

Oregon
Department
of Agriculture

SUMMARY OF THE 2009 FIELD-BURNING SEASON

**Oregon Department of Agriculture
Natural Resources Division
Smoke Management Program**



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****SPECIAL NOTICE****

THE 2009 OREGON LEGISLATIVE ASSEMBLY

The 2009 Oregon Legislative Assembly passed Senate Bill 528 (SB 528). SB 528 dramatically changed the scope of field burning in the Willamette Valley. A brief overview of these changes is outlined below.

Reduction in Acres Burned:

- For **most types of grass seed** grown in the Willamette Valley, the maximum acreage allowed to be open field burned was reduced from 40,000 to 20,000 acres for 2009. In 2010 and each year thereafter, no more of this type of open field burning is allowed except for small amounts in emergencies.
- For certain **special grass seed varieties** and grass seed grown on **steep slopes** in the Willamette Valley, the maximum acreage allowed to be open field burned in 2009 and each year thereafter, was reduced from 25,000 to 15,000 acres. This type of open field burning is only allowed in a restricted area in the north Willamette Valley.
- For grass seed residues burned using a **propane flamer** in the Willamette Valley, the maximum acreage allowed to be flamed in 2009, was reduced from 37,500 to 500 acres. This new maximum will remain in place through 2012. In 2013 and each year thereafter, no propane flaming of grass seed or cereal grain residues will be allowed in the Willamette Valley.
- For grass seed residues **burned in stacks** in the Willamette Valley, the maximum acreage allowed to be burned in 2009, was set at 1000 acres. This new limitation will remain in place through 2012. In 2013 and each year thereafter, no stack burning of grass seed or cereal grain residues will be allowed in the Willamette Valley.

Additional Changes:

- The fees charged for field registration, open field burning, and propane flaming were doubled.
- No field burning is allowed under high voltage power transmission lines.

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Prepared By

The Oregon Department of Agriculture
Natural Resources Division
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 of each field-burning season.

2. Weather Discussion

Willamette Valley weather is a variable that presents ongoing challenges to the Smoke Management Program. Predicting weather patterns that will promote the rapid lifting and evacuation of smoke away from populated areas is complicated by the unpredictability of the environment. Rapidly changing weather conditions, error in computer model forecasts, and unpredictable eddies of smoke down mixing can increase smoke impacts, along with inefficient ignition procedures.

June was warmer and slightly drier than normal across the Willamette Valley with little rain falling during the second half of the month (See Figures 1 & 2). The most notable event was a line of severe thunderstorms that moved across northwestern Oregon during the afternoon of June 4. Frequent lightning, wind-gusts up to 70 mph, locally heavy rain, and hail (up to one inch in diameter) accompanied these storms. There were numerous reports of broken and downed trees. A weak tornado caused some light structural damage in Linn County, north of Peoria. The month closed with dry and warm weather. No field burning was conducted in June.

July was an unusually hot month across all of Oregon with heat waves at both the beginning and the end of the month. A strong upper-level ridge of high pressure pushed Willamette Valley highs into the 90s during the first four days of the month.

An intrusion of cooler marine air and an onshore flow dropped the high temperatures to below normal from the 6th through the 13th. The storm lowered temperatures into the mid 60s, and dumped from one-third to two-thirds of an inch of rain across the Willamette Valley on Sunday, July 12. Sunday's rain made fields too damp for field burning on the 13th and 14th. Rapidly warming temperatures and north-northeasterly winds did not allow for any burning from the 15th through the 17th.

After a weak marine intrusion, high pressure built back over western Oregon on Monday, July 20, with a surface thermal trough over the Willamette Valley, a weather pattern not conducive to burning. The 2009 field-burning season commenced on July 21, with 392 acres burned and no impacts recorded.

Thirty acres of preparatory and 1,347 acres of open burning occurred on Wednesday, July 22, including fields in the Creswell area. The Lyons nephelometer recorded two hours of light smoke impact. A significant influx of marine air prompted a quick return to nephelometer baseline readings by 8 p.m. Due to the marine intrusion, there was only limited preparatory burning on Thursday, July 23, of 20 acres; and Friday, July 24, of 20 acres. No smoke impacts were recorded and no burning was conducted during the heat wave at the end of the month.

