OREGON DEPARTMENT OF AGRICULTURE

Summary of the 2020 Field Burning Season

As prepared by the
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Summary of the 2020 Field Burning Season

Field burning is an essential practice for producers of certain grass seed kinds and other seed and cereal grain crops on steep terrain that require thermal sanitation to stimulate plant growth and reduce disease, weeds, and pests. Since 2009, field burning in Oregon has been limited to fine fescue seed crops and other seed and cereal grain crops on steep terrain (Enrolled Senate Bill 528, 2009). Field burning is limited to up to 15,000 acres in the north Willamette Valley. This report is prepared annually by Oregon Department of Agriculture (ODA) Smoke Management Program to report the statistics for each field burning season. The weather discussion is provided by the Oregon Department of Forestry (ODF) Weather Office.

In 2020, a total of 15,984 acres were registered for field burning. The allocation process (Oregon Administrative Rule OAR 603-077-0113(2)(b)) was implemented to suballocate to growers a percentage of their registered acres that they are allowed to burn. The allocation process is used to keep the total acreage burned under the 15,000-acre cap. For 2020, the allocation was 93 percent of the registered acres, or 14,865 acres. Growers have an option to bale, flail, or leave residues in the field for the acreage that they are not authorized to burn.

A total of 7,512 acres were burned during the 2020 field burning season on 11 burn days. Due to the unprecedented wildfires that impacted the Willamette Valley, the 2020 field burning season was voluntarily ended. This decision was made in collaboration with the Oregon Seed Council and the grower-participants in the field burning program in order to protect the health and safety of both program participants as well as other Oregonians affected by the wildfires. The department took steps to support growers who were unable to burn their allocated acres. The daily weather forecast was extended through October and potential uses for the straw bales from these fields were identified, including use in local restoration efforts for areas affected by the wildfires.

Definitions

Identified species	A grass seed field consisting of Creeping Red Fescue, Chewings Fescue, or Highland Bentgrass, or as identified by the Director of Agriculture (OAR 603-077-0105(24)).
Nephelometer	An instrument for measuring ambient smoke concentrations (OAR 603-077-0105(27)).
Open field burning	Burning of any grass seed or cereal grain crops, or associated residue, including steep terrain and species identified by the Director of Agriculture, or any "emergency" or "experimental" burning, as identified in these rules (OAR 603-077-0105(29)).
Preparatory burning	Controlled burning of portions of selected fields for the specific purpose of reducing the fire hazard potential or other conditions which would otherwise inhibit rapid ignition burning when the field is subsequently open burned (OAR 603-077-0105(34)).
Registered smoke impact (RSI)	Each hour of smoke intrusion that exceeds background levels by greater than $1.8x10^{-4}$ b-scat units.
Steep Terrain	A grass seed or cereal grain field defined by Revised Universal Soil Loss Equation (RUSLE) and percent slope, as identified by the Director of Agriculture (OAR 603-077-0105(53)).

Field Burning and Weather Pattern Summary

The ODA Smoke Management program is mandated to protect health and welfare while operating the field burning program. Together with the cooperation of the Willamette Valley grass seed and cereal grain growers who participate in the program, the program's goal is to reduce and/or eliminate smoke impacts in all populated areas while also burning the mandated acreage. 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, therefore days with "marginal-to-good" ventilation conditions must be efficiently utilized to keep overall smoke impacts to a minimum.

July

The first two weeks of July were dry and cooler than average (**Figures 1** and **2**), slightly delaying the start of the 2020 field-burning season. The first burning of the season occurred on Thursday, July 16, with a dry cold front allowing for the burning of 189 acres with no registered smoke impacts (RSIs) and three complaints (**Table 1**). That was followed by a ridge of high pressure, warming temperatures, and no burning for the next few days.

A brief warm spell peaked on Monday, July 20, with valley temperatures climbing into the low-to-mid 90s. The responsible upper-level ridge flattened just enough by the afternoon of Tuesday, July 21, to bring some cooler marine air into the valley. That capped temperatures near 90 degrees when 583 acres were burned with no RSIs and three complaints. Continued influxes of marine air cooled temperatures and created unfavorable pressure gradients for burning the remainder of that week.

