



12/31/12

**MEMORANDUM FOR:** Roger Lamoni  
Western Region Fire Weather Program Manager  
National Weather Service, Western Region

**FROM:** Andy Haner  
Fire Weather Program Leader  
National Weather Service, Seattle, WA

**SUBJECT:** 2012 Annual Fire Weather Report

The following report evaluates NWS Seattle's Fire Weather products and services in support of Western Washington land management agencies and public safety partners in the 2012 calendar year. This report includes verification statistics for Fire Weather Watches, Red Flag Warnings, and NFDRS zone trend forecasts; the number of spot forecasts issued; the number of IMET dispatches with the number of days out of the office; and detailed information on fire weather teaching assignments and liaison activities.

**Weather Synopsis:**

The 2012 fire season in western Washington experienced a late start, followed by a historically late finish.

Following a June that was significantly cooler and wetter than normal, the weather over western Washington returned to more seasonable levels of warmth and dryness around July 5. By that time though, fuels were near record-moist levels for the date, and the start of fire season appeared to be many weeks away. From July 20-22, wet thunderstorms brought wetting rains to most of western Washington, further delaying the onset of fire season.

The rain spicket shut off after July 22. In fact, no measurable rain was observed at Sea-Tac Airport during the month of August, making it the driest month on record, and making it the first month on record with no measurable rainfall. The only part of western Washington with a wetting rain during the month was the North Coast, where a wetting rain occurred on August 29. Even so, Quillayute only received 21% of its normal August rainfall.

In addition, two separate heat waves occurred in early-mid August, each boosting temperatures at Sea-Tac into the 90s for 2 days apiece. The heat waves accelerated the drying of fuels, and it appeared that fire season was ready to get underway around August 15, which is a few weeks later than usual.

Another heat wave occurred from Sep. 5-8, continuing the drying of fuels well into September. Sea-Tac Airport reached 90 degrees on Sep. 7. On Sep. 8, a prolific lightning event took place, mainly impacting the East Slopes of the Cascades. However, lightning strikes reached the southeast corner of Fire Weather Zone 659, igniting the South Point Fire south of Randle in the Gifford-Pinchot National Forest. A few lightning strikes in Fire Weather Zone 662 started a fire west-northwest of Stehekin as well. Both fires continued well into October.

For the rest of September through October 10, benign weather with above normal temperatures prevailed. The weather continued to be historically dry following a record-dry August. By October 10,

Sea-Tac Airport had recorded its driest 83-day period on record, with only 0.07” of rain occurring since July 21. As a result by early October, fire danger indices were breaking record levels for the date and even exceeded values that would typically be seen in mid-August, when fuel dryness historically peaks. This sent fire season into overtime, well past its normal mid-September end. NWS Seattle had to extend 7-day-a-week Fire Weather desk staffing past its typical Oct. 1 ending date.

From October 3-6, a prolonged Fraser outflow and East Wind event took place, producing critical combinations of strong wind and low relative humidity. This prompted the issuance of Red Flag Warnings, the first such issuance in the month of October in at least the past 10 fire seasons. The Powerline Fire ignited on Oct. 4, threatening dozens of homes on the northeast side of Shelton and prompting DNR to order a Type 2 Incident Management Team.

The autumn rainy season started in earnest on October 12, and the 2012 fire season quickly came to an end.

**Fire Weather Watch/Red Flag Warning Verification:**

Red Flag events in the Seattle Fire Weather district consist of scattered lightning, a combination of strong wind and low relative humidity, or a dry and unstable atmosphere – in combination with dry fuels. Watches and warnings for these weather events are issued when the observed fire danger, as described by the Energy Release Component (ERC), is equal to or above the 90<sup>th</sup> percentile in the historical distribution of ERC’s. The Fuel Dryness Level for PSAs W1 and W2, as described by NWCC Predictive Services, is also considered. Red Flag Warnings are verified 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 also considered.

In 2012, NWS Seattle issued 42 zone-based Red Flag Warnings (RFWs) and 17 zone-based Fire Weather Watches (FWWs). Only 16 of the 42 Red Flag Warnings verified. The biggest reasons for the high False Alarm Rate were forecasted lightning events on August 18 and on September 22, both of which failed to materialize. Another False Alarm event occurred on August 15, when 4 out of 5 zones which had been warned failed to reach wind and humidity criteria.

There were 15 zone-based Missed Events this season, i.e. Red Flag events which take place with no Red Flag Warning in effect. The most significant Missed Event occurred when the Sep. 9 lightning event strayed a little further west than forecast, affecting Fire Weather Zones 659 and 662; no Red Flag Warnings were in effect. Another significant Missed Event occurred when the early October RH/wind event started sooner than expected, causing no Red Flag Warning to be in effect when conditions first materialized on October 3.

