

Oregon
Department
of Agriculture

SUMMARY OF THE 2006 FIELD BURNING SEASON

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



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December 2006

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Prepared By

The Oregon Department of Agriculture
Natural Resources Division
Smoke Management Program

1. Introduction

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

2. Weather Discussion

Weather in the Willamette Valley presents a multitude of challenges to operating the Smoke Management Program. Predicting weather patterns that will take smoke up, out, and away from populated areas is an inexact science. Rapidly changing winds, lower than expected mixing heights (the height of smoke rise), unpredictable smoke down mixing, and inefficient field ignition procedures executed by growers can all contribute to a given burn day's potential for smoke impacts.

Early June was rather wet (see Figure 1), which slowed maturation of the grass seed crops causing harvest to begin a bit later than usual. In late June and early July growers were occupied with combining late maturing crops. Even so, ODA was able to orchestrate a modicum of burning in mid-July by working with individual growers who were able to prepare fields quickly for burning after harvest.

There were a few very hot days during late June and July (see Figure 2) which caused State Fire Marshall (SFM) fire-safety rules* to come into effect. This precluded burning of any kind during those days. The high temperature chart for the summer shows August and early September cyclically varying between warm and cool temperatures. These transitions from warm to cool were usually "marine pushes," which allowed for widespread burning opportunities at relatively regular intervals throughout the month.

The summer of 2006 did not have persistent low-level inversions as have been prevalent in previous summers. However, there was a dominant north wind pattern which precluded field burning on many days.

In 2006, the heaviest recorded number of smoke impact hours occurred on the evening of August 8th and morning of August 9th. On August 8th, on-shore pressure gradients were predicted and

* SFM rules preclude burning on days in which any two of the following three criteria exist in the Willamette Valley: (1) temperature of 95° F or greater, (2) 30% relative humidity or less, and (3) 15 mph or greater surface winds.

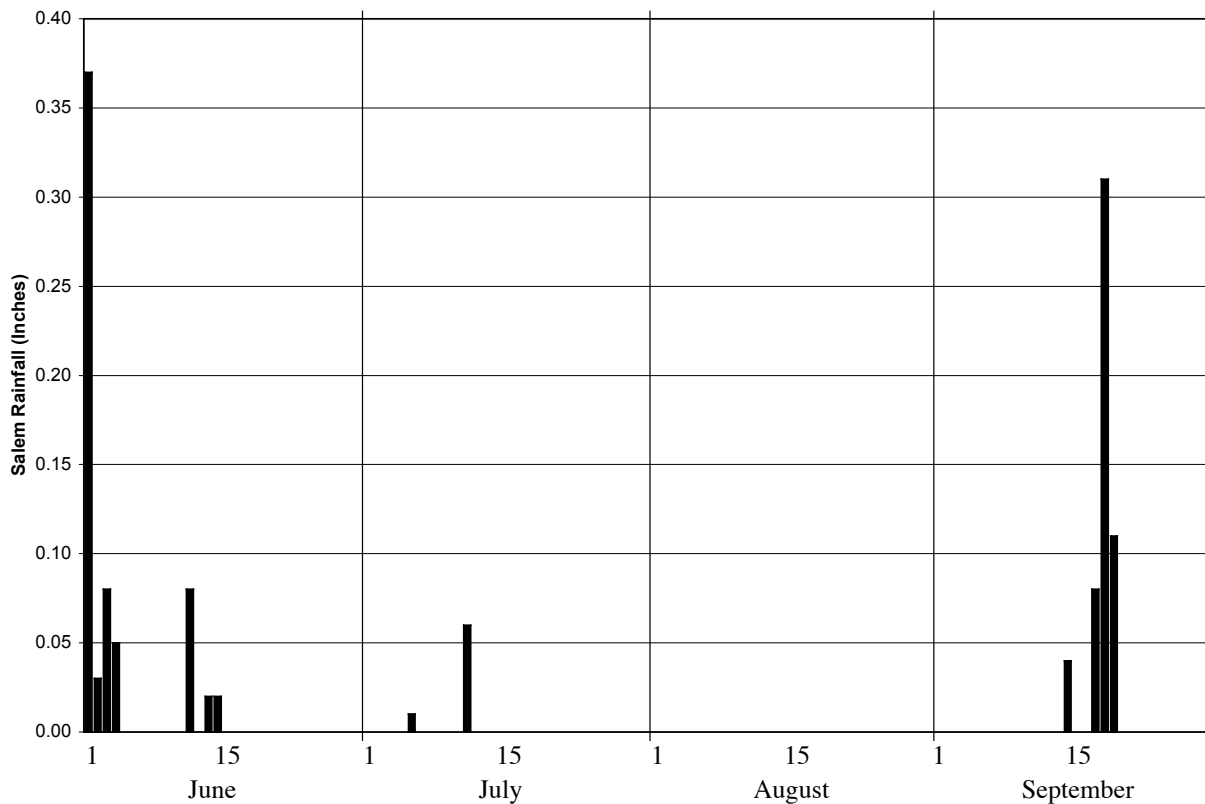
pilot balloon readings indicated a favorable west wind direction for field burning. Upper air charts revealed a minor short wave over northern California moving northeastward. However, it appeared that this short wave was far enough away that it would have no impact on smoke movement out of the Willamette Valley. Nearly 8,500 acres were burned on August 8th.

