

2008 Alaska Wildland Fire Emissions Inventory

Prepared by:
Alaska Department of Environmental Conservation
Division of Air Quality
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2008 Alaska Wildland Fire Emissions Inventory

Summary

The Department of Environmental Conservation (DEC) in coordination with the Alaska Wildland Fire Coordinating Group (AWFCG) developed the Alaska Enhanced Smoke Management Plan (ESMP). The ESMP and accompanying volume of appendices were adopted by the AWFCG in June 2009. According to the ESMP, DEC is responsible for collecting, reviewing, tracking, and summarizing statewide pre- and post-burn data for annual ESMP emissions inventory reports to be distributed to the AWFCG, the U.S. Environmental Protection Agency and the Western Regional Air Partnership (WRAP).¹

The ESMP helps fulfill Alaska's responsibilities for protection of air quality and human health under federal and state law and reflects the Clean Air Act requirement to improve regional haze in Alaska's Class I areas. The updated ESMP will be an important component of Alaska's Regional Haze State Implementation Plan.

This report accomplishes the Department of Environmental Conservation's responsibility for reporting 2008 prescribed fire emissions as required by the Enhanced Smoke Management Plan. It also reports on the statewide wildland fires and "wildland fire use" emissions occurring in 2008. "Wildland Fire Use" is a category of naturally-ignited fires that are managed for specific resource management objectives.

During the summer of 2008 there were 277 human caused fires and 102 fires ignited by lightning. A total of 107,730 acres were burned. The fire season began in mid-March, with the majority of reported fires occurring in the northern half of the state.

Fire activity during the 2008 season was minimal – the second lowest acreage burned since 1985, only 1995 had less acres burned. In the Fairbanks area, the month of July was the 6th wettest July on record.²

The Alaska Interagency Coordination Center (AICC) is the Geographic Area Coordination Center for Alaska. Located on Ft. Wainwright (near Fairbanks), the AICC serves as the focal point for initial attack resource coordination, logistics support, and predictive services for all state and federal agencies involved in wildland fire management and suppression in Alaska.³

The AICC operates on an interagency basis - cooperators include the Bureau of Land Management, State of Alaska Department of Natural Resources (including the Division of Forestry), USDA Forest Service, National Park Service, Bureau of Indian Affairs, and the Fish and Wildlife Service.⁴ The AICC collects most wildland fire related data into daily situation reports, available on their website:

<http://fire.ak.blm.gov/predsvcs/intel.php>

Alaska has 14 Fire Management Zones. Fire management planning, preparedness, suppression operations, prescribed fire, and related activities are coordinated on an interagency basis (i.e., the AICC).

¹ Alaska Enhanced Smoke Management Plan for Planned Fire, Procedures Manual, Executive summary, June 2009

² Alaska Fire Season 2008, prepared by the AICC, website: <http://fire.ak.blm.gov/content/aicc/stats/2008stats.pdf>

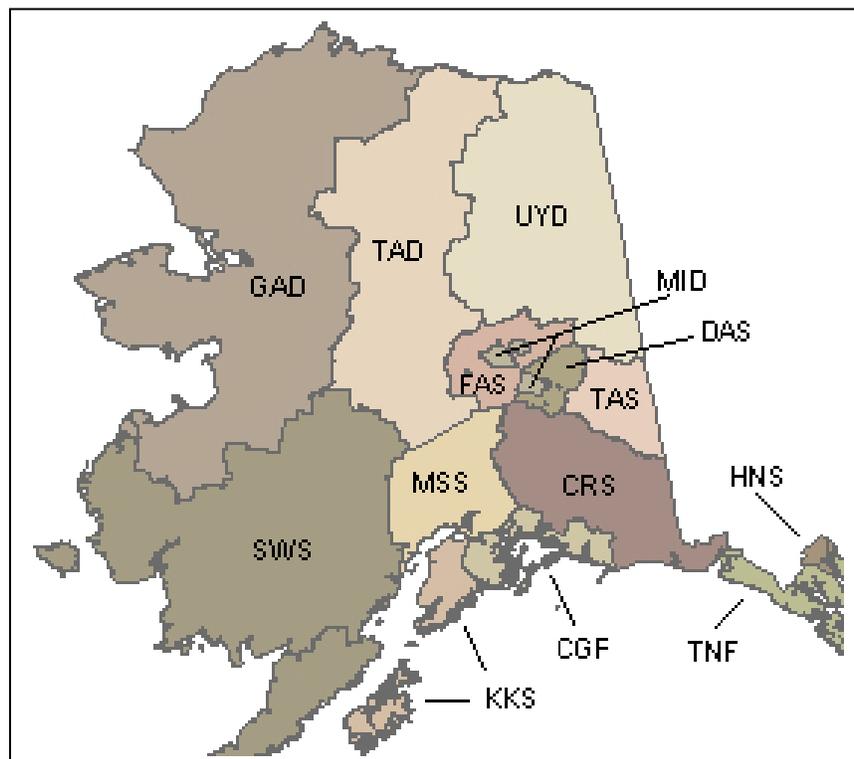
³ Alaska Interagency Coordination Center website: <http://fire.ak.blm.gov/aicc.php>

