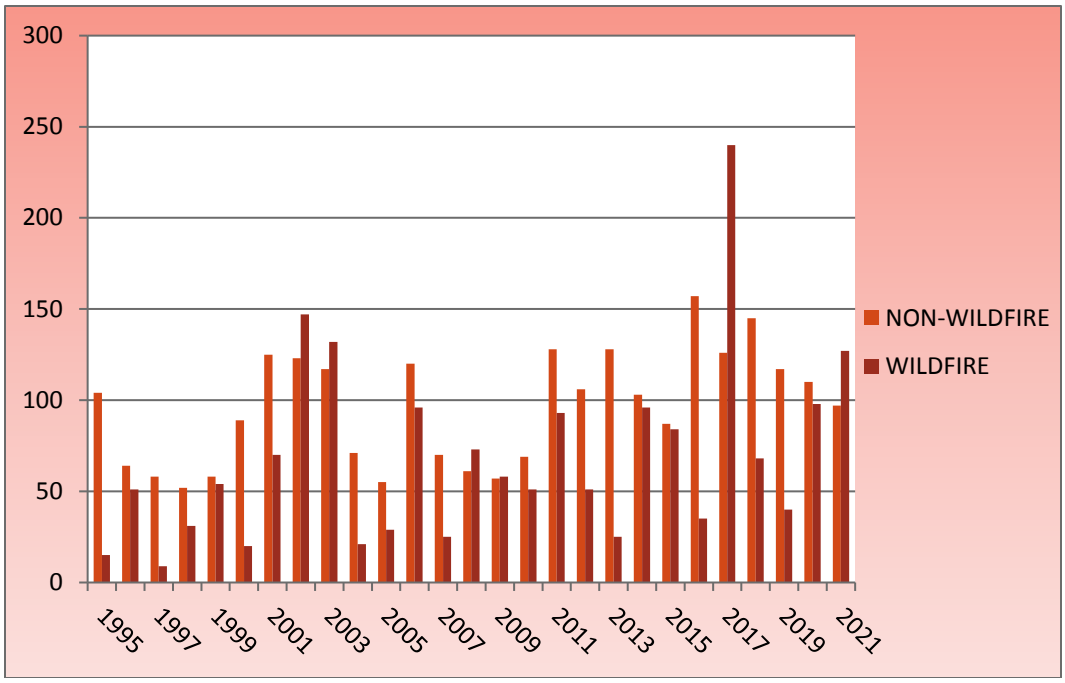

Figure 6 – Annual Spot Forecast Totals

TURN-AROUND TIME

Turn-around times (figure 7 page 23) have been fairly consistent over the past several years. Wildfire spot request turn-around time in 2021 was about five minutes longer compared to 2020. Prescribed burn request turn-around time for 2021 was also about five minutes longer compared to 2020. Shorter turn-around times were noted for Hazmat and Training spot requests, 22 and 28 minutes respectively. Turn-around time was not counted for next-day spots. Average turn-around time for all spots was just under 35 minutes.

Per regional and national agreements, expected turn-around times for wildfire and prescribed burn requests are 45 and 60 minutes, respectively. Turn-around times on a few spot requests exceeded 100 minutes. Pre-arrangements were made with users in nearly all of these instances. Typically, the user would submit the spot request early in the morning, but not need the forecast until late morning. Lengthy turn-around times on a few wildfire spots was usually the result of the requesting official, FBAN or Plans Section Chief, submitting the spot request in the late-morning or early afternoon, but not needing the forecast until the late-afternoon or early-evening planning meeting.