The late-month heat wave shattered daily record high temperatures throughout the Willamette Valley. All-time record warm minimum temperatures were tied in Portland at 74°F on the 28th, and Salem at 70°F on the 27th and 28th. The hottest day for most of the Willamette Valley was August 28, when Eugene at 106°F, Salem at 107°F, and Portland at 106°F fell only a degree or two short of their all-time record highs. Portland hit 106°F again on July 29.

August although cooler than July, was slightly warmer than normal and quite dry across western Oregon. Most of the Willamette Valley received under a quarter of an inch of rain during the entire month. Temperature fluctuations throughout the month helped to create multiple burning opportunities with minimal smoke impacts.

By Monday, August 3, the strong upper-level ridge that started the month off with 90-degree heat began to weaken and the surface thermal trough shifted into central Oregon. The resulting onshore flow allowed for the open burning of 1,842 acres during the late afternoon. One hour of light smoke impact was recorded in Sweet Home with a return to baseline nephelometer readings by 8 p.m.

Cooling aloft, and weak onshore flow at the surface, allowed for the open burning of 2,463 acres during the late afternoon on Tuesday, August 4. No smoke impacts were recorded. Southeasterly flow aloft spread some wildfire smoke from the Williams Creek Wildfire in Douglas County, over northwestern Oregon. Continued southeasterly flow aloft spread more wildfire smoke over northwestern Oregon on Wednesday, August 5; 963 acres were burned, but further open burning was not authorized due to the weakness of the onshore flow. One hour of moderate smoke impact was recorded in Lyons, with a return to baseline nephelometer readings by 8 p.m.

An upper-level low-pressure system moved inland across northern California on Thursday, August 6. Northeasterly flow aloft brought more wildfire smoke and some light showers into the Willamette Valley. Onshore flow at the surface cooled high temperatures about 15 degrees from Wednesday. No burning was conducted. A deep layer of marine air moved over Western Oregon on Friday, August 7, allowing for only limited preparatory burning of 53 acres in the afternoon. Nephelometer readings were still elevated due to wildfire smoke. There were no smoke impacts recorded.

An impressive Pacific frontal system dropping southeastward across the Gulf of Alaska produced southwesterly transport winds and 6,000-foot mixing heights during the afternoon of August 10. In addition, on August 10, 8,314 acres were open burned between 1:25 p.m. and 6:00 p.m. One hour of light and one hour of moderate smoke impact were recorded in both Lyons and Sweet Home, with nephelometer readings returning to baseline levels by 8 p.m.

A cold front had advanced into extreme northwestern Oregon by Tuesday, August 11. Ahead of the front, pilot balloons showed southwesterly transport winds. The rain held off long enough for the burning of 4,155 acres during the early and mid-afternoon with mixing heights at 3,400 feet. One hour of moderate impact was recorded in Lyons with nephelometer readings returning to baseline levels by 7 p.m. The front dropped about one-tenth of an inch of rain over most of the northern Willamette Valley that evening.

Another cold front moved southward, across western Oregon, on Wednesday, August 12. Fields were too damp for burning in the north valley, and southwesterly winds were too strong for burning in the south valley. An upper-level trough followed the cold front onshore Thursday, August 13, producing westerly transport winds and mixing heights over 5,000 feet. There were 2,887 acres open burned with some smoke plumes rising as high as 10,000 feet late in the afternoon. No smoke impacts were recorded.

An unseasonably cool upper-level trough remained over the Pacific Northwest on Friday, August 14, which helped to maintain adequate mixing heights for burning. Around midday, 49 acres of preparatory burning was completed. Northwesterly transport winds allowed for the open burning of 1,507 acres in the north valley that same afternoon. Northwesterly flow aloft lead to some down mixing of the smoke as it evacuated eastward through the Cascade passes. Two hours of light smoke impact were recorded in Lyons. There were four hours of light smoke impact and one hour of moderate smoke impact recorded in Sweet Home. Nephelometer readings remained slightly elevated, but below impact level in both locations until late the next morning.

