Oregon
Department
of Agriculture

SUMMARY OF THE 2007 FIELD-BURNING SEASON

Oregon Department of Agriculture
Natural Resources Division
Smoke Management Program

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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

Willamette Valley weather is a variable that presents ongoing challenges for efficient operation of the Smoke Management Program. Predicting weather patterns that will promote the rapid lifting and evacuation of smoke away from populated areas is an inexact and evolving science. Rapidly changing winds and mixing heights (the maximum height of smoke plumes), inaccuracies in computer model forecasts, along with unpredictable eddies of smoke down-mixing, can result in undesirable smoke impacts. Weather forecast error and inefficient ignition procedures by growers may also contribute to a given burn day's potential for smoke impacts.

The summer of 2007 was dominated by a strong upper-level trough of low pressure in the Gulf of Alaska, with frequent periods of southwesterly flow aloft over the Pacific Northwest. That general weather pattern created fewer than normal "burning opportunities" for the Willamette Valley.

The first half of June was cool and damp with warmer and drier weather conditions at mid-month (see Figures 1 & 2). Weather conditions were favorable for field burning on June 26th, but fields were not yet ready for burning. Damp weather returned to close out the month.

A strong upper-level ridge of high pressure brought an extended period of warm and dry weather to the region during the first half of July. A strong surface thermal trough was developing over the Willamette Valley July 10th. Pilot balloon readings were taken that morning, near Harrisburg, to confirm northeasterly winds aloft. That pattern is not conducive to large-scale open field burning but can be very suitable for the burning of limited fields on the west side of the valley.

ODA authorized the burning of one 48-acre field, near Harrisburg, just before noon on July 10th, expecting the smoke to travel up and out over the relatively unpopulated coast range. Unfortunately, the field was not ignited with "rapid ignition" techniques and produced a large amount of ground smoke, which did not rise into the northeasterly wind layer.

Instead, it traveled south southwestward, on surface winds, and moved across western sections of the Eugene area during a 2-hour period. This event produced an inordinate number of complaint calls from that region. The nephelometers in downtown Eugene and Springfield recorded no smoke impacts.

A long hot and dry spell was broken by a rain event July 17th and 18th. Damp weather and fields prohibited burning until Monday, July 23rd, when approximately 1000 acres of open burning was permitted. One hour of light smoke impact was recorded in Lyons. Other than some limited preparatory (prep) burning on the 31st, weather conditions prohibited burning for the remainder of the month. No further smoke impacts were recorded.

August started with a large ridge of high pressure bringing hot and dry weather to the Pacific Northwest. Fire Marshal conditions prohibited open burning on August 1st. An intrusion of cooler marine air late on the 2nd allowed for the burning of a couple of fields in Jordan Valley. No smoke impacts were registered.

On August 7th a broad upper-level trough of low pressure over the region was helping to create high mixing heights. Pilot balloon readings confirmed a favorable southwesterly wind direction for burning. An approaching weak cold front appeared strong enough to ensure complete evacuation of smoke through the Cascade passes that evening. Approximately 7700 acres were burned that afternoon. Three hours of light smoke impacts were registered at Lyons and 2 hours of light and 2 hours of moderate smoke impacts were recorded at Sweet Home.

Unfortunately, the approaching cold front weakened rapidly as it moved into the Cascades that evening and was not strong enough to complete the evacuation process. Smoke stayed in the Cascade passes until the prevailing westerly flow became strong enough to clear it out late the next morning. Another 2 hours of light impacts were registered at Lyons the morning of August 8th, while another 4 hours of light and 2 hours of moderate impacts were recorded at Sweet Home.

A very similar meteorological set-up occurred two days later on August 9th. ODA made the decision not to approve open burning based on the slow evacuation of smoke from the burn on August 7th. A ridge of high pressure began building over the Pacific Northwest on the morning of August 10th. Pilot balloon readings from Corvallis verified northeasterly winds. That allowed for the burning of two fields, totaling 176 acres, on the west side of the valley near Dawson. The smoke, as expected, lifted and evacuated over the relatively unpopulated coast range. No impacts were registered.

The afternoon of August 17th, ODA authorized open burning in the north and south Willamette Valley. Nearly 4000 acres were field burned. Southwesterly flow aloft and at the surface effectively evacuated the smoke with no impacts registered.

Two moist weather fronts moved through the region on Sunday, August 19th and Monday, August 20th. A total of one-half to three-quarters of an inch of rain was recorded in the Willamette Valley. Fields were too damp for burning the rest of that week.