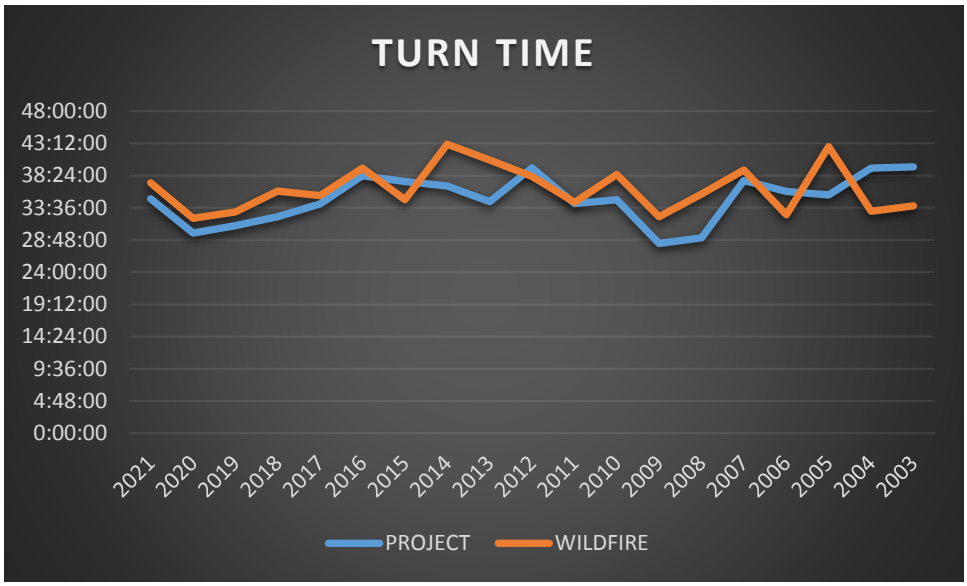

FIGURE 7- ANNUAL SPOT FORECAST TURN-AROUND TIME

Table 9 (below) shows the average spot forecast turn-around time for prescribed burn and wildfire spot forecast requests.

TABLE 9 – TURN-AROUND TIMES

YEAR	PROJECT	WILDFIRE
2021	34:56	37:20
2020	29:51	32:02
2019	30:57	33:00
2018	32:16	36:05
2017	34:11	35:26
2016	38:23	39:30
2015	37:32	34:48
2014	36:52	43:05
2013	34:30	40:43
2012	39:35	38:17
2011	34:13	34:24
2010	34:47	38:33
2009	28:17	32:16
2008	29:07	35:38
2007	37:41	39:14
2006	36:01	32:33
2005	35:30	42:42
2004	39:30	33:06
2003	39:42	33:54

* ***PROJECT TIMES ONLY INCLUDE PRESCRIBED BURN SPOTS***

Mist, OR School – Photo by Scott Weishaar

LARGE FIRES AND IMET DISPATCHES

The 2021 wildfire season in the Portland Fire Weather Forecast area was far less catastrophic compared to the 2020 season. There were multiple large, costly and deadly wildfires during 2020. Nearly all of these large fires happened during the Labor Day Firestorm. The 2017 Eagle Creek Fire was the most recent significant large wildfire, which scorched nearly 50,000 acres. In 2020 there were three fires in excess of 120,000 acres. Overall critical to extremely critical fuel conditions existed for a large portion of prime fire season. Fortunately, below-normal lightning activity, especially during the peak portion of fire season, prevented the 2021 season from being even worse. The COVID-19 pandemic continued to challenge Incident Management Team efforts during the entire fire season.

A significant atmospheric river rainfall event occurred in mid-September. This put a significant damper on the lengthy fire season. Rainfall amounts of 2-3 inches were common on the Bull Complex during this episode. The 10-day zone-average ERC ending September 10th for fire zone 607 was 45, or just under the 90th percentile. The 10-day average ending September 20th had fallen to 30, or well below the 70th percentile.

Table 10 (page 25) shows the major fires for the 2021 season. A major fire is defined as 100 acres in timber and/or the need for a Type 1 or Type 2 IMT. A couple of other notable fires not listed included the Game Hog Creek Fire and the Cedar Butte Fire. The Game Hog Creek Fire started July 3rd in the Tillamook State Forest about 32 miles northwest of Forest Grove. Control lines were in place July 6th, holding the fire at 6 acres. However, gusty wind during the evening of July 13th allowed the fire to jump control lines. The fire was held at 182 acres on July 20th. The Portland

Forecast Office provided spot forecast support for this incident. A total of 12 spot forecasts were issued for the fire.

The Cedar Butte Fire was detected August 11th around 0300 PDT about 18 miles east of Tillamook and north of Highway 6. This fire, estimated at 40 acres by 1540 PDT, was burning in logging slash and some standing timber. The 74-acre fire was completely lined August 14th. The Portland Forecast Office issued five spot forecasts for this incident.

TABLE 10 – MAJOR FIRES

FIRE NAME	AGENCY	SIZE	START DATE	CONTAIN DATE	CAUSE
Bruler Fire	USFS Willamette NF	195	July 12, 2021	September 14, 2021	Unknown
Bull Complex	USFS Mt. Hood NF	24,894	August 2, 2021	November 22, 2021	Lightning
Middle Fork Complex	USFS Willamette NF	30,929	July 29, 2021	October 31, 2021 (est)	Unknown
Knoll Fire*	USFS Willamette NF	544	August 5, 2021	August 21, 2021	Lightning

- The Knoll Fire was managed by Pac NW Team 3 and was combined with the Middle Fork Complex.

Timber Lake near Ripplebrook, OR and Bull Complex ICP – Photo by Scott Weishaar

The Portland office filled 7 IMET requests.