Unfortunately, as the short wave impulse moved northeast it altered the pressure pattern across the Cascades. Subsidence (sinking air motion) behind the axis of the trough caused a rapid rise in pressures in central Oregon. This collapsed the pressure gradient across the Cascades causing the smoke to “hang up” in the Cascades and associated foothills. As a result, the nephelometer at Lyons recorded 13 hours of smoke impact (8 hours light and 5 hours moderate; see section 10). During the same period, the Sweet Home nephelometer recorded 1 hour of light impact.

ODA continues to refine techniques to identify individual fields and geographic locations which can be burned under specific weather conditions that are not conducive to large scale field burning, yet can be used for limited localized burning. The addition of a third theodolite in 2006 allowed ODA to conduct mobile pilot balloon (pibal) readings in more areas throughout the Valley. A pibal is used to collect information about wind speeds and directions through the atmosphere from the surface to approximately 10,000 feet.

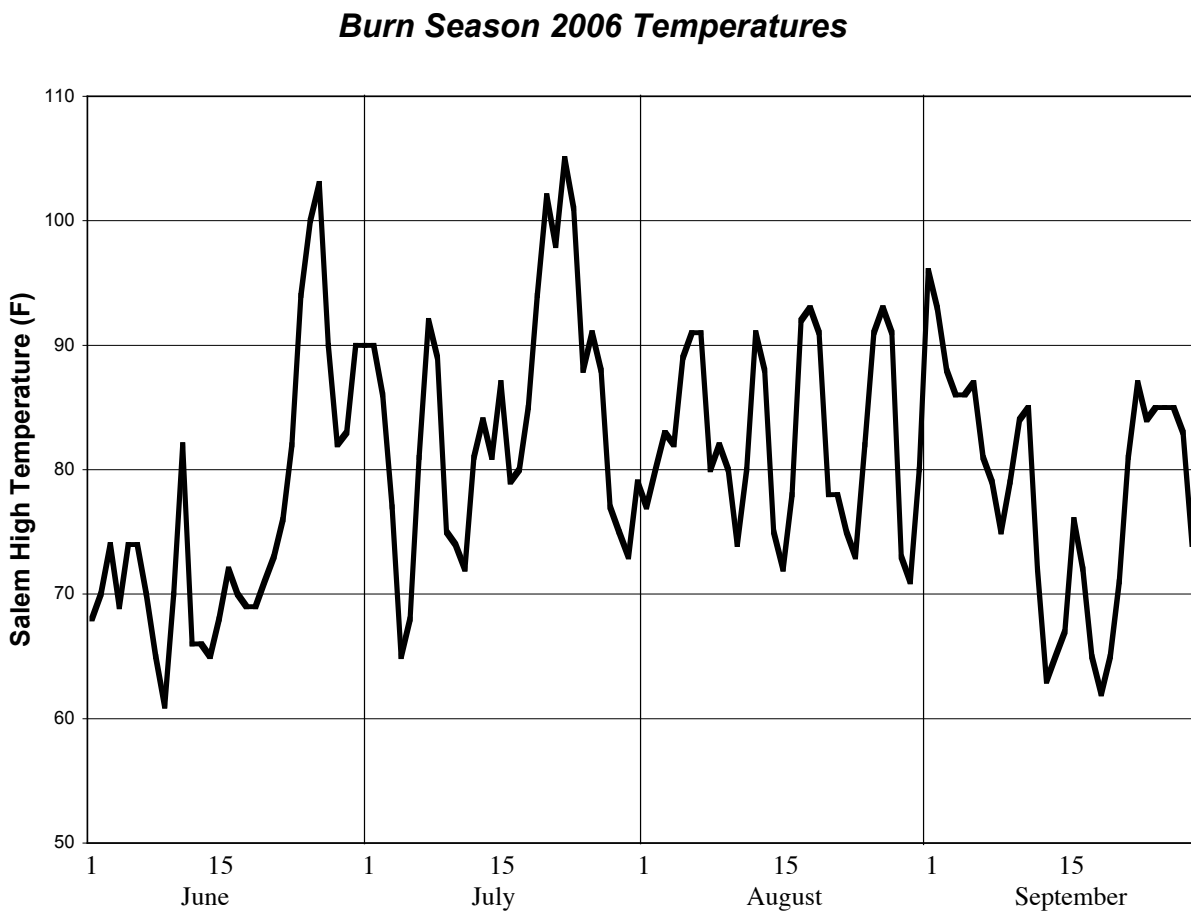
Figure 1

Burn Season 2006 Precipitation



On August 25th, pibals were conducted on the west side of the Willamette Valley to confirm easterly winds aloft. These rare easterly winds are not suited for large-scale open field burning, but are very suitable for burning fields on the west side of the Valley. After east wind confirmation, ODA authorized field burning on the west side of the Valley, expecting smoke to travel out over the relatively unpopulated coast range. Almost 1,700 acres were burned on the west side on the 25th. Unfortunately, one 62-acre field burn north of Corvallis was not ignited with “rapid ignition” techniques and produced a large amount of ground smoke. As such, this smoke did not rise into the easterly wind layer. Instead, it drifted southward on surface winds producing one hour of heavy smoke impact, and an inordinate number of complaint calls from Corvallis and some communities to the south.

