



Oregon
Department
of Agriculture

Summary of the 2016 Field-Burning Season

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1. Introduction

This summary is prepared annually by Oregon Department of Agriculture (ODA) Smoke Management Program staff to report the statistics for each field-burning season.

2. Weather Discussion: Prepared by the Oregon Department of Forestry Weather Office

Predicting weather patterns that will promote the lifting and evacuation of smoke out of the Willamette Valley and away from populated areas is vital to the efficient operation of the Smoke Management Program. There are usually only a few days each summer with “excellent” ventilation conditions, so days with “marginal-to-good” ventilation conditions must be efficiently utilized to keep overall smoke impacts to a minimum.

After near-record rainfall (15.24 inches) in Salem in December 2015, precipitation was near normal for the rest of the winter and spring in the Willamette Valley. Temperatures were also unusually warm (about 4 degrees Fahrenheit higher than average) for the December-through-June period. While December provided good snow in the mountains, the warm weather during the rest of the winter diminished the snowpack sooner than usual, as determined by analysis of snowpack sensors. Snowpack was below normal from March 1 through the remainder of the season.

During June and much of July, frequent upper-level troughs moved onshore pushing marine air into the Willamette Valley. With the exception of a couple of notable heat waves during the first week of June and end of July, these months brought near-seasonal temperatures and normal or slightly below normal rainfall. These conditions were better than during the same months in 2015 and brought a designation of abnormally dry for the Willamette Valley, as opposed to the drought designation that occurred in summer 2015.

Frequent spring-like upper troughs from the northwest continued into much of July, causing many days of deep and stable marine air, but often with negative gradient stacking lasting well into the afternoon. The first field burning of the season occurred on Thursday, **July 7**, thanks to southwesterly transport winds ahead of one of those upper troughs, and good mixing. This allowed 15 acres to be burned with no impacts or complaints recorded. However, this was the first of four consecutive days of measurable rain in the Willamette

Valley. Salem Municipal Airport recorded nearly a half-inch of rain, preventing significant burns.

Conditions were not conducive for burning the following week because of wet fields and northerly transport winds. The first good burning opportunity arrived as a trough was just offshore on Tuesday, July 19. Clouds over the Willamette Valley dissipated and southerly transport winds became light and southwesterly while the mixing height reached more than 6,000 feet. Late that afternoon, 772 acres were burned. No impacts or complaints were recorded.

Another excellent opportunity came on Thursday, July 21, when a marine push began arriving in mid-afternoon and while another strong upper trough approached. Transport winds turned west-southwesterly early in the afternoon, but burning did not begin until pressure gradients balanced and the 1 p.m. PIBAL confirmed the mixing height had reached 3,000 feet. These conditions allowed for the burning of 1,219 acres. No impacts were recorded and two complaints were received.

Another marine push began early on Monday, July 25. Gradients were positive and northwesterly winds increased during the afternoon, allowing 858 acres to be burned, including one “critical problem” field located near a school. However, the wind was quite weak until late afternoon and the rate of burning had to be decreased. Early on, smoke was not evacuating as quickly as hoped, resulting in two complaints. No impacts were recorded.

Favorable burning conditions returned to begin **August**. Another upper low approached northwestern Washington on Monday, Aug. 1, and a marine push was to arrive that night. By 2 p.m., a PIBAL showed that the wind had turned northwesterly and the pressure gradients became slightly positive. By 4 p.m., subsequent PIBALS confirmed that the wind had become northwesterly to a deeper level, which also indicated a deeper mixing level, but winds were not increasing in speed. The determination was made to not allow additional burning permits past 5 p.m. A total of 738 acres were burned. Weak winds caused smoke to sink, prompting seven complaints. Mill City experienced three hours of Light Impact and four hours of Moderate Impact.

The upper low continued eastward on Tuesday, Aug. 2, and in spite of the marine push from the previous night, skies cleared and pressure gradients balanced by 4 p.m. West to west-northwest transport winds increased to 10-15 mph in the afternoon to allow for the burning of another 609 acres, including one “critical problem” field located near a school. Gradients turned negative about 6 p.m. but burning had already stopped. No impacts were recorded and one complaint was received.

Northerly transport winds dominated on Wednesday, Aug. 3, and Thursday, Aug. 4, and no burning was completed.

Winds turned northwesterly and gradients balanced late on Friday, Aug. 5, allowing for 88 acres of burning. No impacts were recorded and one complaint was received.

Showers and negative gradient stacking returned on Aug. 8-9 (Monday and Tuesday), with winds turning northerly on Wednesday through Friday, preventing any burning from occurring that week.

Very little burning was possible through most of the remainder of August. An upper ridge caused frequent offshore flows beginning on Thursday, Aug. 11. This pattern continued through most of the month. Northerly winds were persistent during the week of Monday, Aug. 15. Gradients were positive on Aug. 15 and allowed for 18 acres of preparatory burning. No impacts or complaints were recorded.