A strong upper-level ridge built into the coastline by Monday, August 17. Pilot balloon readings were taken south of Corvallis during the late-morning hours on both Monday, August 17, and Tuesday, August 18. Low-level north-northeasterly winds were considered too strong for open burning. Hot and dry northeasterly winds did not allow for burning either afternoon with local State Fire Marshal Conditions developing.

The strong upper-level ridge moved directly over Oregon on Wednesday, August 19. A surface thermal trough moved into the Willamette Valley producing light surface winds and record warm temperatures. Eugene reached 101 degrees, Salem hit 99 degrees, and Portland topped out at 97 degrees, all new daily records. There was no field burning.

The upper-level ridge and record heat shifted to eastern Oregon and Idaho on Thursday, August 20. In the Willamette Valley, test fires totaling 212 acres were lit in the early afternoon. Increasing southerly flow aloft kept mixing heights low, and burning was discontinued. No smoke impacts were recorded.

A strong surge of cool ocean air on Friday, August 21, resulted in a marine layer close to 4,000 feet thick over the Willamette Valley. Northwesterly transport winds allowed for propane flaming and preparatory burning in the early afternoon, totaling 138 acres. There was too much down mixing of the air mass to allow for any further field burning. One hour of light smoke impact was recorded in Lyons. Nephelometer readings returned to baseline levels by 5 p.m.

A transitory ridge of high-pressure gave way to increasing southwesterly flow aloft on Monday, August 24. Transport winds were too southerly to allow more than a few test fires. Test fires totaling 297 acres were burned that afternoon with no smoke impacts recorded.

A weak cold front brought cloudy skies, and areas of very light rain to northwestern Oregon on Tuesday, August 25. Northerly transport winds and too much down mixing of the air mass did not allow for any burning.

The frontal system weakened and stalled over southeastern Oregon Wednesday, August 26 and Thursday, August 27. On August 26, there was 27 acres of preparatory burning and 17 acres of propane flaming conducted. Southerly transport winds and low mixing heights did not allow for any burning on August 27. There were no smoke impacts recorded.

A weak frontal system pushed some light rain into the Willamette Valley on Friday, August 28, so no burning was allowed. Weak southerly flow aloft began transporting wildfire smoke over western Oregon by Monday, August 31. Nephelometer readings became slightly elevated but stayed below impact levels. Limited preparatory burning of 59 acres and 4 acres of propane flaming was completed with northerly transport winds.

September was very warm and dry statewide. Monthly average temperatures were generally one to three degrees above normal across western Oregon, and two to four degrees above normal east of the Cascades. Rainfall amounts ranged from close to normal along the coast and in the Willamette Valley, to well below normal across central and eastern Oregon. Little to no rain fell over the southeastern corner of the state.

An upper-level trough, slowly approaching the coastline created similar ventilation conditions during the first two days of the month. South-southwesterly transport winds, and mixing heights climbing to nearly 6,000 feet allowed for both preparatory and open burning totaling 1,811 acres on Tuesday, September 1, between 12:00 p.m. and 5:30 p.m. There was one hour of light smoke impact recorded in Sweet Home.

Mixing heights were around 3,000 feet on Wednesday, September 2. Both preparatory and open burning were allowed from 12:00 p.m. until 5:00 p.m. and 3,381 acres were burned. There was one hour of light smoke impact and one hour of moderate smoke impact recorded in Lyons.

The upper-level trough finally came onshore early Thursday morning, September 3, with some light showers and thundershowers moving across the northern Willamette Valley. Measurable rain fell north of Salem and fields remained dry enough for burning in the southern part of the valley. South-southwesterly transport winds and 5,000-foot mixing heights allowed for

preparatory and open burning of 550 acres from 11:00 a.m. to 5:00 p.m. There were no smoke impacts recorded.

No burning was conducted on Friday, September 4. A strong cold front dumped more than one-half inch of rain across the Willamette Valley during the Labor Day weekend.