⁴ ibid

The Division of Forestry, Bureau of Land Management, and the U.S. Forest Service, fight fires within their protection areas on all land ownerships which reduces the duplication of facilities and services. The state and federal agencies routinely utilize each other's personnel and resources to both manage and fight fires for efficiency and cost effectiveness.⁵

Alaska has fourteen Fire Management Zones shown in the map below. These zones are as follows:

- Chugach National Forest (CGF)
- Valdez/Copper River Area Forestry (CRS)
- Delta Area Forestry (DAS)
- Fairbanks Area Forestry (FAS)
- Galena Fire Management Zone (GAD)
- Haines/Northern Southeast Area Forestry (HNS)
- Kenai-Kodiak Area Forestry (KKS)
- Military Fire Management Zone (MIL)
- Mat-Su/Southwest Area Forestry (MSS)
- Southwest District Forestry (SWS)
- Tanana Fire Management Zone (TAD)
- Tok Area Forestry (TAS)
- Tongass National Forest (TNF)
- Upper Yukon Fire Management Zone (UYD)



⁵ Division of Forestry Fire Program webpage: <http://forestry.alaska.gov/fire/>
October 6, 2010

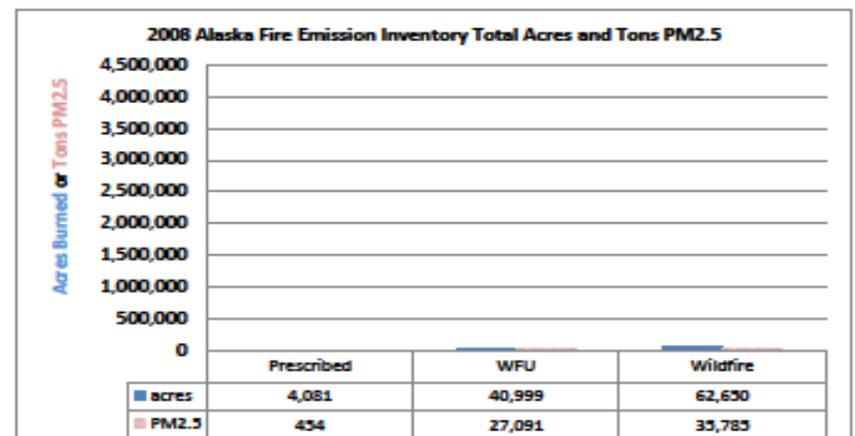
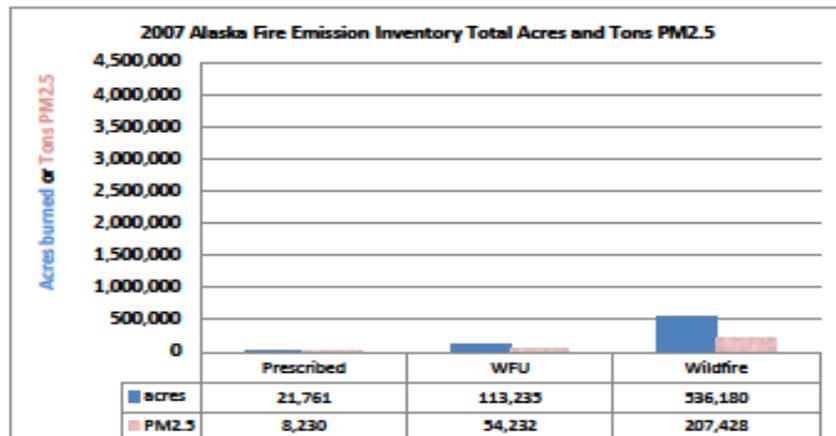
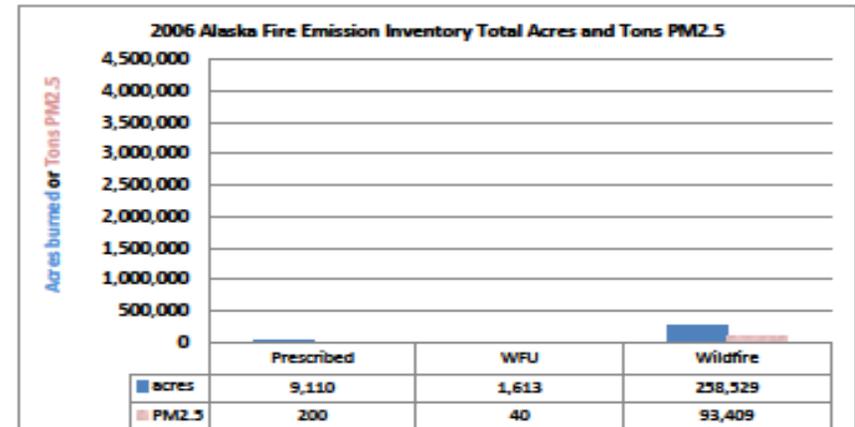
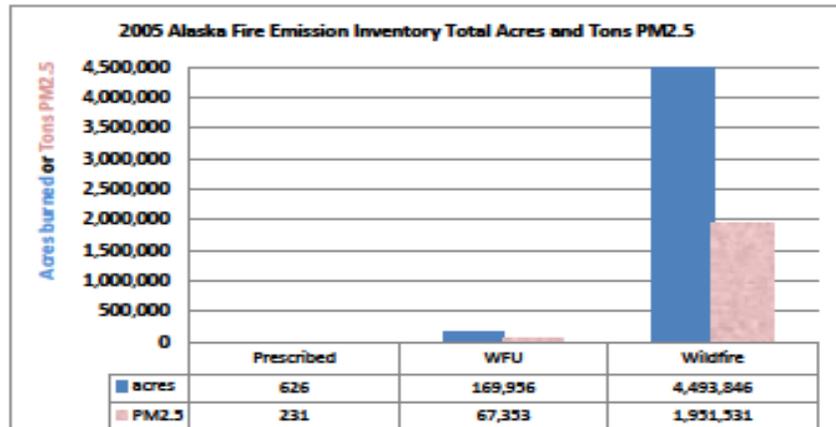
Method for 2008 Alaska Wildland Fire Emissions Inventory