Other isolated lightning occurrences and significant events falling short of Red Flag criteria were headlined in the Fire Weather Planning Forecast.

Fire Weather Watches	- 12 issued	
Average lead-time on Fire Weather Watches	- N/A	
Red Flag Warnings	- 42 issued	
	- 16 verified	
	- 15 missed events	
Average lead-time of Red Flag events	- 8.3 hours	
# Of Red Flag Warnings issued = a + c	= 42	
# Of Red Flag Warnings that verified = a	= 16	
# Of Red Flag Warnings that did not verify = c	= 26	
# Of Red Flag events with no warning issued = b	= 15	
Probability of Detection (POD) = a/(a+b)	= 16/(16+15)	= 0.52

False Alarm Rate (FAR)	= 1 - (a/(a+c))	= 1 - (16/(16+26))	= 0.62
Critical Success Index (CSI)	= a/(a+b+c)	= 16/(16+15+26)	= 0.28

**2012 NFDRS Trend Forecast Verification:**

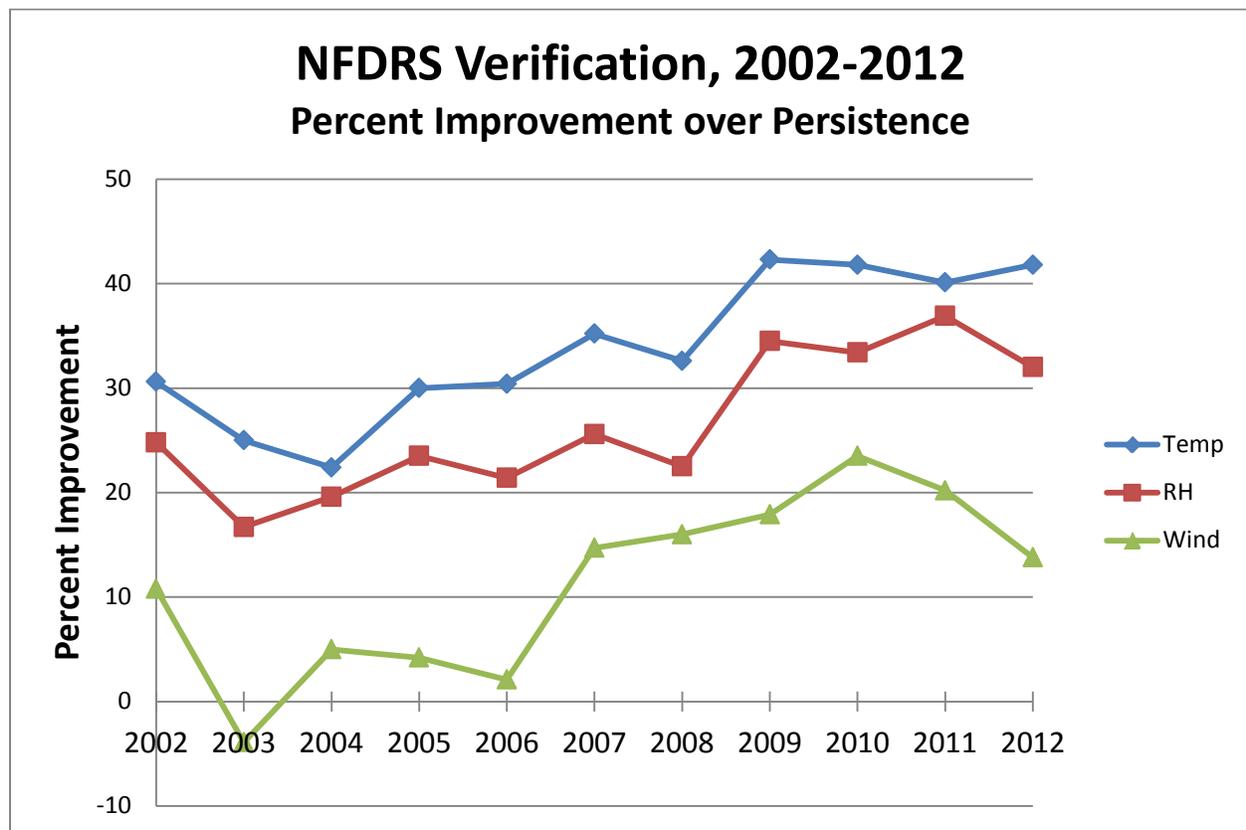
NFDRS Trend Forecast verification was accomplished by comparing the average forecast values derived from the 2 p.m. Zone Trend Forecasts with the 2 p.m. NFDRS Fire Weather Zone observation averages for the following day. While not the most representative method of verifying NFDRS forecasts, a long-term history has been established using this method dating back to 1984 and provides a consistent way of tracking year-to-year changes in skill. Verification statistics were calculated using the same set or group of stations that were used in previous years.