Fields were too damp for burning until early afternoon Thursday, September 10, when a strong upper-level ridge began building over the region. Northeasterly transport winds allowed for test fires near Amity and south of Corvallis totaling 246 acres, with the smoke plumes moving over the coast range. The upper-level ridge strengthened over Oregon Friday, September 11, with Willamette Valley high temperatures climbing into the low to mid 90s.

The southerly flow aloft over the weekend turned more southwesterly by the afternoon of Monday, September 14, as an upper-level trough over central California moved northeastward into northern Nevada. Southwesterly transport winds allowed for the open burning of all available north valley fields totaling 202 acres, from 3:30 p.m. until 6:00 p.m. No south valley fields were available for burning. Smoke plumes rose into the cloud bases at 4,000 feet with no smoke impacts recorded.

Pilot balloon reports showed offshore transport winds over the southwestern Willamette Valley on the morning of Tuesday, September 15. That allowed for the open burning of the three remaining fields totaling 176 acres, near Corvallis, between 11:38 a.m. and 1:25 p.m. The smoke plumes drifted over the coast range. The final two north valley fields of the season, 31 acres, were burned during the afternoon of Friday, September 18. Increasing onshore flow evacuated the smoke plumes to the east with no smoke impacts recorded.

Another strong upper-level ridge of high pressure moved over the region on Monday, September 21, with State Fire Marshal Conditions across the Willamette Valley in the afternoon. The ridge axis shifted slightly eastward to near the Idaho border on Tuesday, September 22. Southerly flow aloft began transporting southern Oregon wildfire smoke northward. Willamette Valley nephelometer readings became highly elevated, especially in the Eugene/Springfield area, until the afternoon of Wednesday, September 24, when onshore flow pushed the smoke east of the valley. No burning was conducted.

An approaching trough on Monday, September 28, created favorable ventilation conditions, for burning, but no fields were available. Light rain rendered fields too wet for burning through Wednesday, September 30.

October began with a dry northwesterly flow aloft. One 10-acre field was propane flamed, in the north valley on Thursday, October 1. A weak weather system brought some light showers to western Oregon from October 2 to October 4, followed by a dry northwesterly flow aloft. Open burning of the final south valley 19-acre field took place during the afternoon on Thursday, October 8. The smoke plume rose to about 3,500 feet, and evacuated over the Cascades with no smoke impacts recorded. More than one-half inch of rain brought a soaking end to the 2009 field-burning season on October 15.