The Wildland Fire Emission Template prepared in 2006 by Air Sciences, Inc. for the Department of Environmental Conservation (DEC) was used to prepare the 2008 wildland fire inventory. A summary of all the 2008 fires, their type, start and end dates, 'owner', locations, and acreages was provided to DEC by the Division of Forestry. The data was copied into the template. The dates were re-entered to conform to the requirements of the template, and the 'emission factor' for each fire, as determined by the description on the 2008 daily Alaska Interagency Coordination Center situation reports, was entered. One 'short cut' was taken: 201 fires were less than 0.25 acre in size. After reviewing approximately 25 of those listed as 0.1 acre and determining most of them had been grass fires, the emission factor of 0.75 (grass) was used for all fires listed as 0.1 acre. This was accomplished using EXCEL. However, when reviewing the daily sit reps, if any 0.1 acre fire had been started in, for example, black spruce, the black spruce emission factor (57.57) was used.

The total acreage in the Emission Inventory is a bit greater than that reported by the AICC as several of the post burn reports for prescribed fires listed a different acreage than was reported in the AICC reports (two fires were smaller by 3.5 acres and 10 acres; another was reported as 100 acres larger).

The fires in the emission inventory are categorized into three groups: Prescribed Fires, Wildland Fire Use (WFU), and Wildfires. The following definitions are taken from the 2009 Alaska Enhanced Smoke Management Plan for Planned Fire.

- **Prescribed Fire**, or controlled burn, is any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist. In a federal action, National Environmental Policy Act requirements must be met prior to ignition. Prescribed fire is a type of open burning.
- **Wildland Fire Use (WFU)** fires entail the application of the appropriate management response to naturally-ignited wildland fires to accomplish specific resource management objectives in pre-defined designated areas outlined in Fire Management Plans.
- **Wildland fire** is any non-structure fire, other than prescribed fire, that occurs in the Wildland. **Wildland** is an area where development is generally limited to roads, railroads, power lines, and widely scattered structures. The land may be neglected altogether or managed for such purposes as wood or forage production, wildlife, recreation, wetlands or protective plant cover.