The forecast on Aug. 17 called for transport winds to turn north-northwesterly but PIBALs showed they were gradually turning north-northeasterly, and no burning occurred. That trend of winds turning north-northeasterly was the beginning of the most intense heat wave of the summer along with associated fire marshal conditions as the region topped 100 degrees each of the following three days and no burning was conducted.

North-northeasterly transport winds again persisted every day of the following week, August 22-26, and no burning occurred.

A potentially good burning day was anticipated Monday, Aug. 29, and it turned out as the most successful field-burning day of the summer. An upper-level trough in the Gulf of Alaska caused a dry, southwesterly flow aloft. Pressure gradients remained positive with mixing heights reaching 4,000 feet that afternoon. PIBALs and test fires confirmed the expected conditions, allowing for the burning of 2,395 acres. Eleven complaints were received and one hour of Light Impact and two hours of Moderate Impact registered in Government Camp.

Continued southwesterly flow aloft on Tuesday, Aug. 30, resulted in the burning of 80 acres with no impacts or complaints recorded.

September began with uncertain burning conditions. On Thursday, Sept. 1, though southwesterly transport winds and favorable pressure gradients were expected, the mixing height was less certain until PIBALs began. Showers were just offshore and expected to reach fields by mid-afternoon. The 2 p.m. PIBAL confirmed the mixing height was 3,000 feet. Quickly, 437 acres were burned before showers arrived shortly after 3 p.m., when burning ended. No impacts or complaints were recorded.

Fields were too wet to continue burning on Friday, Sept. 2, though other conditions were favorable. On Wednesday, Sept. 7, 186 acres were burned, with no recorded impacts and one complaint from Stayton.

On Thursday, Sept. 8, 460 acres were burned close to the foothills. Sweet Home experienced one hour of Light Impact and no complaints were recorded.

A thermal trough moved into the Willamette Valley on Friday, Sept. 9 and north-northeasterly winds prevented burning. The thermal trough persisted into the first part of the second full week of September, preventing burning.

The wind began to shift westerly on Wednesday, Sept. 14. A PIBAL at 2 p.m. showed the mixing height had risen to 3,000 feet while the southwesterly transport wind had increased to 10 mph. A third PIBAL at 3 p.m. showed that the winds, though westerly, were becoming very weak and smoke was not evacuating from the Willamette Valley quickly enough. So burning stopped to allow smoke to disperse. One more hour of burning occurred between 4 and 5 p.m. and was shut down thereafter over concerns of sinking smoke. In those few hours, 1,937 acres were burned, resulting in 14 hours of Light Impact and four hours of Moderate Impact in Detroit and 12 hours of Light Impact and three hours of Moderate Impact in Mill City. Sixteen complaints were received.

Extremely weak (northerly) winds and slowly rising mixing heights on Sept. 15 led to no burning, with the exception of a fire department training exercise in which 2 acres were burned.

An approaching upper-level trough and a marine push were expected on Friday, Sept. 16, leading to another expected burn opportunity. A 2 p.m. PIBAL identified slowly rising mixing heights and balanced pressure gradients. Burning was slowly initiated, but continued through the afternoon. While winds were expected to slowly increase into the evening, enough smoke had been lofted and sunset was approaching, so burning ended around 5 p.m., with 1,154 acres burned. Mill City experienced three hours of Light Impact and six complaints were received.

Northwesterly winds and good mixing on Tuesday, Sept. 20, allowed for the burning of 152 acres before showers moved into the Willamette Valley. No impacts or complaints were recorded. A thunderstorm with hail moved across Salem around 10 p.m. It dropped almost a half-inch of rain at Salem Municipal Airport but the fields east of Interstate 5 remained generally dry.

On Wednesday, Sept. 21, better-than-expected mixing heights and north-northwesterly winds allowed for the burning of 384 acres. Detroit experienced one hour of Light Impact and no complaints were recorded.

Southerly winds became southwesterly on Thursday afternoon, Sept. 22, Northwesterly winds gradually became southwesterly as the mixing height increased as confirmed by PIBALs. Once gradients balanced, conditions became excellent for burning, and 690 acres were burned. S.E. Portland experienced one hour Light Impact and one complaint was received.

Showers and negative gradient stacking prevented burning on Friday, Sept. 23.

A thermal trough over the Willamette Valley during the weekend shifted eastward on Monday, Sept. 26. While the day began with warm air aloft, the thermal trough moved east

early enough for winds to turn northwesterly at low levels and southwesterly above. A total of 240 acres were burned with no impacts and one complaint received.

Winds turned northwesterly on Thursday, Sept. 29, as the first in a long series of upper-level troughs approached. It was indicative of an approaching wet autumn pattern. The conditions were more than sufficient to allow burning of the remaining 15 acres on Sept. 29, with no impacts or complaints recorded. This concluded the 2016 field-burning season.

