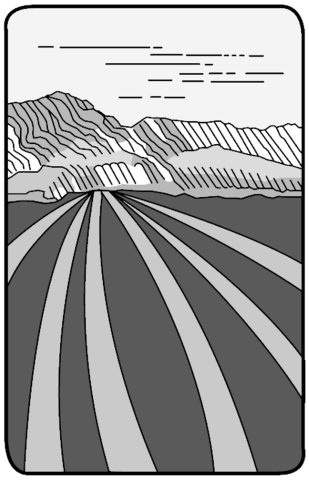


Oregon
Department
of Agriculture

Summary of the 2015 Field Burning Season

As prepared by
Natural Resources Program Area
Smoke Management Program
635 Capitol Street NE
Salem, OR 97301
503-986-4701
http://www.oregon.gov/ODA/programs/NaturalResources/Pages/Burning.aspx

In compliance with the Americans with Disabilities Act, this publication will be made available in alternate formats upon request.

Summary of the 2015 Field-Burning Season

Prepared By
The Oregon Department of Agriculture
Natural Resources Program Area
Smoke Management Program

1. Introduction

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

In 2015, two air quality-measuring devices (in addition to existing devices) were placed in Mill City and Detroit at the beginning of the field-burning season. The data from these devices assist ODA in evaluating field burning strategies and any impacts caused by field burning and will help improve operational efficiency in the future

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 a primary objective of the Smoke Management Program. There are usually only a few days each summer with "excellent" ventilation conditions. Days with "marginal-to-good" ventilation conditions must be efficiently utilized to not only keep smoke impacts to a minimum, but also provide burning opportunities.

After a warm start to spring, the **April through June** period was warmer and drier than average. Beginning in late **May**, several heat waves brought temperatures between 10 and 15 degrees higher than seasonal averages. Below-average snowpack, the lowest "peak" snowpack recorded on April 1 in state history, prompted early requests for drought declarations by the governor for 20 of 36 counties in Oregon before the end of spring.

As many agricultural products began to ripen and be harvested in late **June**, there were several periods of exceptionally warm weather, with Salem recording a high temperature of 90°F or greater on six of the first nineteen days of summer (See Figure 1). That same period was generally dry with no significant rainfall in the Willamette Valley (See Figure 2).

Starting in **July** the upper-level ridge over the Great Basin weakened enough by July 7 to allow for the burning of the first fields of the season. There were 34 acres burned with no registered smoke impacts and no complaints received. July 8 had lower mixing heights until later in the afternoon, as an upper-level ridge over the Columbia River produced sinking air aloft with neutral flow over the Cascades; this precluded any smoke from being able to ventilate out of Willamette Valley. After waiting for a brief window of favorable winds and mixing conditions to

arrive, the next burning opportunity came just ahead of a cool upper-level trough on Friday, July 10, with 65 acres burned in the afternoon hours near Sublimity. Some down mixing of the plume occurred, halting further burning, but no smoke impacts were registered and no complaints were received.

After a mostly cloudy weekend with very light rainfall across the Willamette Valley, more burning was performed on Monday, July 13; 433 acres were burned near Silverton, with no smoke impacts registered and no complaints received.

With an upper-level trough moving across the northwest on Tuesday, July 14, surface winds became more northerly under a steady onshore flow with another day of excellent mixing conditions. A mild afternoon sea breeze with northwesterly winds allowed for some test fires and small-acreage burning of fields near Lyons; 65 acres were field burned and no complaints were received.

Similar conditions set up again the following day, on July 15. An upper-level trough swung across the northern Willamette Valley, providing excellent ventilation with steady northwesterly winds. This allowed 743 acres to be burned, including two "critical problem" fields located near schools. No smoke impacts were registered and seven complaints were received.

A moderate marine push overnight brought moisture into the Willamette Valley early on July 16 and was followed by another weak upper-level trough that passed across the Silverton Hills in the late afternoon. Two small test fires totaling 11 acres determined that conditions were not favorable for open field burning. There were no impacts or complaints receive.

The upper-level ridge was displaced as a strong upper-level trough sunk south from Canada on July 17 and offshore gradients developed. Combined with breezy northeasterly flow and a warming, drying atmosphere, no open field burning was accomplished.

A weak ridge sat over Oregon the weekend of July 18-19, positioned west of the Cascades on Saturday before being forced east on Sunday. The dry air and very warm temperatures continued to help get fields ready for open field burning on Monday, July 20. An upper-level trough approached from the Pacific Ocean producing onshore flow with west-by-northwesterly surface winds and excellent mixing conditions. There were 581 acres burned, with one hour of Light Impact recorded in Lyons and one hour of Light Impact recorded in Mill City. There were six complaints received. Field burning ended early that afternoon, as winds and low humidity hovered just outside of State Fire Marshal Burn-Ban criteria.