NWS Seattle verification scores have entered a multi-year period of consistently excellent performance. 2012 verification beat the 10-year running average in all categories, indicating continued improvement over the years.

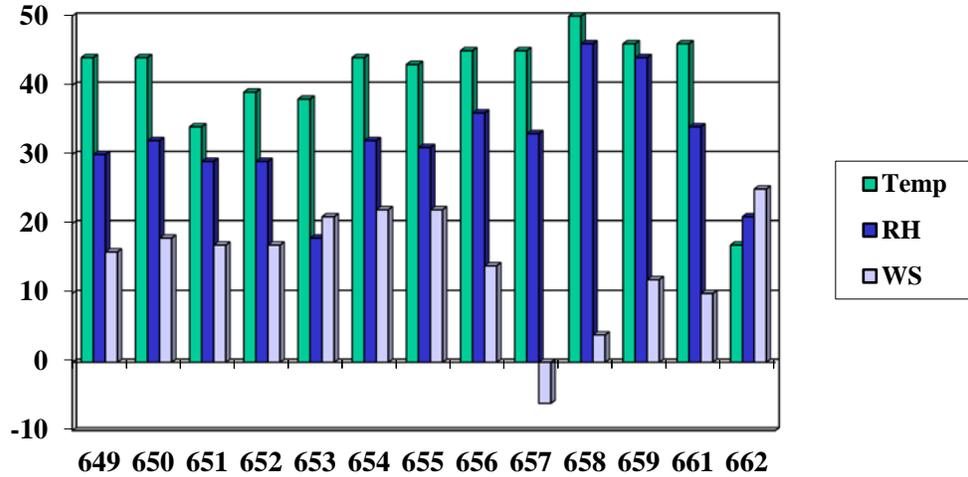
Temperature: Forecasts showed 41.8% improvement over persistence. This is 8.8% over the 10-year running average.

Relative Humidity: Forecasts showed 32.0% improvement over persistence. This is 6.1% higher than the 10-year running average.

Wind Speed: Forecasts showed 13.8% improvement over persistence. This is 2.8% over the 10-year running average.