On Tuesday, August 28th, morning pilot balloon readings from Corvallis confirmed northeasterly winds. ODA authorized the burning of two fields totaling 125 acres. The smoke lifted and was evacuated over the coast range with no impacts registered. The upper-level ridge shifted east of the region Thursday, August 30th. Southwesterly flow aloft initiated a push of cool marine air into western Oregon in the afternoon. Pilot balloon readings were taken in the north and south valley to confirm southwesterly transport winds and approximately 8000 acres were burned. One hour of light and 4 hours of moderate smoke impacts were registered at Lyons with 3 hours of light impact at Sweet Home. There was some slowing of the evacuation of smoke through Lyons due to thunderstorm development in central Oregon, but nephelometer readings returned to baseline levels by 9 am the next morning.

About 250 acres of prep burning were completed on Friday, August 31st. Open burning was not allowed due to the recent intrusion of marine air into the Willamette Valley, which is not conducive to excellent smoke evacuation through the Cascade passes. One hour of light impact was registered at Lyons.

The day after Labor Day (Tuesday, September 4th) a strong cold front dumped from one-tenth to one-half of an inch of rain across the Willamette Valley. Fields were too damp for burning on the 5th with limited prep burning authorized on the 6th and 7th. No smoke impacts were registered. An upper-level ridge of high pressure created conditions not conducive for burning on Monday, September 10th.

A weak onshore flow began on the September 11th, but test fires confirmed that winds were not strong enough for open burning. About 250 acres of prep burning was permitted on the 12th with 1 hour of light and 2 hours of moderate impact registered at Lyons and one 90-acre test fire was allowed in the south valley with no impacts recorded. Stable atmospheric conditions prohibited field burning on the 13th.

A weak upper-level low-pressure area off the northern California coastline helped raise mixing heights to allow for prep and open burning on Friday, September 14th. Burning was limited to 800 acres, as marine air in the valley did not make for optimal ventilation conditions through the Cascade passes. No smoke impacts were registered.

Nearly ideal smoke ventilation conditions occurred just ahead of a cold front on Sunday, September 16th. Due to the lack of good burning conditions for most of the summer, field burning was conducted. This Sunday burning was only the 2nd time that weekend field burning was permitted in the past five years. Approximately 4100 acres were field burned between 11:00 a.m. and 1:30 p.m. No smoke impacts were registered. The predicted cold front arrived following the field burning, dropping up to a quarter of an inch of rain in sections of the Willamette Valley that evening. Fields were too damp for burning on Monday, September 17th.

A strong upper-level trough dropping into the region provided good mixing heights on Tuesday, September 18th, and pilot balloons confirmed northwesterly transport winds. Open burning was allowed in the north valley, with a single test fire conducted in the south valley.

Due to dampness of the fields, more smoke than usual was generated with the north valley fires. Approximate 1800 acres were burned with 3 hours of light and 3 hours of moderate smoke impacts registered at Lyons.

Open burning of approximately 400 acres was authorized in the north valley, ahead of a cold front, on Thursday, September 20th. Unfortunately, the cold front weakened as it moved through the region that evening and was not strong enough to completely evacuate smoke through the Cascade passes. Lyons had 11 hours of light and 2 hours of moderate smoke impact from 4 p.m. Thursday through 4 a.m. Friday. Nephelometer readings at Lyons returned to baseline values by 10 am Friday the 21st.

Two test fires, totaling nearly 80 acres, were authorized by ODA in the Philomath area the morning of Friday, September 21st. The smoke rose and evacuated over the coast range, as expected, via northeasterly winds. No smoke impacts were registered.

The weather forecast models were indicating season-ending rain moving into the valley on or about Friday, September 28th. One-hundred-forty acres of prep burning was authorized on Tuesday, September 25th in preparation for burning the final 875 acres on Thursday, September 27th. Ventilation conditions were sufficient on both days for no smoke impacts to be registered. A parade of wet storms brought an early and abrupt end to the 2007 field-burning season on September 28th.