Figure 2



3. Four-Day Burn Percentage

During the 2006 field-burning season, 56% of all the acreage open field burned occurred over 4 days. This compares with 53% of all acreage burned over 4 days in 2005. The chart below outlines the 2006 figures.

Tues. 8/8/06	Thu. 8/10/06	Mon. 8/28/06	Fri. 9/8/06	4 Day Total	Percent
8,412	5,275	7,018	6,932	27,637	56%

4. Registered Acres

Open field burning and propane flaming acreage pre-registration began on March 17th and continued through April 1st. The chart below shows the breakdown of acres registered by type, the statutory limitation of each type, and the final allocation of each type as imposed by the statutory limitation.

Type	Limitation	Acres Registered	Allocation
Regular	40,000	96,962	41%
Identified Species	22,000	16,294	100%
Steep Terrain	3,000	1,041	100%
Propane Flame	37,500	2,439	100%

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 the 2006 field burn season, a total of 114,297 acres were registered for open field burning compared to 114,299 in 2005. Registration included 96,962 acres of regular, 16,294 acres of identified species, and 1,041 acres of steep terrain. Regular registration exceeded the legislatively mandated limitation of 40,000 acres; therefore, the regular open field burning allocation rate for 2006 was 41%. The allocation rate for identified species and steep terrain for 2006 was 100%.

A total of 49,017 acres were open field burned during the 2006 burn season (34,971 regular limitation, 13,375 identified species, and 671 steep terrain). By comparison, a total of 49,225 acres were burned in 2005, 49,553 acres in 2004, 50,437 acres in 2003, and 51,374 acres in 2002.