1. **WA DNR PrePo REMOTE SUPPORT (14 DAYS)**

IMET: JON BONK
DATES: July 9th through July 22nd, 2021
LOCATION: REMOTE – PQR Forecast Office
Incident – WA-WAS-000011
IMT: None
CAUSE: NA

2. **SKYLINE RIDGE (15 DAYS)**

IMET: SCOTT WEISHAAR
DATES: August 5th through August 20th, 2021
LOCATION: ICP – Riddle, OR
Incident – OR-732S-000174
Primarily ODF land between Myrtle Creek and Tiller, OR
IMT: ODF Team 1 – IC Kessel FBAN – Brian Reel
CAUSE: Lightning

3. **SHERWOOD FIRE (4 DAYS)**

IMET: JON BONK
DATES: July 31st through August 3rd, 2021
LOCATION: ICP – Near Wellpinit, WA
Incident – WA-SPA-002124
Spokane Agency
IMT: Pac NW Type 2 Team 6 – IC Sheldon FBAN – Katie Hetts
CAUSE: Lightning

4. **MCCASH FIRE (21 DAYS)**

IMET: JON BONK
DATES: August 20th through September 9th, 2021
LOCATION: ICP – Orleans, CA 2nd ICP – Happy Camp, CA
Incident – CA-SRF-000651
Fire began near Somes Bar, CA in the Sixes River NF
IMT: Great Basin Type 2 Team 3 – August 23 through September 6
Great Basin Type 2 Team 7 – IC Knudsen
FBANS – John Kern, Joe Flores
CAUSE: Lightning

5. BULL COMPLEX (15 DAYS)

IMET: SCOTT WEISHAAR
DATES: September 5th through September 20th, 2021
LOCATION: ICP – Timberlake Job Corp, Ripplebrook, OR
Incident – OR-MHF-000753
Fires began in Bull of the Wood Wilderness, Clackamas RD
IMT: Northern Rockies Type 2 Team 4 (Sep 2-16) – IC Connell
LTAN/FBAN – Todd Erdody
Pac NW Type 2 Team 13 (Sep 16-20) – IC Gales, Reinerz(t)
FBAN – John Kern, Dean Warner, Casey O' Connor
CAUSE: Lightning

6. BULL COMPLEX (11 DAYS)

IMET: JON BONK
DATES: September 20th through September 30th, 2021
LOCATION: ICP – Timberlake Job Corp, Ripplebrook, OR
Incident – OR-MHF-000753
Fires began in Bull of the Wood Wilderness, Clackamas RD
IMT: Pac NW Type 2 Team 13 – IC Gales, Reinerz(t)
FBAN – Dean Warner, Casey O'Connor
CAUSE: Lightning

7. MCCASH FIRE (9 DAYS)

IMET: JON BONK
DATES: October 10th through October 18th, 2021
LOCATION: ICP – Orleans, CA
Incident – CA-SRF-000651
Fire began near Somes Bar, CA in the Sixes River RD
IMT: California Type 2 Team 10 – IC Dalrymple
FBAN – Clint Isabell (virtual)
CAUSE: Lightning

TRAINING AND OUTREACH ACTIVITIES

The COVID-19 pandemic virtually eliminated all fire weather outreach activities. Wildland fire course instruction, fire weather refreshers and RT-130 sessions were curtailed. Fire weather training was provided for newer forecasters, with assistance from NWCC. Some fire weather

outreach was provided via virtual platforms. Table 11 (below) summarizes the few outreach accomplishments for 2021.

TABLE 11 – TRAINING AND EDUCATIONAL OUTREACH ACTIVITIES

DATES	ACTIVITY	AGENCY/USER	INSTRUCTOR
March 15-19, 2021	VIRTUAL IMET CEE	NWS	BONK WEISHAAR/WEAGLE KRIEDERMAN
May 20, 2021	LINCOLN CO. FIRE WX OUTLOOK	COUNTY EM	WEISHAAR
May 21, 2021	CGNSA FIRE WX REFRESHER	CGNSA	WEISHAAR
June 10, 2021	NFDRS TRAINING #1	NWS	SALTENBERGER
June 16, 2021	NFDRS TRAINING #2	NWS	SALTENBERGER
June 22-23, 2021	S290 SALEM	USFS/ODF/BLM	NEUMAN
June 24, 2021	CLATSOP CO. BRIEFING	CLATSOP CO. EM	WEISHAAR
Nov 6-7, 2021	S290 BANKS	ODF/LOCAL FD	WEISHAAR/MUESSLE
Nov 13-14, 2021	S290 BANKS	ODF/LOCAL FD	MUESSLE ATTENDING

FORECAST SERVICES NOTES:

Dedicated Fire Weather Shifts begin:	April 19, 2021
7-Day Coverage Begins:	May 30, 2021
940 AM User Briefings Begin:	May 10, 2021
1115 AM GACC Coordination Calls Begin:	June 15, 2021
1115 AM GACC Coordination Calls End:	October 1, 2021
Fall Land Management (5-day) Begins:	October 11, 2021
Dedicated Fire Weather Shifts end:	October 22, 2021

Appendix 1: 2021 Fuel Indices

The following tables (pages 30-41) show the 10-day average fuel indices from May 15 through October 20.