A total of 12,449 acres were burned during the 2016 field-burning season.

Figure 1
Observed Temperatures at McNary Field (Salem Municipal Airport)

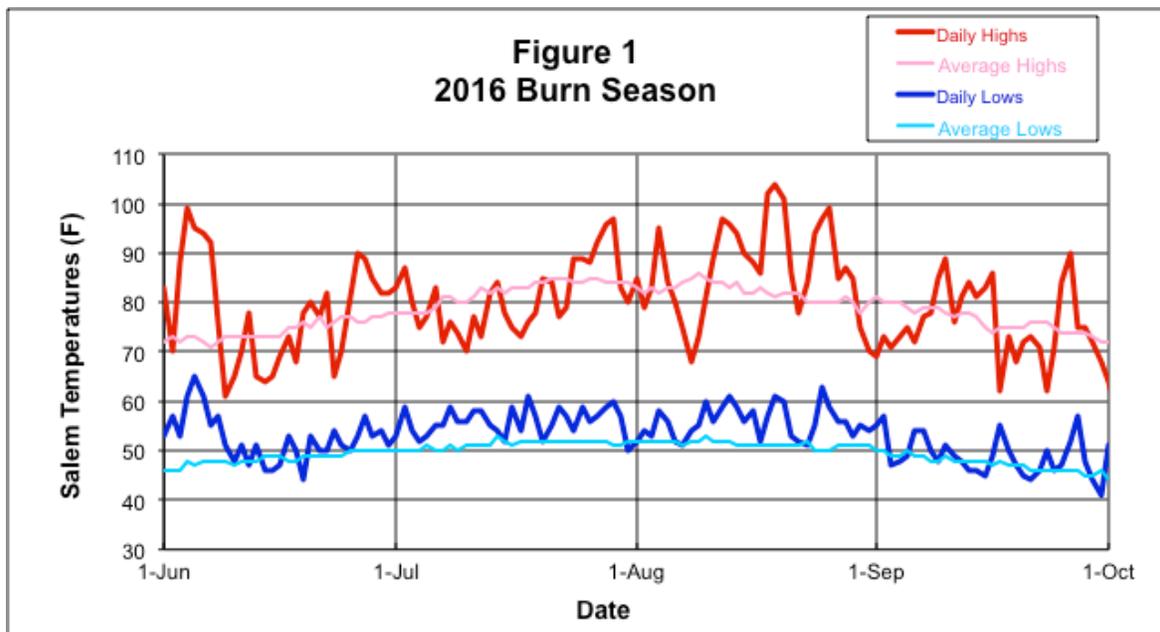
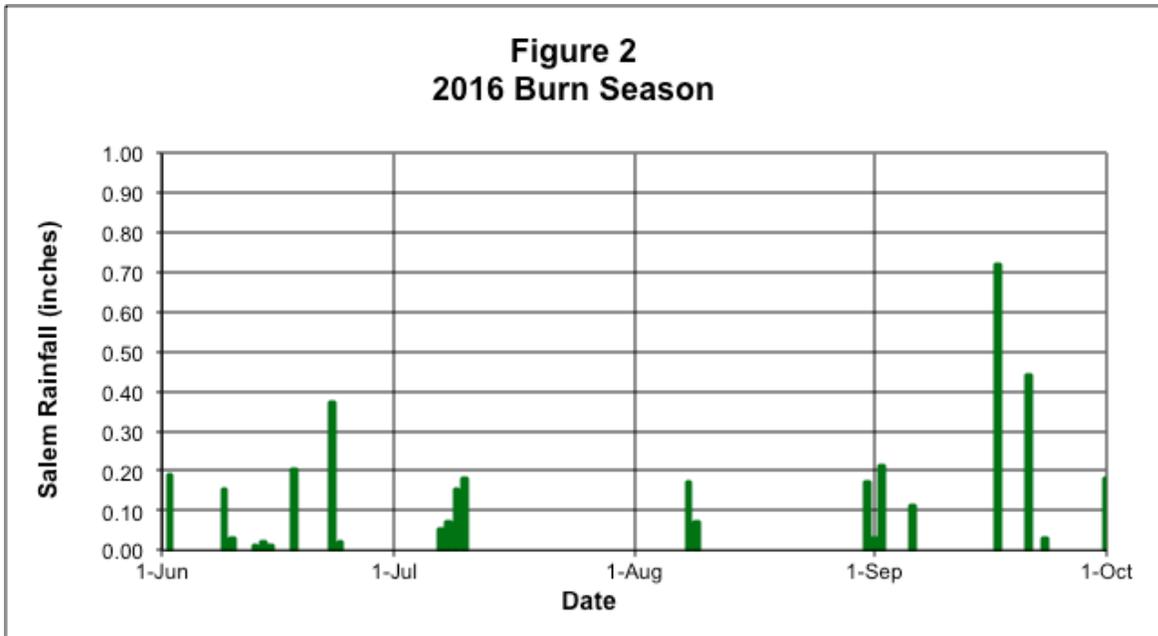


Figure 2
Observed Precipitation at McNary Field (Salem Municipal Airport)



3. Registered and Burned Acres

Open field-burning acreage registration begins in March and continues through April 1. Table 1 shows the breakdown of acres registered, the statutory limitation of each type, and the final allocation. The registration amounts show “on-time” registered acres. Registration totals can fluctuate slightly after “late registration” is conducted.