2006 Open Field Burning by Crop

Species	Burned (acres)	% Of Total
Annual Ryegrass	27,640	56.39%
Chewings Fescue	8,714	17.78%
Perennial Ryegrass	4,867	9.93%
Creeping Red Fescue	3,824	7.80%
Tall Fescue	1,649	3.36%
Cereal Grain	970	1.98%
Highland Bentgrass	837	1.71%
Orchardgrass	299	0.61%
Fine Fescue	217	0.44%
TOTAL	49,017	100%

6. Propane Flaming

The maximum allowable acreage to be propane flamed is 37,500 acres (as set by the 1995 Oregon Legislature). In 2006 growers registered 2,439 acres of fields to be propane flamed and burned 1,466 of those registered acres. This compares to 1,631 acres propane flamed in 2005, 1,067 acres in 2004, 1,602 acres in 2003, and 1,582 acres in 2002.

2006 Propane Flame Burning by Crop

Species	Burned (acres)	% Of Total
Creeping Red Fescue	653	44.54%
Perennial Ryegrass	351	23.94%
Chewings Fescue	242	16.51%
Cereal Grain	100	6.82%
Kentucky Bluegrass	85	5.80%
Tall Fescue	35	2.39%
Highland Bentgrass	0	0%
Orchardgrass	0	0%
Fine Fescue	0	0%
TOTAL	1,466	100%

7. Stack Burning

Stack burning does not have an imposed acreage limitation, nor is registration required. Growers are obligated to secure a stack burning permit containing the responsible party's name, location of the burn, and acreage represented by the accumulated residue prior to ignition. The stack burning season lasts from April 1st to March 31st of the following year. As of October 31, 2006, growers had stack burned 1,061 acres since April 1, 2006. Previous years are as follows:

Historical Stack Burn Statistics

Year	Interim – October 31 st	Final – March 31 st
2006-2007	1,061	N/A
2005-2006	1,366	1,692
2004-2005	1,667	1,864
2003-2004	1211	1,636
2002-2003	616	1018

8. Total Thermal Residue Management

The chart below shows the figures for total thermal residue management, including stack-burning acreages.

Burn Type	2006	2005	2004	2003	2002
Open Field Burning	49,017	49,225	49,553	50,437	51,374
Propane Flaming	1,466	1,631	1,067	1,602	1,582
Stack Burning [†]	1,399	1,692	1,864	1,636	1,018
Total	51,882	52,548	52,484	53,675	53,974

9. Enforcement

The 2006 burn season marked the tenth year that the department 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 5 enforcement contacts during the 2006 season (as of October 31, 2006). This compares with 17 enforcement contacts during the 2005 season, 21 contacts in 2004, 2 contacts in 2003, 11 contacts in 2002, and 10 contacts in 2001.

Of the 5 enforcement contacts in 2006, all of them resulted in letters of warning; none resulted in notices of non-compliance, and none resulted in civil penalty assessments.

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

[†] Estimated Total Stack Burn Acreage (April 1, 2006 – March 31, 2007)

wind speeds and directions, other meteorological factors and inefficient lighting techniques all contribute to the occurrence of impacts.

Smoke intrusions attributable to open field burning occurred on 7 days in 2006. Previous years totals included 15 days in 2005, 10 days in 2004, 9 days in 2003, and 9 days in 2002.

The number of hours of recorded smoke impact[‡] in cities monitored for smoke in 2006 are outlined below.

2006 Open Field Burning Impacts

Date	Acres Burned	Impact Hours			Location
		Heavy	Moderate	Light	
8-Aug	8,412		5	8	Lyons
8-Aug	8,412			1	Sweet Home
15-Aug	107			1	Sweet Home
21-Aug	3,833		2		Lyons
21-Aug	3,833			1	Sweet Home
23-Aug	1,097			1	Lyons
25-Aug	1,699	1			Corvallis
28-Aug	6,915		1		Lyons
28-Aug	6,915		1		Sweet Home
8-Sep	6,932			2	Lyons
8-Sep	6,932		2	2	Sweet Home

11. Complaints

Open field burning complaints received from Willamette Valley residents by the Smoke Management Program[§] totaled 1,182 during the 2006 field-burning season. This compares with 1,106 complaints received for the 2005 season, 475 in 2004, 206 in 2003, 705 in 2002, and 608 in 2001.