Wrapped Structures Bagby Hot Springs during the Bull Complex, Mt. Hood NF
Photo by Scott Weishaar

2021 FUELS SUMMARY ZONES 601/664

DATE	ERC AVE	F100 AVE	F1000 AVE		
	Red ERC values indicate 90th percentile or greater (26.5)				
May 15-20	8.37	17.07	26.61		
May 21-31	2.49	23.73	30.15		
Jun 1-10	5.73	18.71	29.12		
Jun 11-20	2.73	22.21	32.03		
Jun 21-30	16.38	13.33	25.64		
Jul 1-10	17.55	16.67	22.55		
Jul 11-20	22.53	15.97	21.07		
Jul 21-31	29.38	14.13	19.24		
Aug 1-10	24.00	17.23	18.80		
Aug 11-20	24.64	15.86	19.41		
Aug 21-31	17.57	19.60	20.95		
Sep 1-10	24.96	15.85	19.68		
Sep 11-20	17.57	20.56	20.98		
Sep 21-30	6.78	23.16	26.96		
Oct 1-10	1.01	24.99	31.06	# DAYS ERC > 22	# DAYS ERC >26.5
Oct 11-20	0.11	27.50	35.11		
ERC 22 – 80TH PCTL		ERC 26.5 – 90TH PCTL		48	26

HUCKLEBERRY STATS:
 # DAYS ERC >22: 59

41.6 – AUG 15
41.0 – AUG 4
40.4 – JUL 30

CEDAR STATS:
 # DAYS ERC >25: 48

48.2 – AUG 4
47.0 – JUL 30
45.4 – AUG 3

PEAK ERC DAYS: **35.92 AUG 4, 2021**
35.48 JUL 30, 2021
34.16 AUG 3, 2021

 # DAYS F100 </= 10: 0

LOWEST AVE F100: 10.38 JUN 28, 2021

2021 FUELS SUMMARY ZONE 602

	ERC AVE	F100 AVE	F1000 AVE		
DATE	*Red ERC values indicate 90th percentile or greater (32.5)*				
May 15-20	18.92	15.88	22.49		
May 21-31	9.26	20.65	25.72		
Jun 1-10	13.95	16.47	25.25		
Jun 11-20	6.86	20.51	29.24		
Jun 21-30	28.21	10.08	22.56		
Jul 1-10	27.72	15.00	19.36		
Jul 11-20	31.63	14.69	18.00		
Jul 21-31	39.22	12.33	16.33		
Aug 1-10	38.44	13.92	15.12		
Aug 11-20	40.12	13.41	15.00		
Aug 21-31	31.31	16.50	16.70		
Sep 1-10	39.51	13.23	15.68		
Sep 11-20	28.61	17.99	17.12		
Sep 21-30	11.57	21.74	23.93		
Oct 1-10	3.47	23.38	25.61	# DAYS ERC > 26.5	# DAYS ERC >32.5
Oct 11-20	0.70	25.43	31.07		
ERC 26.5 – 80TH PCTL		ERC 32.5 – 90TH PCTL		82	56