Figure 1
2007 Burn Season Temperatures

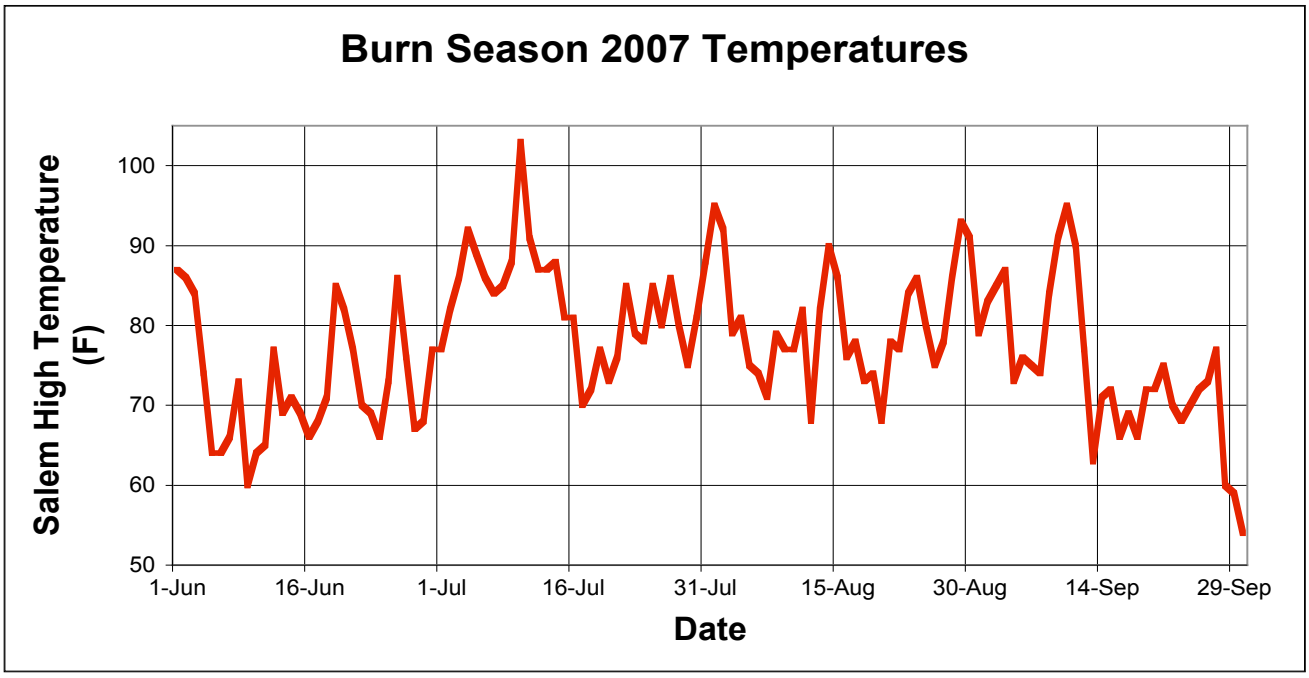
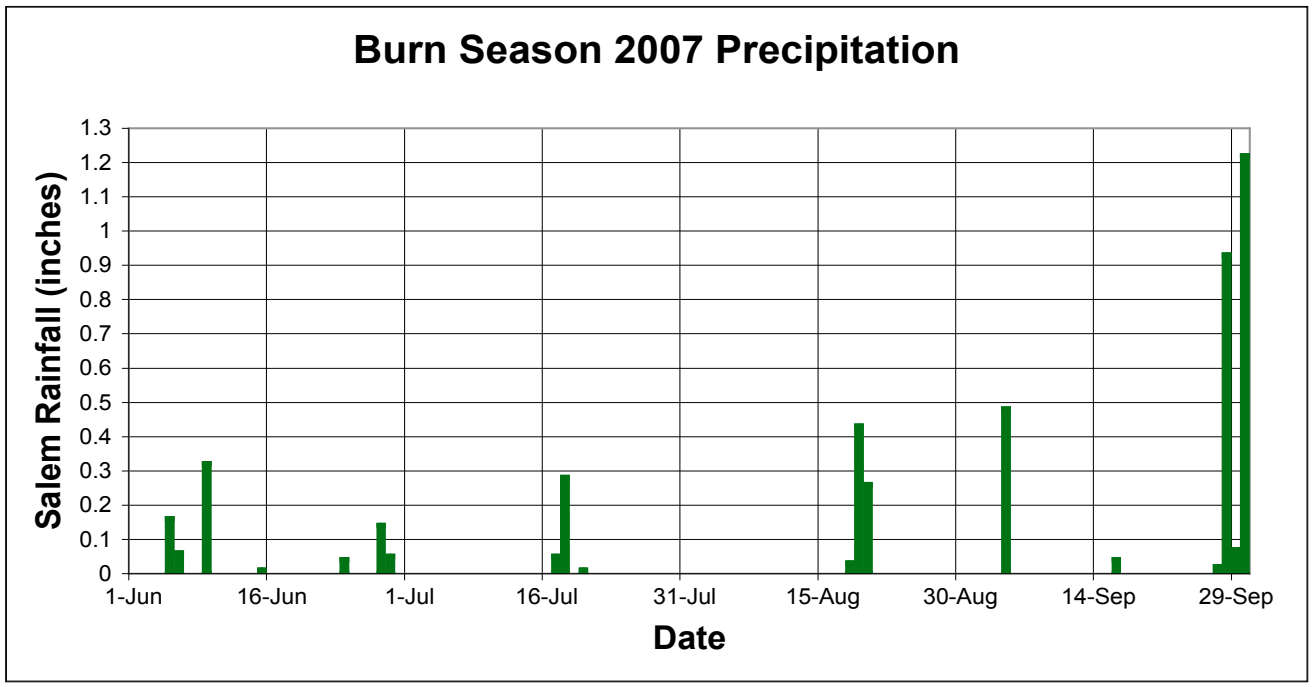