A decaying frontal boundary pushed into the Willamette Valley mid-day on July 21, promoting mixing of the atmosphere while causing the onshore gradients to wash out west of the Cascades. This prevented burning opportunities from developing in spite of some late heating of the atmosphere once the clouds scattered out.

Marginal conditions persisted into July 22, when weak upper-level troughs passing over western Oregon failed to dislodge a stubborn surface ridge extending eastward across Salem. There were 22 acres of "preparatory" burning accomplished without any complaints received.

As the ridge off the coast of Oregon was weakened and pushed further south than anticipated, July 23 provided an additional day of open field burning opportunities. A northwesterly onshore flow for most of the day with southwesterly flow aloft allowed for 565 acres of preparatory and open field burning to occur successfully, with the elevated smoke being kept aloft after a mild sea breeze arrived generating no smoke impacts and two complaints.

The weather on Friday, July 24, developed as a very favorable open field-burning day. With southwesterly flow and excellent mixing conditions, 2,211 acres of preparatory and open field burning were conducted. There were no impacts recorded and fifteen complaints were received.

The week ended with a total of 3,379 acres being field burned with no smoke impacts registered.

A high-pressure system in the Pacific began to rebuild over the Northwest, weakening the air above as the warm air in the Willamette Valley significantly increased temperatures. Monday, July 27 saw a brief period of marginal open field burning opportunities, allowing 45 acres of preparatory burning to be accomplished before humidity dropped too low and winds began to turn northeasterly. No impacts were recorded and two complaints were received.

A persistent weather pattern locked into place for the rest of the week, with a heat wave across western Oregon pushing daytime temperatures over 100 degrees in many places, with very low humidity and stiff offshore winds meeting State Fire Marshal Burn-Ban criteria for field burning from Tuesday through Friday afternoons. Thursday, July 30 set a new daily record temperature of 105° Fahrenheit in Salem and was officially the hottest day of the year to date for the Mid-Willamette Valley region. Before the area of high-pressure in the upper atmosphere would weaken and shift east into Idaho, offshore gradients with poor mixing conditions would persist into the first weekend of August.

The week of **August** 3 through August 10 was one of increasing burning opportunities, peaking on the afternoon of Friday, August 7. On August 4, 47 acres were open burned in test fires in the late afternoon hours ahead of a mild sea breeze. The following day on August 5, 16 acres of preparatory burning were accomplished as the marine air required several hours of direct sunlight to begin mixing out. Only one compliant was received during these two days of burning.

August 6 saw favorable conditions develop briefly, allowing 35 acres of preparatory burning to occur in the mid-afternoon hours ahead of a well-developed sea breeze. No impacts or complaints were received.

Friday, August 7 provided almost optimal field burning conditions as a surface trough passed through southern Washington. The morning hours brought partly cloudy skies with west-to-southwesterly winds into the Silverton Hills. Winds began to shift more northwesterly soon after preparatory burning was completed giving way to open field burning. There were 1,377 acres burned under a steady northwest wind from the surface up to the top of the mixed layer, but unexpected gusty winds initially caused impacts in Lyons and Mill City that evening, before dissipating smoke at ground level. There were seven complaints filed, with three hours of Light Impacts registered in Lyons, and two hours of Light Impacts, and one hour of Moderate Impact in Mill City.

August 10 through August 17 saw another period of warmer temperatures with limited open field burning opportunities. On August 12, 172 acres were burned ahead of an afternoon sea breeze with southwesterly winds. Shifting winds caused ambient wildfire smoke in the upper atmosphere to begin down mixing. Heavy smoke from a hay barn fire in Lebanon significantly contributed smoke intrusions that persisted overnight and into the next day. Lyons, reported twelve hours of Moderate Impacts and two hours of Light Impacts before air quality returned to normal levels after sunrise on August 13. Detroit, reported twelve hours of Light Impact with four hours of Moderate Impact in the early morning hours of August 13. Mill City saw the most protracted smoke intrusion, with twelve hours of Moderate Impacts beginning after sunset on August 12 and eleven hours of Light Impacts on August 13. Complaints received on August 12 totaled eighteen. There were 30 acres burned on August 13 by the Sublimity Fire Department for a multi-department training event with no impacts or complaints received.