## 2012 Percent Improvement over Persistence by Fire Weather Zone



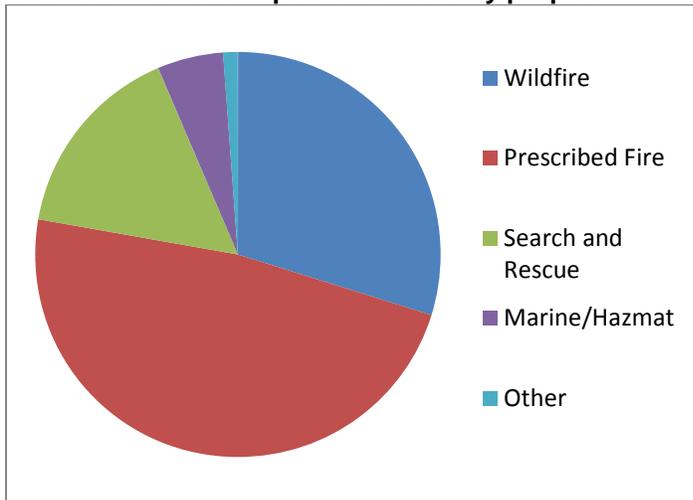
Yearly Zone Average Verification											
Year	Temperature			Relative Humidity			Wind Speed				
	MAE(f)	MAE(p)	%IMPV	MAE(f)	MAE(p)	%IMPV	MAE(f)	MAE(p)	%IMPV		
1984	3.7	5.2	28.8	8.8	11.1	20.7	1.8	1.9	5.2		
1985	3.2	4.8	33.3	8.6	11.2	23.2	1.7	2.0	15.0		
1986	3.6	4.7	23.4	9.0	10.9	17.4	1.6	1.8	11.1		
1987	3.4	5.4	37.2	8.0	10.8	25.9	1.5	1.7	8.7		
1988	3.2	5.6	42.8	8.2	11.1	26.1	1.7	1.7	11.7		
1989	3.2	4.8	33.5	8.5	10.6	19.6	1.5	1.7	12.5		
1990	3.3	5.4	37.9	8.5	11.5	25.5	1.4	1.5	4.0		
1991	3.3	5.7	52.8	8.2	11.5	28.7	1.6	1.9	15.8		
1992	3.2	5.1	38.1	9.0	11.8	23.9	1.5	1.6	3.1		
1995	3.3	4.9	32.6	8.8	11.3	22.1	1.7	1.9	10.5		
1996	3.0	5.4	44.4	7.8	11.0	29.1	1.8	2.0	10.0		
1998	3.4	5.5	38.2	8.1	11.6	30.2	1.6	1.6	0.7		
1999	3.8	6.1	37.3	9.0	12.9	30.3	1.5	1.5	0.7		
2000	3.6	5.2	30.7	8.6	11.7	26.5	1.6	1.6	0.0		
2001	3.5	4.4	21.6	8.1	10.0	18.7	1.6	1.8	6.3		
2002	3.4	4.9	30.6	8.0	10.7	24.8	1.7	1.9	10.8		
2003	4.1	5.5	25.0	9.2	11.3	16.7	1.9	1.9	-3.9		
2004	3.8	4.9	22.4	9.2	11.5	19.6	1.6	1.8	5.0		
2005	3.8	5.4	30.0	9.5	12.6	23.5	1.5	1.6	4.2		
2006	3.9	5.6	30.4	8.7	11.2	21.4	1.5	1.6	2.1		
2007	3.6	5.5	35.2	9.0	12.5	25.6	1.4	1.6	14.7		
2008	3.6	5.5	32.6	9.1	12.0	22.5	1.7	2.1	16.0		
2009	3.4	6.0	42.3	8.4	13.0	34.5	1.4	1.8	17.9		
2010	3.1	5.4	41.6	7.9	12.0	33.2	1.5	2.0	23.3		
2011	3.1	5.1	39.7	7.6	12.2	36.8	1.5	2.0	20.9		
2012	<u>3.2</u>	<u>5.5</u>	<b>41.8</b>	<u>7.8</u>	<u>11.6</u>	<b>32.0</b>	<u>1.2</u>	<u>1.5</u>	<b>13.8</b>		

**2012 Spot Forecasts:**

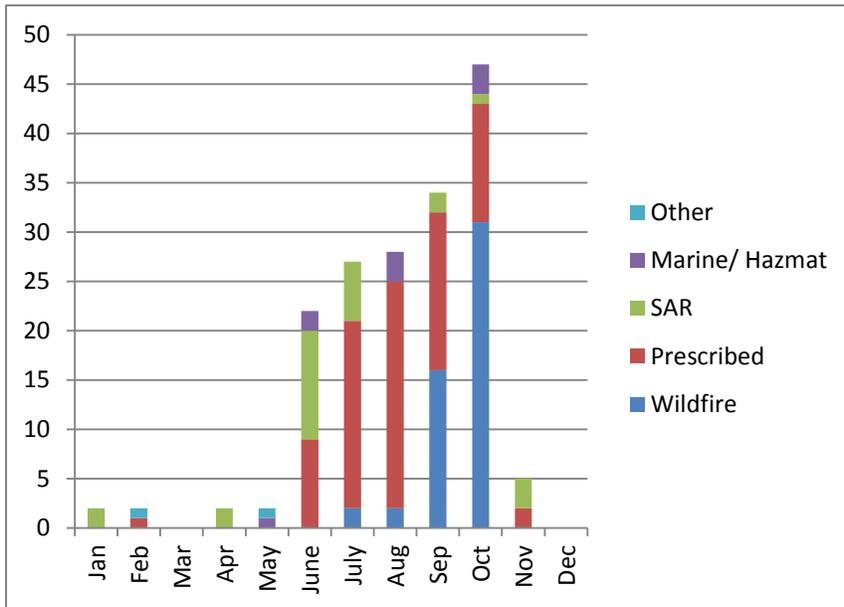
NWS Seattle issued 171 Spot Forecasts in 2012. This was the second-most number of Spot Forecasts issued in a single year. It is second to the 175 Spot Forecasts issued in 2009. The heaviest spot forecast load occurred in early October; in most years, western Washington fire season is over by October. Spot Forecasts were in support of wildland fires, prescribed burns, Search and Rescue missions, Marine/HAZMAT operations, or other operations. In 2012, prescribed burners made routine use of the experimental Hysplit functionality in the Spot program.