A building ridge of high pressure brought the warmest temperatures of the month to the Willamette Valley on Sunday, July 26, when Salem Municipal Airport recorded a temperature of 100 degrees Fahrenheit. An increase in onshore flow cooled temperatures by Tuesday, July 28, to allow for the burning of 153 acres with no RSIs and three complaints. A strengthening ridge weakened the onshore flow and allowed temperatures to rise to the mid-90s, prohibiting further burning. A dry upper-level trough brought some cooling on Friday, July 31, when 1,030 acres were burned resulting in no RSIs and three complaints.

In summary, 1,955 acres were burned in July on four days, with 12 complaints and no RSIs.

Figure 1. Observed Temperatures at McNary Field (Salem Municipal Airport) during the 2020 Field Burning Season.

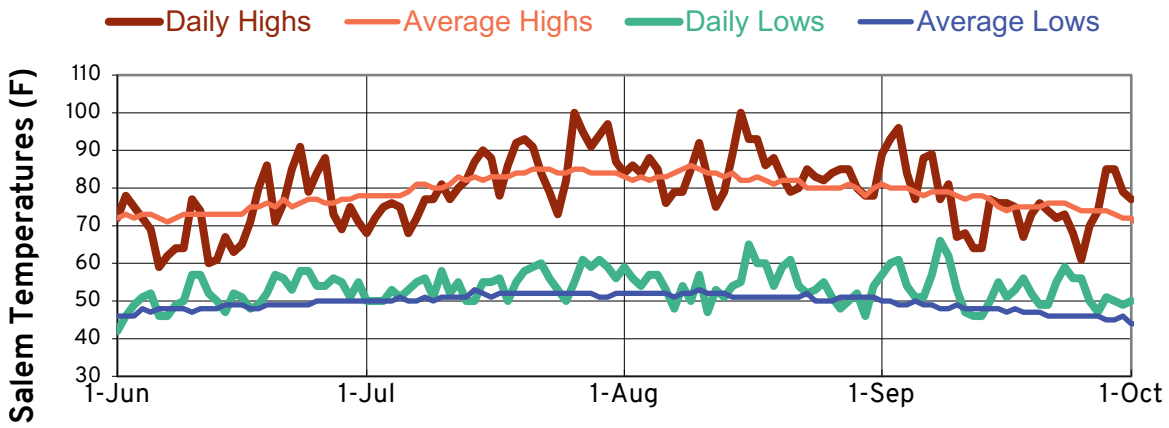
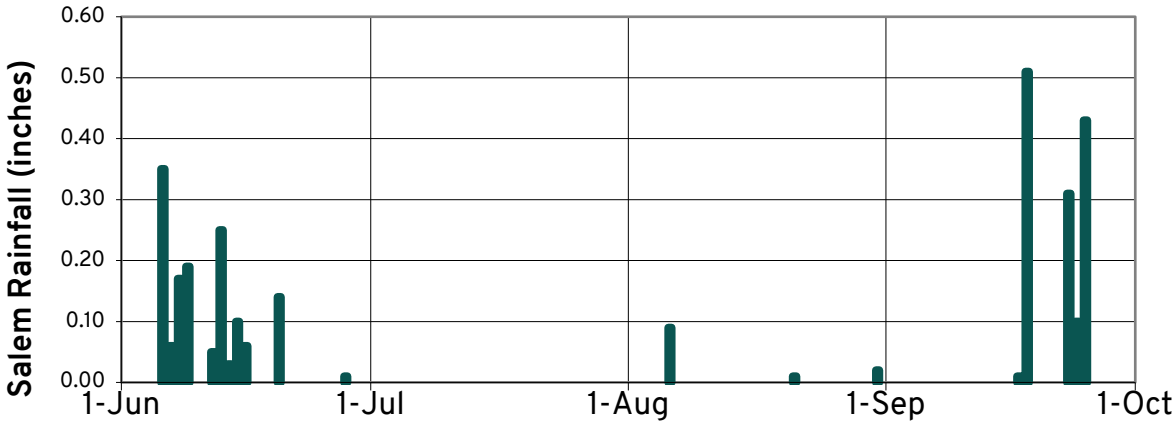


Figure 2. Observed Precipitation at McNary Field (Salem Municipal Airport) during the 2020 Field Burning Season.