August 17 through August 24 saw two shorter periods of warm weather with strong marine pushes in between limited open field burning opportunities. The only burning for the week took place on Thursday, August 20, after the first marine push brought clouds into Willamette Valley; 67 acres of preparatory burning was accomplished, with some down mixing observed in the plume that halted any further burning. There were six complaints received. There was one hour of Moderate Impacts in both Lyons and Mill City. The second warming period began early in the weekend, before onshore flow returned Sunday, August 23.

There was no field burning the week of August 23-30 in the Silverton Hills. A stationary area of high pressure was positioned between the Oregon coast and the Willamette Valley, preventing enough onshore flow to properly evacuate smoke if burning were to take place. As meteorological autumn approached the Pacific Northwest Friday, August 28 saw a significant change in the weather pattern. An unusually powerful cyclone developed out in the Pacific Ocean near Oregon, sending a weak band of rain showers onshore before sunrise. Wetting rains did not occur over the Silverton Hills, but wind direction shifted to become more southerly ahead of a cold front that passed in the early morning hours of August 29 with isolated thundershowers and wetting rains throughout the Willamette Valley.

On Monday, August 31, the Silverton Hills were under the influence of a cooling onshore flow. This was the second drying day in a row, with partly cloudy skies allowing a fair amount of daytime heating to occur. A test fire showed favorable results, allowing open field burning to commence for the rest of the afternoon; 691 acres were completed ahead of a weak cold front with two complaints received and no impacts were registered.

Tuesday, **September** 1 marked the arrival of meteorological autumn and proved to be a very favorable day for open field burning. Open field burning began after noon and continued uninterrupted for several hours. There were 2,487 acres successfully burned with no smoke impacts and six complaints received. The upper-level trough near the Canadian coast that had kept Oregon under onshore flow began to shift closer to Washington on Wednesday, September 2, bringing wetting rains again early in the day. Scattered showers and even isolated thunderstorms would persist until the upper-level disturbance finally exited to the south Friday evening, ahead of the Labor Day Weekend.

The Labor Day Weekend passed with diminishing onshore flow, as an upper-level ridge expanded over the northeastern Pacific Ocean, creating a broad area of higher pressure over the Pacific Northwest. Warming air aloft suppressed mixing and temperatures during the day began to climb above seasonal averages on Tuesday, September 8. The influence of high pressure over the region created northerly surface winds with weak offshore gradients, preventing favorable conditions for open field burning. An upper-level trough approached southwestern Oregon early Friday morning, helping to weaken the high pressure over the Willamette Valley on September 11. Temperatures lowered back closer to seasonal averages for Sunday, September 13 as onshore flow returned to western Oregon, with increasing cloud coverage further reducing daytime heating.

Monday, September 14 saw winds remain northerly through most of the day, limiting possible field burning geographically while the elevated humidity from isolated showers further restricted open field burning operations. Several test fires were ignited totaling 206 acres. The marginal conditions for ventilation led to one hour of Light Impact to both Detroit and Lyons, with three hours of Light and four hours of Moderate Impacts to Mill City and six complaints. An upper-level trough approached the region on Tuesday, increasing cloud cover under winds that were initially south-by-southeasterly. Wind direction changed to more favorable conditions mid-afternoon, as showers held off from impacting the Silverton Hills, allowing burning operations to begin late and run until nearly sunset. There were 647 acres completed on September 15, with no impacts or complaints received.

The upper-level trough deepened and slowed its advance into Oregon, providing cool showery weather with wetting rains until passing east of the Cascades on Thursday, September 17 after sunset. An upper-level ridge approaching the Pacific Northwest allowed mild, clear skies to return for the weekend. Open field burning was planned for Sunday, September 20 and weather conditions proved to be optimal as a weak mid-level trough swept across northern Oregon on Sunday evening; 1,310 acres were burned ahead of this trough, with one hour of Light Impact observed in Mill City before sunset and five complaints were received.

Unfavorable conditions settled in early the week of September 21, as a deep marine layer moved in after Sunday night's sea breeze. Widespread fog and clouds as well as elevated humidity made it difficult to warm the atmosphere and generate lift under a weakening September sun.

An upper-level trough off the coast of Oregon approached early Wednesday, September 23, turning onshore flow more south-to-southwest and helping to create a brief window of opportunity for open field burning. Modest mixing heights with some clouds moving over the Silverton Hills allowed 244 acres to be burned, with one hour of Light Impact in Lyons immediately after the last field was burned. There were three complaints received.