MILLER STATS:
 # DAYS ERC >30: 72

46.2 – AUG 12
45.4 – JUL 30
44.9 – AUG 13

SOUTH FORK STATS:
 # DAYS ERC >29: 76

56.2 – AUG 4
55.0 – JUL 30
53.3 – AUG 2

RYE MT. STATS:
 # DAYS ERC >29: 91

54.0 – JUN 27
49.8 – JUN 29
49.0 – JUN 26

PEAK ERC DAYS: **46.23 JUL 30, 2021**
45.30 AUG 4, 2021
45.09 AUG 12, 2021

 # DAYS F100 </= 10: 7

LOWEST AVE F100: 7.77 JUN 28, 2021

2021 FUELS SUMMARY ZONE 603

	ERC AVE	F100 AVE	F1000 AVE		
DATE	*Red ERC values indicate 90th percentile or greater (45.0)*				
May 15-20	28.46	14.11	18.46	**VILLAGE STATS:** *# DAYS ERC >42: 60* *56.5 – AUG 12* *56.3 – JUL 30* *56.2 – JUL 298* **ROCKHOUSE STATS:** *# DAYS ERC >51: 64* *67.4 – SEP 4* *67.3 – AUG 16* *67.2 – AUG 4* **DEVILS GYARD STATS:** # DAYS ERC >36: 54 48.6 – SEP 4 48.4 – AUG 12 46.9 – SEP 17	
May 21-31	21.87	17.37	19.92		
Jun 1-10	29.23	13.74	18.31		
Jun 11-20	12.09	20.85	23.68		
Jun 21-30	28.46	12.24	20.20		
Jul 1-10	32.11	13.80	17.67		
Jul 11-20	37.24	13.33	15.99		
Jul 21-31	45.82	10.93	14.26		
Aug 1-10	46.10	12.21	13.08		
Aug 11-20	48.34	11.92	12.62		
Aug 21-31	42.71	14.24	13.39		
Sep 1-10	47.92	11.82	12.97		
Sep 11-20	38.11	15.56	14.47		
Sep 21-30	21.57	19.45	19.50		
Oct 1-10	13.27	20.35	22.91	# DAYS ERC > 39.4	# DAYS ERC >45.0
Oct 11-20	6.66	23.16	25.39		
ERC 39.4 – 80TH PCTL		ERC 45.0 – 90TH PCTL		58	38

PEAK ERC DAYS: 52.94 AUG 13, 2021

52.89 AUG 12, 2021 **# DAYS F100 </= 10:** 8

52.73 SEP 4, 2021 **LOWEST AVE F100:** 9.55 JUN 28, 2021

2021 FUELS SUMMARY ZONE 604

	ERC AVE	F100 AVE	F1000 AVE		
DATE	*Red ERC values indicate 90th percentile or greater (41.75)*				
May 15-20	28.63	14.38	18.30		
May 21-31	23.75	16.93	19.69		
Jun 1-10	31.55	13.39	17.97	**FINLEY STATS:** *# DAYS ERC >38: 76*	
Jun 11-20	17.70	19.13	20.93		
Jun 21-30	32.44	12.62	18.17	*51.8 – AUG 4* *51.2 – JUL 29* *51.1 – AUG 12*	
Jul 1-10	37.84	12.54	16.03		
Jul 11-20	40.15	12.80	15.38	**WILLOW CK. STATS:** *# DAYS ERC >41: 59*	
Jul 21-31	46.63	10.92	14.17		
Aug 1-10	46.96	11.98	13.18		
Aug 11-20	47.92	12.01	12.88	*51.7 – AUG 4* *51.5 – AUG 12* *51.5 – JUL 29*	
Aug 21-31	44.66	13.39	13.30		
Sep 1-10	47.12	12.51	13.07		
Sep 11-20	38.15	15.15	14.13		
Sep 21-30	23.04	19.10	18.79		
Oct 1-10	18.25	19.21	20.78	**# DAYS ERC > 37.0**	**# DAYS ERC >41.75**
Oct 11-20	13.35	21.21	22.31		
ERC 37.0 – 80TH PCTL		**ERC 41.75 – 90TH PCTL**		**77**	**64**

PEAK ERC DAYS: **51.30 JUL 29, 2021**

51.23 AUG 12, 2021 **# DAYS F100 </= 10: 0**

51.07 AUG 11, 2021 **LOWEST AVE F100: 10.61 JUL 31, 2021**

2021 FUELS SUMMARY ZONE 605

	ERC AVE	F100 AVE	F1000 AVE		
DATE	*Red ERC values indicate 90th percentile or greater (40.5)*				
May 15-20	23.11	14.81	20.11		
May 21-31	8.57	21.68	25.21		
Jun 1-10	19.21	14.52	22.82		
Jun 11-20	8.04	20.59	26.36		
Jun 21-30	29.74	10.43	21.01		
Jul 1-10	35.98	11.71	17.23		
Jul 11-20	41.62	11.89	14.94		
Jul 21-31	48.39	10.62	13.46		
Aug 1-10	48.79	11.67	12.45		
Aug 11-20	49.02	11.56	12.48		
Aug 21-31	37.67	15.17	14.38		
Sep 1-10	45.39	11.57	13.82		
Sep 11-20	33.67	16.50	15.31		
Sep 21-30	20.25	18.87	20.87		
Oct 1-10	11.29	20.35	24.02	# DAYS ERC > 35.0	# DAYS ERC >40.5
Oct 11-20	5.29	22.82	26.47		
ERC 35.0 – 80TH PCTL		ERC 40.5 – 90TH PCTL		75	58