August

Mostly sunny skies continued through the early part of the following week with near-average temperatures. Very weak onshore flow and good afternoon mixing on Tuesday, August 4, saw 15 acres of preparatory burning conducted with no RSIs and no complaints. Transport winds were too northerly to allow for open burning. The strongest upper-level trough since June approached the coast on the afternoon of Wednesday, August 5. Increasing onshore flow and cooling aloft provided excellent ventilation conditions for the burning of 1,271 acres, including 15 acres of preparatory burning, with no RSIs and four complaints. The next day, a cold front brought about one-tenth of an inch of rain across the Silverton Hills. It was the first measurable rainfall since late June at Salem Municipal Airport.

Temperatures were in the low-90s by Monday, August 10. A dry upper-level trough brought

increasing onshore flow and minor cooling on Tuesday, August 11. That allowed for the burning of 871 acres with 1 hour of light smoke impact each registered in Lyons, Mill City, and Detroit, and three complaints. A ridge of high pressure turned surface winds northerly the remainder of the week, with progressively drier air putting the valley into State Fire Marshal Burn-Ban Conditions during the late afternoons of Thursday and Friday, August 13 and 14. The strengthening upper-level ridge brought a couple of hot days over the weekend. Salem Municipal Airport recorded its second 100-degree day of the summer on Saturday, August 15. Southerly flow aloft forced enough clouds over western Oregon the following day to hold temperatures in the 90s with isolated thunderstorms and a few sprinkles.

A strong upper-level ridge remained anchored over the Southwestern United States on Monday, August 17, bringing hot weather to that section of the country. South-southwesterly flow aloft continued to direct very warm and unstable air over Oregon, but afternoon and evening thunderstorm development stayed south and east of the Willamette Valley. With a surface thermal trough parked over the Cascades, afternoon valley temperatures climbed back into the 90s. Onshore flow was too weak to allow for any burning.

A very weak and dry weather system flattened the upper-level ridge slightly on Tuesday, August 18. That generated just enough onshore flow that 1,812 acres were burned, including 50 acres of preparatory burning. Conditions provided good mixing, northwesterly winds near the surface, and southwesterly winds near the mixing height. Smoke elevated well and exited the valley into the Cascades during the period of field burning. However, the onshore flow was not strong enough to push all of the smoke across the Cascades prior to the evening, allowing some to spill back westward into the foothills. The returning smoke combined with smoke from California wildfires (transported over the region via south-southwesterly winds aloft) resulted in 11 hours of light and 7 hours of moderate smoke impact in Lyons; 13 hours of light and 3 hours of moderate smoke impact in Mill City; and 8 hours of light smoke impact in Detroit (**Table 3**). This day of burning resulted in 19 complaints (**Table 4**). No burning was conducted on Wednesday, August 19, to allow increasing onshore flow the chance to evacuate both the previous day's field-burning smoke and the wildfire smoke from the region.

A stronger weather system brought clouds, slightly cooler temperatures, and increasing south-southwesterly winds to the Willamette Valley. On Thursday, August 20, 1,198 acres were burned with no RSIs and three complaints. Light rain fell that evening in the Silverton Hills. The next morning (August 21), Salem Municipal Airport recorded its first measurable rainfall (0.01 inches) since June 28, with another upper-level disturbance pushing light rain into the Willamette Valley that afternoon and evening. A dry southwesterly flow aloft brought back mostly sunny and moderate conditions that weekend.

The next burning opportunity came on Tuesday, August 25, when an approaching weak upper-level trough increased the onshore flow just enough to allow for the late-afternoon burning of 318 acres with no RSIs and no complaints. Low-level winds remained too northerly to allow for any field burning the remainder of that week. Progressively drier conditions put the valley into State Fire Marshal Burn-Ban Conditions in the afternoons.

Northwesterly flow aloft pushed a very weak upper-level disturbance across the region on the morning of Monday, August 31, with a few light showers dropping a total of 0.02 inches of rain at Salem Municipal Airport.

In total for August, 5,485 acres were burned on six days, with 29 complaints and RSIs recorded on two days. For more details on the RSIs, see **Table 3.**

September

A building upper-level ridge brought dry and progressively warmer conditions beginning Tuesday, September 1. No burning was conducted until Friday, September 4, when the strong upper-level ridge shifted eastward to over Idaho. Onshore flow cooled valley temperatures back into the mid-80s and allowed for the burning of 72 acres with no RSIs and two complaints. As it turned out, that would be the last day of field burning for the season.