<b><u>Purpose</u></b>	<b><u># of Spots</u></b>
Wildfire	51
Prescribed Burns	82
Search and Rescue	27
Marine/HAZMAT	9
Other	2

**Breakdown of 2012 Spots Forecasts by purpose**



## Breakdown of 2012 Spots Forecasts by Month



## 2012 IMET Dispatches

In the 2012, NWS Seattle Incident **M**eteorologists (**IMETs**) responded to five dispatches totaling 61 days of on-site weather support. They were:

<u>Dates</u>	<u>IMET</u>	<u>Location</u>	<u>Incident</u>
12/29/11 – 1/13/12	Haner	Merkel, TX	Texas Fire Support
8/10 – 8/25	Cerniglia	Lakeview, OR	Barry Point Fire
8/30 - 9/7	Cerniglia	John Day, OR	Parish Cabin Fire
9/8 – 9/23	Haner	North Fork, ID	Mustang Complex
10/6 - 10/12	Haner	Trout Lake, WA	Cascade Creek Fire

## Training and Liaison Activities in 2012:

NWS Seattle committed 41 staff-days in 2012 in direct support of fire weather training and/or liaison activities. A combined total of 845 people attended these events. The table below lists the assignments. Also, NWS Seattle used an online forum for the second year to conduct the annual Fire Weather Users' Meeting.

<u>Date</u>	<u>Forecaster</u>	<u>Location</u>	<u>Activity</u>
1/19	Haner	Vancouver, WA	PNW Fire Behavior Workshop (52 Attendees)
3/20	Cerniglia	North Bend, WA	Fire Refresher (24 Attendees)
4/4 – 4/5	Haner	Portland, OR	PNW AOP Mtg. (14 Attendees)

4/10	Haner, Cerniglia	North Bend, WA	Fire Refresher (20 Attendees)
4/13	Haner	Joint Base Lewis-McChord, WA	Fire Refresher for Pilots (30 Attendees)
4/16	Cerniglia	Sedro Woolley, WA	Fire Refresher (17 Attendees)
4/17	Haner, Cerniglia	Yakima, WA	Seasonal Outlook WA Type-2 Team Mtg. (150 Attendees)
5/1 – 5/3	Haner, Cerniglia	Auburn, WA	S-290 Instruction Green River CC (12 Attendees)
5/9	Haner, Cerniglia	Concrete, WA	Weather Review/Refresher Baker River Hotshot Crew (22 Attendees)
5/10	Haner, Cerniglia	Port Angeles, WA	RT-130 / Fire Refresher Pack Test Olympic NP (20 Attendees)
5/16	Haner, Cerniglia	Seattle, WA	Annual Fire Weather Users' Conference via Go-To Meeting (18 Attendees)
5/17	Haner	Edgewood, WA	Seasonal Outlook Pierce County Wildland Fire Conference (18 Attendees)
5/22	Haner	North Bend, WA	Fire Refresher Mt. Baker-Snoqualmie NF (25 Attendees)
5/24	Haner, Mercer	Darrington, WA	S-190 Instruction Mt. Baker-Snoqualmie NF Initial Attack Crew (25 Attendees)
5/31	Cerniglia	Ohanapecosh, WA	Fire Refresher Mt. Rainier NP (32 Attendees)
6/2	Cerniglia	Anacortes, WA	Training Burn Mt. Erie Fire Department (20 attendees)
6/4	Cerniglia	Darrington, WA	Fire Refresher Mt. Baker-Snoqualmie NF (13 attendees)
6/7	Cerniglia	Port Angeles, WA	Fire Refresher Olympic NP (56 Attendees)
6/12	Cerniglia	Ohanapecosh, WA	Fire Refresher Mt. Rainier NP (27 Attendees)

6/18	Haner	Port Angeles, WA	S-190 Instruction Olympic NP (55 Attendees)
6/18	Cerniglia	North Bend, WA	Fire Refresher Mt. Baker-Snoqualmie NF (22 Attendees)
6/19	Cerniglia	Enumclaw, WA	S-190 Instruction and Test Review South Puget DNR (25 Attendees)
6/20	Cerniglia, D'Amico	Joint Base Lewis-McChord, WA	IMET-type Weather Briefing and Training Burn (72 Attendees)
6/21	Haner	Sedro Woolley, WA	Fire Refresher Mt. Baker-Snoqualmie NF (30 Attendees)
6/21	Cerniglia, Buehner	Seattle, WA	Fire Weather Media Tour (Visited 20 Journalists)
8/9	Cerniglia	Burlington, WA	Fire Refresher (20 Attendees)
11/8	Haner, Reedy	Olympia, WA	Post-Season Review DNR Resource Protection (6 attendees)