Figure 1
2008 Burn Season Temperatures

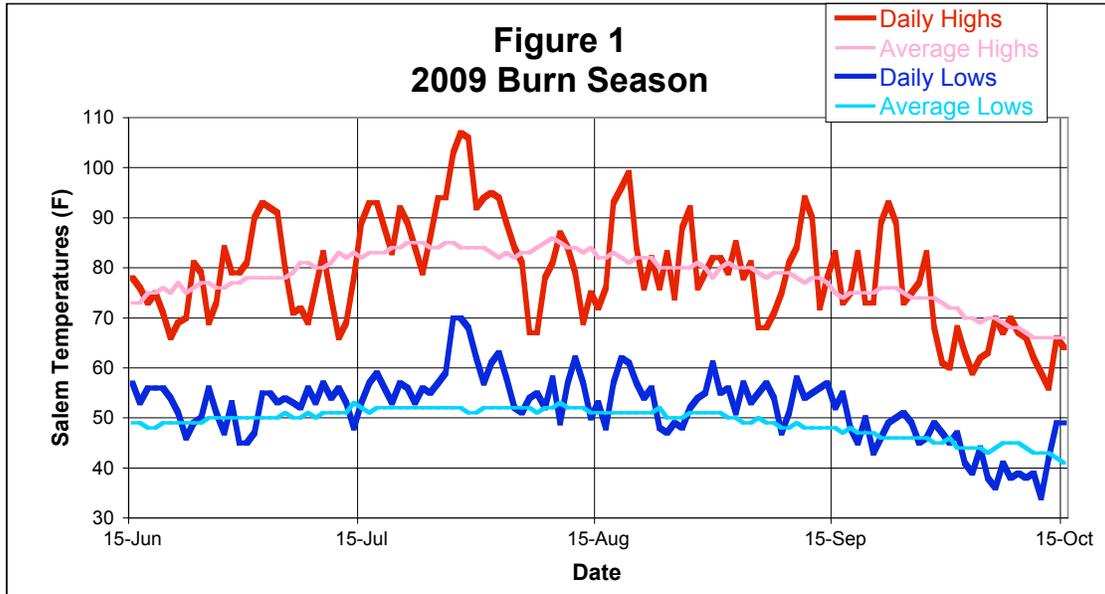
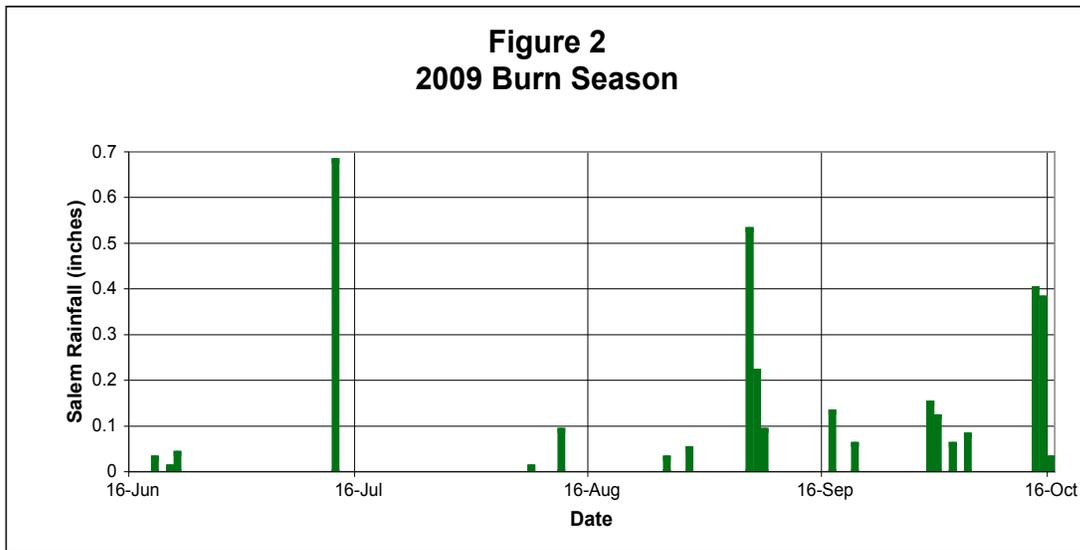


Figure 2
2008 Burn Season Precipitation



3. Four-Day Burn Percentage

During the 2009 field-burning season, 60% of all acreage open field burned occurred over four days, with 68% of all acres open field burned occurring over five days. This compares with 60% of all acreage open field burned over four days in 2008, and 77% in 2007. Figure 3 below outlines the 2009 season.

Figure 3

Percentage of Total Acres Open Field Burned Over Four Days

Monday 8/10/09	Tuesday 8/11/09	Thursday 8/13/09	Wednesday 9/2/09	4 Day Total	Percent
8,314	4,155	2,838	3,381	18,688	60%

4. Registered Acres

Open field burning and propane flaming acreage pre-registration begins March 1 and continues through April 1. Figure 4 below shows the breakdown of acres registered by the type, the statutory limitation of each type, and the final allocation of each type as imposed by the statutory limitation. Figures show “on-time” registered acres. Figures fluctuate slightly after “late-registration” is completed.

Figure 4

Acres Registered (as of April 2, 2009) by Grass Seed Type

Type	Limitation Pre-SB 528*	Limitation Post-SB 528	Acres Registered	Allocation Post-SB 528
Regular	40,000	20,000	56,765	35%
Identified Species	22,000	15,000	17,137	84%
Steep Terrain	3,000		582	
Propane Flaming	37,500	500	420	100%

*The passage of Senate Bill 528 (SB 528) reduced the number of acres that could be field burned. SB 528 was passed after “on-time” registration was completed.