An upper-level ridge, with its axis over the eastern Gulf of Alaska, rapidly amplified during the Labor Day weekend (September 5-7). That maintained a dry northerly flow aloft over Oregon, causing valley temperatures to climb into the upper-80s on Sunday and Monday. On Monday, an unseasonably-cold air mass dropped into the northern Rockies, generating very strong and dry offshore winds that created critical fire-weather conditions across western Oregon.

Heavy smoke, from wildfires in eastern Washington, central Oregon, and the Oregon Cascades, blanketed sections of western Oregon, beginning late Monday, September 7. Pushed by strong easterly winds, the situation evolved into an epic wildfire outbreak for western Oregon. By Tuesday night, wildfires were burning on both sides of the Willamette Valley. Weakening offshore flow maintained a virtual blanket of thick smoke across western Oregon on Wednesday, September 9, with multiple wildfires statewide forcing the rapid evacuation of thousands of residents and putting as many as 500,000 residents into evacuation warning areas. Many of the evacuations occurred in and near the Cascade foothills.

As wildfire burned closer to the Fern Ridge area in the Stayton Fire District on Tuesday and Wednesday, September 8-9, two growers reported emergency burning (a combined 140 acres

of registered grass seed fields) to save buildings.

Surface winds turned light by the end of the week, as a strong upper-level ridge shifted directly over Oregon. That trapped hazardous levels of smoke across all of western Oregon, extending all the way to the coast and beyond. The upper-level ridge shifted eastward to over Idaho during the weekend. South-southwesterly flow aloft forced significant wildfire smoke across all of Oregon. Very weak onshore flow brought some relief from the smoke to residents along the immediate coast, but heavy smoke continued to blanket the Willamette Valley.

The stubborn weather pattern continued during the week beginning Monday, September 14, as a slowly-approaching upper-level trough maintained dry south-southwesterly winds aloft and generally light surface winds across Oregon. Multiple large wildfires continued to creep along the eastern side of the Willamette Valley, as well as other locations across the state. Thick smoke maintained hazardous air quality across much of the state, including the entire Willamette Valley.

Finally, a weak weather system came onshore on Thursday, September 17, and brought some very light rain to the valley. That system began to improve air quality in the valley. However, valley residents had to wait until the evening of Friday, September 18, for the smoke to finally get forced east of the region, as the parent upper-level trough moved overhead, bringing a burst of rain and a surge of fresh onshore flow from off of the Pacific Ocean. Valley air quality rapidly improved into the “good” category and brought relief to residents who had endured 10-plus days of “hazardous” air quality, mass evacuations, and property loss. Statewide, nine people died in the fires, the Oregon Office of Emergency Management reported.

Conditions dried out over the following weekend, but onshore flow kept the bulk of smoke from ongoing wildfires in the Cascade foothills generally east of the valley. Some smoke was able to spill back into eastern sections of the valley during the overnight periods, especially on the morning of Monday, September 21, but it was minimal compared to what had just been experienced.

The first Pacific storm of the autumn season came in right on schedule during the first full day of autumn (Wednesday, September 23), producing blustery south winds and dumping about one-third of an inch of rain at Salem Municipal Airport. Greater totals fell in the Cascade foothills. Another storm brought more rain and brisk winds on Friday, September 25, with a few showers the next day. A strong upper-level ridge prompted the return of dry and unseasonably-warm weather to close out the month. Light southerly winds aloft transported elevated smoke from California wildfires over the state, making for generally hazy conditions,

which continued into early October. By then, the decision had been made to end field burning for the season.

In total for September, 72 acres were burned on one day, with no RSIs and two complaints.

A total of 7,512 acres were burned during the 2020 field-burning season on 11 burn days. Most of the remaining acreage was baled, as ODA worked with the ODF Weather Office to provide a forecast for growers through the baling process.

Table 1. 2020 Field Burning Acreage, Impacts, and Complaints Summary.

Burn Date	Acres Burned	Registered Impacts (Y/N)	Complaints
July 16	189	N	3
July 21	583	N	3
July 28	153	N	3
July 31	1,030	N	3
August 4	15	N	0
August 5	1,271	N	4
August 11	871	Y	3
August 18	1,812	Y	19
August 20	1,198	N	3
August 25	318	N	0
September 4	72	N	2
Days: 11	**Acres: 7,512**	**Days with Impacts: 2**	**Complaints: 44***

*One complaint was received that did not reference a particular burn date.