HORSE CK. STATS:
 # DAYS ERC >34: 73

56.3 – AUG 7
56.0 – AUG 15
56.0 – AUG 4

EAGLE CK. STATS:
 # DAYS ERC >36: 76

53.5 – AUG 15
52.7 – SEP 17
52.5 – AUG 16

PEAK ERC DAYS: **54.75 AUG 15, 2021**

53.80 AUG 16, 2021 **# DAYS F100 </= 10: 13**

52.90 AUG 4, 2021 **LOWEST AVE F100: 8.15 JUN 29, 2021**

2021 FUELS SUMMARY ZONE 606

	ERC AVE	F100 AVE	F1000 AVE		
DATE	*Red ERC values indicate 90th percentile or greater (45.0)*				
May 15-20	26.76	14.11	19.21	**YELLOWSTONE STATS:**	
May 21-31	15.39	19.53	22.72	*# DAYS ERC >38: 64*	
Jun 1-10	25.52	13.74	20.62		
Jun 11-20	11.91	20.06	24.26	*60.6 – SEP 8*	
Jun 21-30	30.41	11.38	20.31	*60.5 – SEP 4*	
Jul 1-10	38.38	11.52	16.74	*59.7 – SEP 17*	
Jul 11-20	44.57	11.43	14.45	**BRUSH CK. STATS:**	
Jul 21-31	50.87	10.10	12.96	*# DAYS ERC >39: 72*	
Aug 1-10	51.41	11.36	12.03	*55.4 – AUG 12*	
Aug 11-20	52.77	11.07	11.87	*55.0 – AUG 13*	
Aug 21-31	45.92	13.75	12.62	*54.5 – AUG 16*	
Sep 1-10	51.86	10.94	12.16	**GREEN MTN STATS:**	
Sep 11-20	39.82	15.62	13.74	*# DAYS ERC >41: 72*	
Sep 21-30	21.68	19.30	20.13	*57.2 – SEP 4*	
Oct 1-10	13.78	19.89	23.23	*57.0 – SEP 8*	
Oct 11-20	4.69	23.62	26.98	*56.2 – SEP 7*	
				# DAYS ERC > 38.25	**# DAYS ERC >45.0**
ERC 38.25 – 80TH PCTL		**ERC 45.0 – 90TH PCTL**		**76**	**58**

PEAK ERC DAYS: **56.60 SEP 4, 2021**

55.87 SEP 8, 2021 **# DAYS F100 </= 10: 20**

55.66 AUG 12, 2021 **LOWEST AVE F100: 8.36 JUN 29, 2021**

2021 FUELS SUMMARY ZONE 607

	ERC AVE	F100 AVE	F1000 AVE		
DATE	*Red ERC values indicate 90th percentile or greater (48.33)*				
May 15-20	12.84	19.32	24.40	**LOG CREEK STATS:** *# DAYS ERC >36: 28*	
May 21-31	7.02	22.52	28.77		
Jun 1-10	15.03	15.34	25.76		
Jun 11-20	7.58	20.47	28.50	*51.8 – AUG 2* *48.2 – AUG 4* *48.0 – AUG 3*	
Jun 21-30	26.93	10.57	22.24		
Jul 1-10	34.41	11.42	17.89	**RED BOX STATS:** *# DAYS ERC >45: 68*	
Jul 11-20	40.37	11.78	15.32		
Jul 21-31	47.33	10.65	13.68	*64.3 – AUG 15* *63.3 – AUG 2* *62.6 – AUG 16*	
Aug 1-10	47.06	11.79	12.74		
Aug 11-20	45.46	11.70	13.51	**WANDERER'S PEAK STATS:** *# DAYS ERC >45: 23*	
Aug 21-31	34.32	15.49	15.63		
Sep 1-10	44.85	11.05	14.28		
Sep 11-20	30.13	17.53	16.24	*60.6 – AUG 4* *59.7 – AUG 2* *57.2 – AUG 3*	
Sep 21-30	15.84	19.80	23.11		
Oct 1-10	9.60	19.90	25.99	**# DAYS ERC > 42.33**	**# DAYS ERC >48.33**
Oct 11-20	1.61	24.60	30.87		
ERC 42.33 – 80TH PCTL		**ERC 48.33 – 90TH PCTL**		**32**	**16**