Definitions

Type: Open Field Burning

- **Regular:** Perennial or annual grass seed, or cereal grain residue.
- **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:** Locations in the Willamette Valley where grass seed is grown, but because of the steepness of the terrain, it is extremely difficult to apply alternatives to open field burning.

Type: Propane Flaming

- The process of sanitizing (burning) regular and identified species fields with a propane flamer; a mobile, fire-producing, sanitation device.

5. Open Field Burning

In 2009, a total of 75,037 acres (including “late” registration acres) were registered for open field burning, compared to 86,309 acres registered in 2008. Registration included 57,238 acres of regular, 17,217 acres of identified species, and 582 acres of steep terrain. Regular registration exceeded the legislatively mandated (SB 528) limitation of 20,000 acres; therefore, the regular open field burning allocation rate for 2009 was 35%. The allocation rate for identified species and steep terrain for 2009 was 84%.

A total of 31,084 acres were open field burned during the 2009 burn season (17,719 regular limitation; 12,991 identified species; and 374 steep terrain). SB 528 mandated that a maximum of 20,000 acres of “Regular,” and 15,000 acres of “Identified Species” and “Steep Terrain” acres combined, for a maximum of 35,000 acres to be burned. Figure 5 below shows the numbers of acres burned by species. Figure 6 shows the percentages to the total number of acres burned by crop.

6. Propane Flaming

The maximum allowable acreage to be propane flamed is 500 acres as set by the 2009 Oregon Legislature. In 2009, growers registered 420 acres and burned 227. This compares to 235 acres burned in 2008, and 788 acres burned in 2007.

Figure 5

Acres Field Burned by Crop (Open field burning and propane flaming)

Species	Burned (acres)
Annual Ryegrass	14,073
Cereal Grain	1,535
Chewings Fescue	8,410
Creeping Red Fescue	4,549
Fine Fescue	302
Highland Bentgrass	258
Kentucky Bluegrass	40
Orchard grass	110
Perennial Ryegrass	1,835
Tall Fescue	64
Seashore Passpalum	135
TOTAL	31,311

Figure 6

Percentage of Total Acres Burned by Crop (Open field burning and propane flaming)

Species	Percentage of Total
Annual Ryegrass	45.0%
Chewings Fescue	27.0%
Creeping Red Fescue	15.0%
Perennial Ryegrass	6.0%
All remaining species	7.0%
TOTAL	100%

7. Stack Burning

SB 528 has mandated a stack burning acreage limitation of 1,000 acres per calendar year through 2012 and none thereafter.

In 2009, 507 acres were stack burned. This compares with 1,608 acres in 2008.

Figure 7 below shows the figures for total thermal residue management, including propane flaming acreages.

Figure 7

Historical Field Burned Acres

Burn Type	2009*	2008	2007	2006	2005
Open Field Burning	31,084	38,173	32,322	49,017	49,225
Propane Flaming	227	235	788	1,466	1,631
Total	31,311	38,408	33,110	50,483	50,856

*Following the passage of Senate Bill 528 (35,000 acres maximum for 2009 only).

9. Enforcement

The 2009 burn season marked the thirteenth year that ODA has performed the enforcement function of the Smoke Management Program (as stipulated under a Memorandum of Understanding with the Oregon Department of Environmental Quality, pursuant to Oregon Revised Statutes 468A.585).

There were three enforcement contacts during the 2009 season. This compares with three enforcement contacts in 2008, six enforcement contacts in 2007, five enforcement contacts during the 2006 season, and seventeen enforcement contacts in 2005.

Of the three enforcement contacts in 2009, one resulted in a letter of warning, and two resulted in notices of non-compliance.

10. Smoke Impacts

It is the goal of the ODA Smoke Management Program, with the cooperation of the Willamette Valley growers, to reduce or eliminate smoke impacts in populated areas. The combination of accurate weather prediction for burning, ODA field personnel observations, and grower experience all contribute to alleviate smoke impacts; however, smoke impacts still occur. Unexpected wind shifts, rapidly changing mixing heights, rapidly decreasing transport wind speeds and directions, other meteorological factors, and inefficient lighting techniques all contribute to the occurrence of impacts.