The upper-level trough stalled out off the coast of Oregon and began to weaken on Thursday, September 24. This provided a relatively neutral gradient over the Willamette Valley, keeping winds southerly with restricted lift. Only 19 acres were burned with one hour of Light Impact reported in Silverton and no complaints received. Ridging aloft with higher pressure at the surface expanded north into Oregon from Nevada, producing offshore flow with restricted mixing of the atmosphere through the final days of September.

Field conditions were determined to be unsuitable for burning on September 30, which brought the 2015 Field Burning Season to an end.

The total number of acres burned for the season equaled 12,123 acres over a total of 25 days. There were a total of 86 complaints regarding open field burning received during the 2015 field-burning season (see Section 6). Detailed smoke impact data can be seen in Section 5.

Figure 1

Observed Temperatures at the Salem Airport

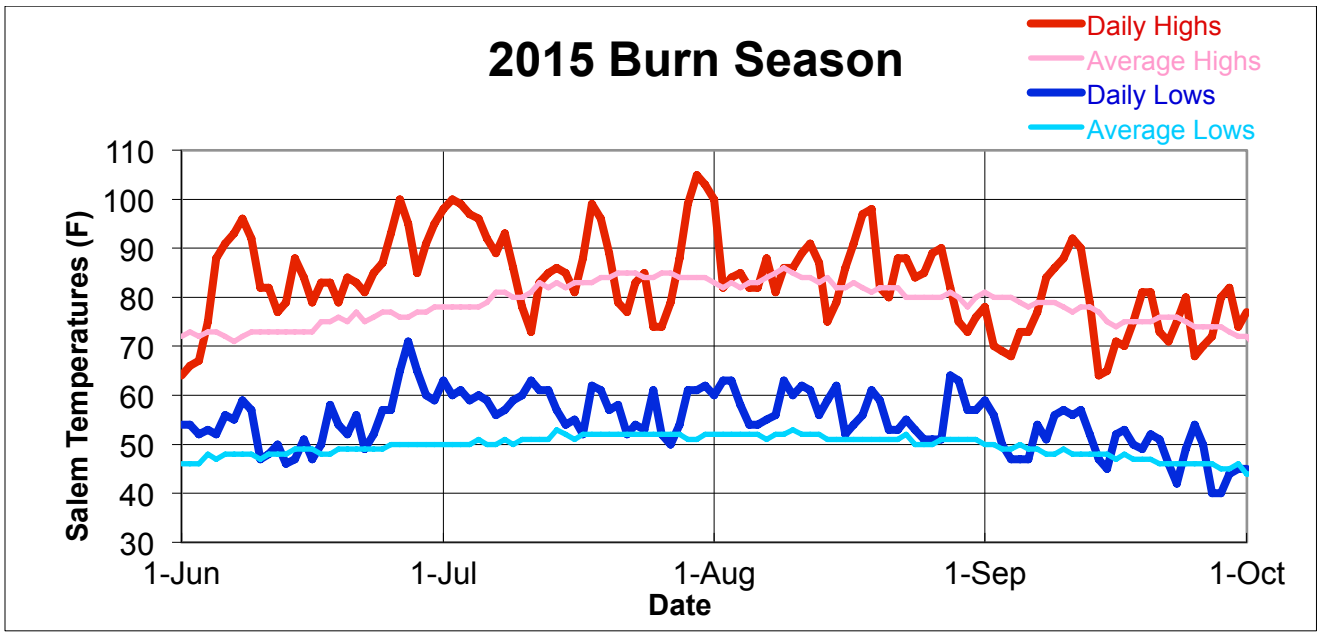
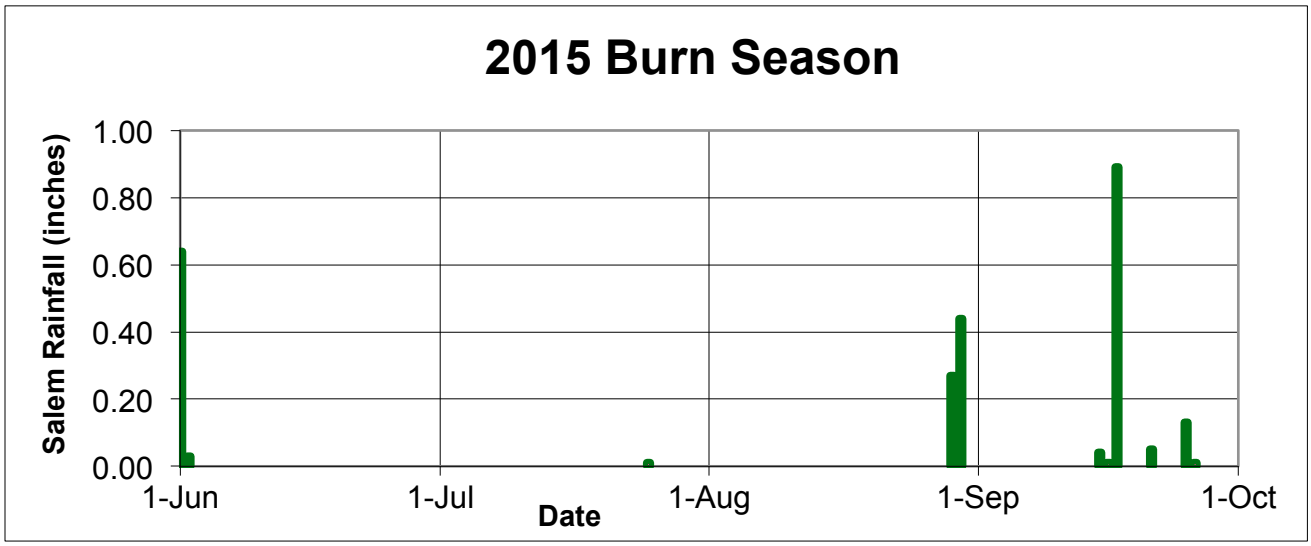