Registered and Burned Acres

Open field burning acreage registration begins in March and continues through April 1. Acres registered prior to the April 1 deadline are considered "on-time" acres. Table 2 shows the breakdown of acres registered by April 1, 2020, and the final allocation.

Fields are categorized into two types: Identified Species and Steep Terrain. Research has identified some species of grass seed that cannot be profitably produced without thermal sanitation. These seed kinds are Chewings Fescue, Creeping Red Fescue, and Highland Bentgrass and are categorized as Identified Species. Steep Terrain fields are those fields located in the Willamette Valley where grass seed or cereal grain is grown but because of the steepness of the terrain, it is extremely difficult to apply alternatives to open field burning. Additionally, the perennial varieties of grass seed grown in these fields can prevent erosion on steep hillsides.

Table 2. Registered and Burned Acreage for the 2020 Field Burning Season.

Field Type	Limitation (Maximum burnable acres)	Acres Registered (As of April 1, 2020)	Allocation (acres)	2020 Acres Burned
Identified Species and Steep Terrain	**15,000**	**15,984**	**93% (14,865)**	**7,512***

*Wildfires led to the voluntarily end of the 2020 season without burning all allocated registered acres.

In September 2020, unprecedented wildfires burned more than 1,000,000 acres statewide, including two that burned together to form a single fire that quickly moved west toward the field burning footprint. As a result, no acreage was burned as part of the field burning program after September 8. On September 22, in consultation with program partners, including the Oregon Seed Council and the growers who participate in the program, the field burning season was voluntarily ended. As of September 8, 6,656 acres remained on the ready list – available to be burned or baled. Most of these acres were baled, with the exception of 140 acres that were emergency burned to protect against the wildfires.

Enforcement

The 2020 field burning season marked the 23rd 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 2020 field burning season.

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, and inefficient lighting techniques, can all contribute to the occurrence of impacts.

The number of hours recorded for smoke impacts in 2020 in cities monitored are outlined in Table 3. Nephelometers are located in Carus, Detroit, Eugene, Lyons, Mill City, Portland, Salem, Silverton, Springfield, and Sweet Home. There were a total of 11 days when burning was conducted during the 2020 season; two of the 11 days resulted in impacts.

Table 3. 2020 Field Burning Season Recorded Smoke Impacts in Monitored Cities.

		Impact Hours			
Date	**Acres Burned**	**Heavy**	**Moderate**	**Light**	**Location**
August 11, 2020	871			1	Lyons
				1	Mill City
				1	Detroit
August 18, 2020	1,812		7	11	Lyons
			3	13	Mill City
				8	Detroit
	Totals:	**0**	**10**	**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 x 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 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. Only “moderate” and “heavy” impacts are required to be recorded per OAR 603-077-0105. “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.

Complaints

The Smoke Management Program received a total of 44 field burning complaints during the 2020 field-burning season. Table 4 identifies the number of complaints originating from individual cities/areas.

Table 4. Complaints for the 2020 Field Burning Season by City/Area.

City/Area	No. of Complaints	City/Area	No. of Complaints
Albany	0	Salem/Keizer	0
Detroit	0	Scio	3
Eugene/Springfield	0	Silverton	4
Idanha	0	Stayton	8
Lebanon	1	Sublimity	1
Lyons/Mehama	16	Unknown	1
Mill City/Gates	4	Other	6
Portland Metro	0		
		Total Complaints:	**44**

Research

The Oregon Seed Council and ODA made available approximately $150,000 in June 2020 to fund alternatives to field burning research projects through the Alternatives to Field Burning Research Financial Assistance Program. In cooperation with the Oregon State University Office for Sponsored Research and Award Administration, the funding is available for projects lasting one to three years. Funding comes from fees growers pay to register and burn their fields.

Two projects received funding. They are as follows:

Fall mowing and management options to increase yield in nonburned fine fescue stands
Applicant: Betsy Verhoeven, Willamette Valley Field Crops Oregon State University Extension Service, Marion and Clackamas Counties
Amount: $12,000
Duration: One year

Expanding chemical weed management options for fine fescue growers

Andrew Hulting and Caio Brunharo, Weed Science Program Department of Crop and Soil Science, Oregon State University

Amount: $133,410

Duration: Three years