Figure 2

2007 Burn Season Precipitation



3. Four-Day Burn Percentage

During the 2007 field-burning season, 77% of all acreage open field burned occurred over 4 days. This compares with 56% of all acreage open field burned over 4 days in 2006, and 53% in 2005. Figure 3 below outlines the 2007 season.

Figure 3

Percentage of Total Acres Burned Over Four Days

Tues. 8/8/07	Fri. 8/17/07	Thurs. 8/30/07	Sun. 9/16/07	**4 Day Total**	**Percent**
8,044	3,741	8,810	4,444	**25,039**	**77%**

4. Registered Acres

Open field burning and propane flaming acreage pre-registration began on March 15th and continued through April 1st. 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 by Grass Seed Type

Type	Limitation	Acres Registered	Allocation
Regular	40,000	83,136	48%
Identified Species	22,000	17,466	100%
Steep Terrain	3,000	1,148	100%
Propane Flame	37,500	557	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 2007, a total of 102,385 acres (including "late" registration acres) were registered for open field burning, compared to 114,297 acres registered in 2006. Registration included 83,813 acres of regular, 17,532 acres of identified species, and 1,040 acres of steep terrain. Regular registration exceeded the legislatively mandated limitation of 40,000 acres; therefore, the regular open field burning allocation rate for 2007 was 48%. The allocation rate for identified species and steep terrain for 2007 was 100%.

A total of 32,332 acres were open field burned during the 2007 burn season (19,286 regular limitation; 12,335 identified species; and 701 steep terrain). By comparison, a total of 49,017 acres were open burned in 2006; 49,225 acres were open burned in 2005; 49,553 acres were open burned in 2004; and 50,437 acres were open burned in 2003. Figures 5 and 6 below show the number of acres field burned by species and their percentages to the total number of acres burned.

6. Propane Flaming

The maximum allowable acreage to be propane flamed is 37,500 acres (as set by the 1995 Oregon Legislature). In 2007, growers registered 929 acres to be propane flamed and burned 788 acres. This compares to 1,466 acres propane flamed in 2006; 1,631 acres propane flamed in 2005; 1,067 acres in 2004; and 1,602 acres in 2003.

Figure 5

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

Species	Burned (acres)
Annual Ryegrass	16,049
Cereal Grain	53
Chewings Fescue	8,591
Creeping Red Fescue	3,653
Fine Fescue	417
Highland Bentgrass	341
Kentucky Bluegrass	68
Orchard grass	59
Perennial Ryegrass	3,044
Tall Fescue	835
TOTAL	**33,110**

Figure 6

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

Species	Percentage of Total
Annual Ryegrass	48.5%
Chewings Fescue	26.0%
Creeping Red Fescue	11.0%
Perennial Ryegrass	9.0%
All remaining species	5.5%
TOTAL	**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, 2007, growers had stack burned 931 acres since April 1, 2007. Previous years are shown below in figure 7.

Figure 7

Historical Stack Burn Statistics

Year	April 1 - October 31	November 1 - March 31
2007-2008	931	N/A
2006-2007	1,061	1,208
2005-2006	1,366	1,692
2004-2005	1,667	1,864
2003-2004	1,211	1,636

8. Total Acres Field Burned

Figure 8 below shows the figures for total thermal residue management, including stack-burning acreages. Figure 9 shows the five-year comparative of field burning data.