Figure 2
Salem Precipitation Observations



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, 2015)	Allocation	2015 Acres Burned
Identified Species & Steep Terrain	**15,000**	**14,430**	**100%**	**12,123**

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 2015 Field-burning Season marked the eighteenth 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 two enforcement contacts during the 2015 field-burning Season. Both of these enforcement actions resulted in Letters of Warning.

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 2015 in cities monitored are outlined below.

There were a total of 25 days when burning was conducted; 8 of the 25 days resulted in impacts during the 2015 season.

- July 20, 2015, 581 acres burned with 1 Hour Light Impact in both *Lyons* and *Mill City*.
- August 7, 2015, 1377 acres burned with 3 Hours Light Impact in *Lyons*, 2 Hours Light Impact in *Mill City* and 1 Hour Moderate Impact in *Mill City*.
- August 12, 2015, 172 acres burned with *Lyons* Impacts: 2 Hours Light, 12 Hours Moderate; *Detroit* Impacts: 12 Hours Light, 4 Hours Moderate; *Mill City* Impacts: 11 Hours Light, 11 Hours Moderate.
    - **August 12: Elevated readings were contributed to the Southern Oregon Wildfire smoke and the August 12, 2015, barn fire in Lebanon that contained 2,000 tons of straw. Sweet Home and Eugene Nephelometers were elevated due to the Southern Oregon Wildfires also.**
- August 20, 2015, 67 acres burned with 1 Hour Moderate Impact in both *Lyons* and *Mill City*.
- September 14, 2015, 206 acres burned with 1 Hour of Light Impact in both *Lyons* and *Detroit*, 3 Hours of Light Impact and 4 Hours of Moderate Impact in *Mill City*.
- September 20, 2015, 1310 acres burned with 1 Hour of Light Impact in *Mill* City.
- September 23, 2015, 244 acres burned with 1 Hour Light Impact in *Lyons*.
- September 24, 2015, 19 acres burned with 1 Hour of Light Impact in *Silverton*.

As defined in Oregon Administrative Rule (OAR) 603-077-0105, cumulative hours of smoke impact result in hourly nephelometer measurements that exceed 1.8 x 10^{-4} b-scat above the average prior 3-hour background levels. For the purposes of this report, "heavy" hours of smoke impact are 5.0 x 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 x 10^{-4} to 5.0 x 10^{-4} b-scat above background (equivalent to visual range of 12 miles or less); and "light" hours of smoke impact are 1.0 x 10^{-4} to 1.8 x 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

Open field burning complaints received from Willamette Valley residents by the Smoke Management Program totaled 86 for the 2015 Field-burning Season. Table 2 identifies the number of field burning complaints originating from individual cities.

Table 2

Complaints by City

Albany	**0**	**South Willamette Valley**	**0**
Detroit	**0**		
Eugene/Springfield	**0**	**Salem/Keizer**	**2**
Idanha	**1**	**Scio**	**1**
Lebanon	**1**	**Silverton**	**14**
Lyons/Mehama	**31**	**Stayton**	**19**
Mill City/Gates	**12**	**Sublimity**	**1**
Other	**4**	**Unknown**	**0**
Portland Metro	**0**	**Total**	**86**