PEAK ERC DAYS: **58.27 AUG 2, 2021**

56.97 AUG 4, 2021 **# DAYS F100 </= 10: 25**

55.60 AUG 3, 2021 **LOWEST AVE F100: 7.83 JUN 29, 2021**

2021 FUELS SUMMARY ZONE 608

	ERC AVE	F100 AVE	F1000 AVE		
DATE	*Red ERC values indicate 90th percentile or greater (49.0)*				
May 15-20	28.91	13.98	18.80	**PEBBLE STATS:** *# DAYS ERC >39: 72* *55.5 – SEP 7* *54.4 – SEP 8* *53.8 – SEP 3* **EMIGRANT STATS:** *# DAYS ERC >55: 73* *75.3 – SEP 7* *73.0 – AUG 12* *72.0 – SEP 4/5* **BOULDER STATS:** *# DAYS ERC >33: 81* *57.8 – AUG 2* *54.9 – AUG 13* *54.3 – AUG 4*	
May 21-31	12.51	20.17	23.93		
Jun 1-10	24.89	13.29	20.85		
Jun 11-20	12.76	19.44	24.03		
Jun 21-30	33.68	10.20	19.46		
Jul 1-10	43.96	9.95	15.64		
Jul 11-20	49.65	10.43	13.32		
Jul 21-31	52.79	10.27	12.31		
Aug 1-10	53.66	10.94	11.82		
Aug 11-20	53.98	10.83	11.71		
Aug 21-31	48.93	12.80	12.43		
Sep 1-10	55.26	10.17	11.72		
Sep 11-20	39.85	15.49	13.84		
Sep 21-30	25.71	17.82	19.26		
Oct 1-10	17.99	18.12	22.40	**# DAYS ERC > 42.0**	**# DAYS ERC >49.0**
Oct 11-20	7.97	22.26	25.81		
ERC 42.0 – 80TH PCTL		**ERC 49.0 – 90TH PCTL**		**76**	**53**

PEAK ERC DAYS: **60.07 SEP 7, 2021**

59.59 SEP 4, 2021 **# DAYS F100 </= 10: 41**

59.33 AUG 12, 2021 **LOWEST AVE F100: 7.55 JUN 29, 2021**

2021 FUELS SUMMARY ZONE 612

	ERC AVE	F100 AVE	F1000 AVE		
DATE	*Red ERC values indicate 90th percentile or greater (33.5)*				
May 15-20	17.13	16.91	21.99		
May 21-31	8.80	20.75	24.90		
Jun 1-10	14.19	16.86	23.60		
Jun 11-20	4.16	22.15	28.88		
Jun 21-30	17.50	13.49	24.12		
Jul 1-10	18.30	16.95	21.71		
Jul 11-20	25.36	14.96	19.69		
Jul 21-31	37.62	11.55	16.73		
Aug 1-10	38.58	13.40	14.92		
Aug 11-20	38.75	13.90	14.60		
Aug 21-31	33.18	16.68	15.87		
Sep 1-10	39.40	13.45	15.21		
Sep 11-20	32.22	16.37	15.84		
Sep 21-30	18.32	20.05	20.23		
Oct 1-10	8.00	21.85	24.53	# DAYS ERC > 26.5	# DAYS ERC >33.5
Oct 11-20	2.63	24.30	27.95		
ERC 26.5 – 80TH PCTL		ERC 33.5 – 90TH PCTL		66	49