Smoke impacts attributable to open field burning occurred on 11 days in 2009. Previous years totals included 10 days in 2008, 12 days in 2007, 7 days in 2006, and 15 days in 2005.

The number of hours recorded for smoke impacts in cities monitored for smoke intrusions in 2009 are outlined below in Figure 8. The total number of hours with field burning impacts in cities monitored for smoke intrusion, and over how many days the impacts occurred is outlined in Figure 9.

Figure 8
2009 Open Field Burning Impacts*

Date	Acres Burned	Impact Hours			Location
		Heavy	Moderate	Light	
July 22	1,379			2	Lyons
August 3	1,842			1	Sweet Home
August 5	963		1		Lyons
August 10	8,314		1	1	Sweet Home
August 10	8,314		1	1	Lyons
August 11	4,155		1		Lyons
August 14	1,503		1	4	Sweet Home
August 14	1,503			2	Lyons
August 21	135			1	Lyons
September 1	1811			1	Sweet Home
September 2	3381		1	1	Lyons

* As defined in Oregon Administrative Rule (OAR) 603-077-105, cumulative hours of smoke impact result in hourly nephelometer measurements that exceed 1.8×10^{-4} b-scat above the average prior 3-hour background levels. For the purposes of this report, "heavy" hours of smoke impact are 5.0×10^{-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 prior to 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, Corvallis, Eugene, Lyons, Portland, Salem, Springfield, and Sweet Home.

Figure 9
Total Hours of Open Field Burning Impacts

<i>Smoke Impact Hours</i>	<i>2009</i>				<i>2008</i>				<i>2007</i>			
	<i>H</i>	<i>M</i>	<i>L</i>	<i>days</i>	<i>H</i>	<i>M</i>	<i>L</i>	<i>days</i>	<i>H</i>	<i>M</i>	<i>L</i>	<i>days</i>
Portland												
Salem												
Corvallis												
Carus												
Lyons		4	7	7		5	9	7		11	23	9
Sweet Home		2	7	4			3	3		4	9	3
Eugene												
Springfield												

11. Complaints

Open field burning complaints received from Willamette Valley residents by the Smoke Management Program[†] totaled 193 for the 2009 field-burning season. This compares to 463 complaints during the 2008 field-burning season, and 776 complaints received during the 2007 field-burning season. Figure 12 below identifies the number of field burning complaints originating from individual cities for the 2009 field-burning season.

Figure 12
2009 Open Field Burning Complaints by City

Albany	0	Noti	1
Brownsville	1	Portland Metro	3
Corvallis	1	Salem/Keizer	5
Cottage Grove/Lorane	1	Scio	0
Creswell	12	Silverton	9
Eugene	8	Springfield	4
Harrisburg	10	Stayton	13
Junction City/Monroe	5	Sublimity	2
Lebanon	36	Sweet Home	9
Lyons/Mehama	38	Veneta/Elmira	0
Mill City/Gates	18	Other	8
Mohawk Valley	8	Unknown	1
		Total	193

[†] Complaints received by the Lane Regional Air Protection Agency (LRAPA) are forwarded to ODA during the field-burning season. Those complaints are included in the total presented in this report.

Breakdown of 2009 Open Field Burning Complaint Calls

ODA tracks the number of complaint calls by individuals to determine the amount of repeat callers. Figure 13 identifies how many times individual people called.

Figure 13
Number of Complaint Calls Per Individual[‡]

Number of People	Times Called	Number of Complaints
70	1	70
13	2	26
8	3	24
1	4	4
2	6	12
1	9	9
48	Unknown	48
Total		193

[‡]Chart outlines the number of individuals and how many times they called. For example: 8 people called 3 times each for a total of 24 complaints; 48 callers chose not to provide identifying information; therefore, it is unknown if those callers called multiple times.