[‡] 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 Portland, Eugene, Springfield, Sweet Home, Lyons, Corvallis, Salem, and Carus.

[§] Complaints received by the Lane Regional Air Protection Agency (LRAPA) are forwarded on to ODA at the end of every week during the field burning season. Those complaints are also included in the total presented in this report.

2006 Open Field Burning Complaints by City

Albany	8	Noti	17
Brownsville	10	Portland Metro	0
Corvallis	75	Salem/Keizer	16
Cottage Grove/Lorane	13	Scio	3
Creswell	27	Silverton	7
Eugene	275	Springfield	65
Harrisburg	16	Stayton	19
Junction City/Monroe	49	Sublimity	6
Lebanon	59	Sweet Home	36
Lyons/Mehama	11	Veneta/Elmira	107
Mill City/Gates	27	Other	160
Mohawk Valley	131	Unknown	45
		Total	1,182

Breakdown of 2006 Open Field Burning Complaint Calls**

ODA tracks the number of complaint calls by individuals to determine the amount of repeat callers. Information is recorded by ODA in order to prevent the results from being skewed by multiple calls from one individual.

Number of People	Times Called	Number of Complaints
649	1	649
100	2	200
24	3	72
10	4	40
7	5	35
2	6	12
3	7	21
1	8	8
1	10	10
1	12	12
1	16	16
107	Unknown	107
Total		1,182

** Chart outlines the number of individuals and how many times they called. For example; 3 people called 7 times each for a total of 21 complaints. 107 callers chose not to provide identifying information and, therefore, it is unknown if those callers called multiple times.

5 Year Historical Comparative Open Field Burning Data

Season	2006	2005	2004	2003	2002
Acres Registered ^{††}	116,328	114,299	91,933	83,695	79,679
Acres Open Field Burned	49,017	49,225	49,553	50,437	51,374
Most burned in one day	8,412	9,311	10,252	8,617	9,994
Burn days accounting for 75% of total acres	7	10	7	9	6
Weekend burn days allowed	0	0	1	0	0
Number of Burn Days^{‡‡}					
300 – 999 acres burned	15	15	8	11	2
1,000 – 4,999 acres burned	5	10	5	8	8
5,000 – 9,999 acres burned	4	2	3	3	4
10,000 or greater burned	0	0	1	0	0
Total Burn Days	24	27	17	22	14
Smoke Impact Hours total/heavy/mod/light(#days)^{§§}					
Portland	0/0/0/0	0/0/0/0	0/0/0/0	0/0/0/0	0/0/0/0
Salem	0/0/0/0	0/0/0/0	0/0/0/0	0/0/0/0	0/0/0/0
Corvallis	1/1/0/0	0/0/0/0	0/0/0/0	0/0/0/0	0/0/0/0
Carus	0/0/0/0	0/0/0/0	1/0/1/1(1)	0/0/0/0	0/0/0/0
Lyons	8/0/8/11(5)	14/0/14/25(14)	5/1/4/5(5)	4/0/4/10(6)	3/0/3/11(4)
Sweet Home	3/0/3/5(5)	0/0/0/1(1)	2/0/2/9/(4)	2/0/2/2(3)	5/0/5/16(4)
Eugene	0/0/0/0	1/0/1/1(2)	0/0/0/0	0/0/0/0	0/0/0/0
Springfield	0/0/0/0	4/0/4/3(3)	0/0/0/0	0/0/0/0	0/0/0/1(1)
Total (day total is of individual days not of days at each location)	12/1/11/16(7)	19/0/19/30(15)	8/1/7/15/(10)	6/0/6/12(9)	8/0/8/28(9)

^{††} All registered regular, identified species, and steep terrain open field-burning acres plus registered propane acres.

^{‡‡} Days with less than 300 acres burned are not counted as open field burning days.

^{§§} As defined in Oregon Administrative Rule (OAR), total hours of impact include hourly nephelometer measurements exceeding 1.8×10^{-4} b-scat above prior 3-hour background. 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 Portland, Eugene, Springfield, Sweet Home, Lyons, Corvallis, Salem, and Carus.