CANNIBAL STATS:
 # DAYS ERC >25: 62

42.6 – AUG 4
42.2 – AUG 12
42.0 – JUL 30

GOODWIN PEAK STATS:
 # DAYS ERC >28: 72

50.0 – SEP 4
48.5 – JUL 29
48.3 – JUL 30

PEAK ERC DAYS: 45.30 SEP 4, 2021

45.15 JUL 30, 2021 # DAYS F100 </= 10: 4

44.95 AUG 12, 2021 LOWEST AVE F100: 9.12 JUL 30, 2021

2021 FUELS SUMMARY ZONE 660

DATE	ERC AVE	F100 AVE	F1000 AVE		
	Red ERC values indicate 90th percentile or greater (41.6)				
May 15-20	11.03	18.34	24.21	**DRY CREEK STATS:**	
May 21-31	5.75	22.43	27.82	***# DAYS ERC >51: 48***	
Jun 1-10	13.31	16.00	25.55		
Jun 11-20	4.91	21.60	29.12	***65.9 – AUG 13***	
Jun 21-30	24.57	10.84	23.33	***65.7 – AUG 16***	
Jul 1-10	25.81	14.78	19.45	***64.8 – AUG 15***	
Jul 11-20	31.47	14.52	17.57	**3 CORNER STATS:**	
Jul 21-31	39.89	11.95	15.74	***# DAYS ERC >30: 35***	
Aug 1-10	37.13	14.05	14.96	***46.7 – AUG 13***	
Aug 11-20	39.32	12.36	15.07	***45.1 – SEP 7***	
Aug 21-31	29.89	16.56	16.93	***45.0 – AUG 2***	
Sep 1-10	41.83	11.54	15.31	**LARCH MT. STATS:**	
Sep 11-20	29.62	17.50	16.41	***# DAYS ERC >29: 67***	
Sep 21-30	12.84	21.74	23.69	***45.1 – SEP 8***	
Oct 1-10	2.65	23.24	29.00	***44.0 – JUL 29***	
Oct 11-20	0.51	25.54	32.72	***43.9 – SEP 17***	
				# DAYS ERC > 35.8	**# DAYS ERC >41.6**
ERC 35.8 – 80TH PCTL		**ERC 41.6 – 90TH PCTL**		**37**	**21**

PEAK ERC DAYS: **47.74 AUG 4, 2021**

47.42 JUL 30, 2021 **# DAYS F100 </= 10: 9**

47.36 AUG 2, 2021 **LOWEST AVE F100: 7.81 JUN 28, 2021**

2021 FUELS SUMMARY ZONE 663

	ERC AVE	F100 AVE	F1000 AVE		
DATE	*Red ERC values indicate 90th percentile or greater (67.0)*				
May 15-20	0.00	26.31	26.52		
May 21-31	0.00	26.51	26.53		
Jun 1-10	21.95	14.49	23.06		
Jun 11-20	17.86	16.67	23.24		
Jun 21-30	38.25	8.66	18.37		
Jul 1-10	49.25	8.54	14.34		
Jul 11-20	59.17	7.88	11.70		
Jul 21-31	65.27	7.52	10.03		
Aug 1-10	63.70	9.22	9.38		
Aug 11-20	66.62	8.36	9.10		
Aug 21-31	58.72	11.20	9.83		
Sep 1-10	62.49	9.32	9.80		
Sep 11-20	45.26	14.45	11.90		
Sep 21-30	26.99	18.22	17.57		
Oct 1-10	25.06	16.88	19.33	# DAYS ERC > 62.0	# DAYS ERC >67.0
Oct 11-20	22.81	17.88	19.32		
ERC 62.0 – 80TH PCTL		ERC 67.0 – 90TH PCTL		35	12

BUCK CREEK STATS:

 # DAYS ERC >62: 35

73.4 – AUG 15
71.6 – AUG 16
69.7 –AUG 13

 # DAYS ERC >71: 2

 # DAYS F100 <10: 65

6.62 – AUG 16
6.78 – JUN 30
6.94 – JUN 29

PEAK ERC DAYS: 73.40 AUG 15, 2021

71.60 AUG 16, 2021 # DAYS F100 </= 10: 65

69.70 AUG 13, 2021 LOWEST AVE F100: 6.62 AUG 16, 2021

2021 FUELS SUMMARY ZONE 665

	ERC AVE	F100 AVE	F1000 AVE		
DATE	*Red ERC values indicate 90th percentile or greater (34.5)*				
May 15-20	16.00	16.63	23.12		
May 21-31	9.75	21.37	25.73		
Jun 1-10	12.64	18.14	26.08		
Jun 11-20	5.85	20.96	29.46		
Jun 21-30	20.49	12.91	23.73		
Jul 1-10	23.95	15.00	20.21		
Jul 11-20	29.50	14.64	18.03		
Jul 21-31	36.50	13.24	16.27		
Aug 1-10	35.76	14.25	15.19		
Aug 11-20	37.10	13.80	15.08		
Aug 21-31	30.82	16.73	16.18		
Sep 1-10	35.45	14.78	15.81		
Sep 11-20	26.56	18.46	17.02		
Sep 21-30	11.68	23.22	23.07		
Oct 1-10	3.67	24.30	29.01	# DAYS ERC > 30.5	# DAYS ERC >34.5
Oct 11-20	2.30	25.29	30.75		
ERC 30.5 – 80TH PCTL		ERC 34.5 – 90TH PCTL		53	32

ABERNATHY STATS:

 # DAYS ERC >28: 49

44.3 – JUL 30
43.6 – AUG 4
43.1 – AUG 3

CASTLE ROCK STATS:

 # DAYS ERC >33: 59

42.8 – AUG 12
42.4 – AUG 11
40.4 – AUG 13

PEAK ERC DAYS: **42.00 JUL 30, 2021**

41.95 AUG 4, 2021 **# DAYS F100 </= 10: 0**

41.10 AUG 12, 2021 **LOWEST AVE F100: 10.81 JUL 31, 2021**