Table 1
Acres Registered On-time and Total Burned

Type	Limitation (Maximum burnable acres)	Acres Registered (As of April 2, 2016)	Allocation	2016 Acres Burned
Identified Species and Steep Terrain	15,000	13,882	100%	12,449

Definitions

Type: Open-Field Burning

- **Identified Species:** Research has identified some species of grass seed that cannot be profitably produced without thermal sanitation. These identified species are Chewings Fescue, Creeping Red Fescue, and Highland Bentgrass.
- **Steep Terrain:** Fields located in the Willamette Valley where grass seed or cereal grain is grown; however, because of the steepness of the terrain, it is extremely difficult to apply alternatives to open field burning, and the perennial varieties of grass seed grown prevent erosion on steep hillsides.

4. Enforcement

The 2016 field-burning season marked the 19th year that ODA has performed the enforcement function of the Smoke Management Program. This is stipulated under a Memorandum of Understanding with the Oregon Department of Environmental Quality, pursuant to Oregon Revised Statutes 468A.585.

There were no enforcement contacts during the 2016 field burning season.

5. Smoke Impacts

It is the goal of the ODA Smoke Management Program, with the cooperation of the Willamette Valley grass seed and cereal grain growers, to reduce and/or eliminate smoke impacts in all populated areas. The combination of accurate weather prediction for open field burning, ODA field personnel observations, and grower experience all contribute to alleviate smoke impacts; however, smoke impacts still occur. Unexpected wind shifts, changes in mixing heights, transport wind speeds, and wind directions, along with inefficient lighting techniques, can all contribute to the occurrence of impacts.

The number of hours recorded for smoke impacts in 2016 in cities monitored are outlined in Table 2 (on Page 10).

There were a total of 21 days when burning was conducted; 6 of the 21 days resulted in impacts during the 2016 season.

Table 2
2016 Open Field Burning Impacts

Date	Acres Burned	Impact Hours			Location
		Heavy	Moderate	Light	
Aug. 1, 2016	738		4		Mill City
Aug. 1, 2016	738			3	Mill City
Sept. 8, 2016	460			1	Sweet Home
Sept. 14, 2016	1,937		3		Mill City
Sept. 14, 2016	1,937			12	Mill City
Sept. 14, 2016	1,937		4		Detroit
Sept. 14, 2016	1,937			14	Detroit
Sept. 16, 2016	1,070			3	Mill City
Sept. 21, 2016	384			1	Detroit
Sept. 22, 2016	690			1	SE Portland
Totals		0	11	35	

As defined in Oregon Administrative Rule (OAR) 603-077-0105, cumulative hours of smoke impact result in hourly nephelometer measurements that exceed 1.8×10^{-4} b-scat above the average prior three-hour background levels. For the purposes of this report, “heavy” hours of smoke impact are 5.0×10^{-4} b-scat or more above background (equivalent to visual range of 5 miles or less); “moderate” hours of smoke impact are 1.8×10^{-4} to 5.0×10^{-4} b-scat above background (equivalent to visual range of 12 miles or less); and “light” hours of smoke impact are 1.0×10^{-4} to 1.8×10^{-4} b-scat above the background. “Light” hours of smoke impact were not recorded before the 1999 season. The terms “light,” “moderate,” and “heavy” as used in relation to smoke impacts are not defined in OAR but are used by ODA to quantify the level of smoke impact on residents of the Willamette Valley. Nephelometers are located in Carus, Detroit, Eugene, Lyons, Mill City, Portland, Salem, Silverton, Springfield, and Sweet Home.

6. Complaints

A total of 49 Willamette Valley residents submitted complaints to the Smoke Management Program during the 2016 field-burning season. Table 3 (on Page 11) identifies the number of field-burning complaints originating from individual cities/areas.

Table 3
Complaints by City/Area

Albany	0	Salem/Keizer	2
Detroit	0	Scio	0
Eugene/Springfield	0	Silverton	7
Idanha	0	Stayton	7
Lebanon	1	Sublimity	1
Lyons/Mehama	13	Unknown	0
Mill City/Gates	4		
Other	14		
Portland Metro	0	Total	49