Figure 8

Historical Field Burned Acres

Burn Type	2007	2006	2005	2004	2003
Open Field Burning	32,322	49,017	49,225	49,553	50,437
Propane Flaming	788	1,466	1,631	1,067	1,602
Total	**33,110**	**50,483**	**50,856**	**50,620**	**52,039**

Figure 9

5 Year Historical Comparative Open Field Burning Data

Season	2007	2006	2005	2004	2003
Acres Registered*	103,314	116,328	114,299	91,933	83,695
Acres Open Field Burned	32,332	49,017	49,225	49,553	50,437
Most burned in one day	8,810	8,412	9,311	10,252	8,617
Burn days accounting for 75% of total acres	4 (77%)	7	10	7	9
Weekend burn days allowed	1	0	0	1	0
Number of Burn Days†					
300 – 999 acres burned	2	15	15	8	11
1,000 – 4,999 acres burned	4	5	10	5	8
5,000 – 9,999 acres burned	2	4	2	3	3
10,000 or greater burned		0	0	1	0
Total Burn Days	**8**	**24**	**27**	**17**	**22**

* All registered acres (including "late" registered acres) regular, identified species, and steep terrain open field-burning acres plus registered propane acres.

9. Enforcement

The 2007 burn season marked the eleventh 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 six enforcement contacts during the 2007 season (as of December 31, 2007). This compares with five enforcement contacts during the 2006 season, 17 enforcement contacts in 2005, 21 contacts in 2004, two contacts in 2003, and 11 contacts in 2002.

Of the six enforcement contacts in 2007 five resulted in letters of warning, one resulted in a notice of non-compliance, and zero 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 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 12 days in 2007. Previous years totals included 7 days in 2006, 15 days in 2005, 10 days in 2004, and 9 days in 2003.

The number of hours of recorded smoke impacts[‡] in cities monitored for smoke intrusions in 2007 are outlined below in figure 10. The total number of hours of field burning impacts in cities monitored for smoke intrusion, and over how many days the impacts occurred is outlined in figure 11.

[†] Days with less than 300 acres burned are not counted as open field burning days.

[‡] 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.

Figure 10

2007 Open Field Burning Impacts*

Date	Acres Burned	Impact Hours			Location
		Heavy	Moderate	Light	
July 23	1,032			1	Lyons
Aug 7	8,044			3	Lyons
Aug 7	8,044		2	2	Sweet Home
Aug 7-8	8,044			2	Lyons
Aug 7-8	8,044		2	4	Sweet Home
Aug 30	8,810		4	1	Lyons
Aug 30	8,810			3	Sweet Home
Aug 30-31	8,810			1	Lyons
Sept 12	252		2	1	Lyons
Sept 18	1,803		3	3	Lyons
Sept 20	379		2	7	Lyons
Sept 20-21	379			4	Lyons

Figure 11

Total Hours of Open Field Burning Impacts

Smoke Impact Hours	***2007***				***2006***				***2005***			
Heavy/Moderate/Light/Days	***H***	***M***	***L***	***days***	***H***	***M***	***L***	***days***	***H***	***M***	***L***	***days***
Portland												
Salem												
Corvallis					2			1				
Carus												
Lyons		11	23	9		8	11	5		14	25	14
Sweet Home		4	9	3		3	5	5			1	1
Eugene										1	1	2
Springfield										4	3	3

11. Complaints

Open field burning complaints received from Willamette Valley residents by the Smoke Management Program[§] totaled 776 for the 2007 field-burning season. This compares to 1,182 complaints received during the 2006 field-burning season; 1,106 complaints received for the 2005 season; 475 in 2004; 206 in 2003; and 705 in 2002. Figure 12 below identifies the number of field burning complaints originating from individual cities.

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

Figure 12

2007 Open Field Burning Complaints by City

Albany	1	Noti	1
Brownsville	6	Portland Metro	0
Corvallis	3	Salem/Keizer	3
Cottage Grove/Lorane	8	Scio	3
Creswell	9	Silverton	7
Eugene	368	Springfield	72
Harrisburg	18	Stayton	22
Junction City/Monroe	17	Sublimity	3
Lebanon	32	Sweet Home	23
Lyons/Mehama	32	Veneta/Elmira	1
Mill City/Gates	11	Other	88
Mohawk Valley	18	Unknown	30
		Total	**776**

Breakdown of 2007 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
454	1	454
72	2	144
14	3	42
1	4	4
3	5	15
1	8	8
1	9	9
1	11	11
89	Unknown	89
	Total	**776**

[**]Chart outlines the number of individuals and how many times they called. For example: 14 people called 3 times each for a total of 42 complaints. 89 callers chose not to provide identifying information and, therefore, it is unknown if those callers called multiple times.