This page shows four years of Alaska wildland fire emissions for Prescribed Fire, Wildland Fire Use, and Wildland Fires for the years 2005 through 2008.

The scale of the acres burned or tons of PM 2.5 was kept the same for each graph to show the differences between the years.

Note that for 2006, the report included 38,092 acres "prescribed fire" which included events in small permitted burns, administered by the Alaska DNR. These burn acres were not included in the 2006 graph to be consistent with the other years depicted which did not include the DNR permit acreage.

Discussion of Results

The Fire Emission Template presents results through 12 graphs. Figures 1 through 12 are discussed on the following pages. A listing of the emission factors used for vegetation groups is provided after Figure 12.

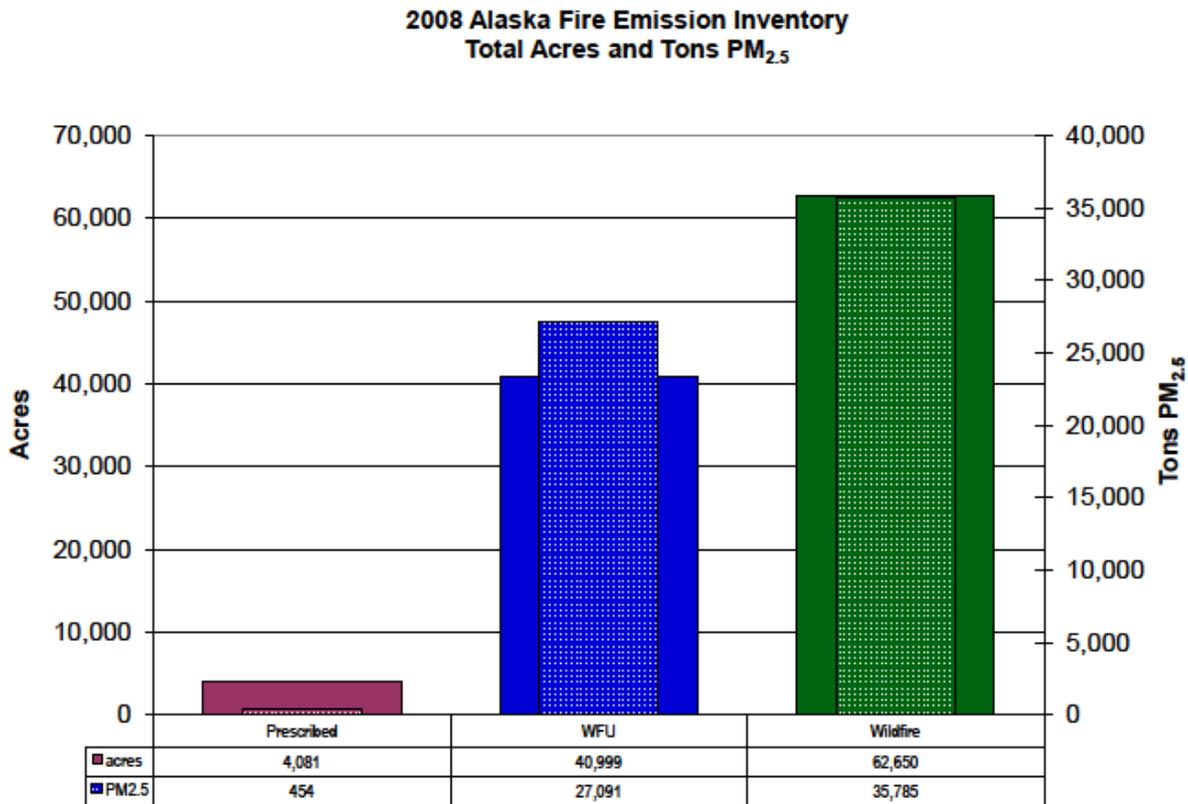


Figure 1

Figure 1 shows the number of acres burned and the tons of PM_{2.5} produced for each fire type (prescribed, WFU, and wildfire) during the 2008 season.

- *Prescribed fires* were approximately 3.8 % (4081 acres) of the total 2008 Alaskan fires, producing 454 tons of PM_{2.5} (approximately 0.7 %) of the total PM_{2.5} produced. In 2008, many of the prescribed burns were conducted on grasslands, which are rated with a low emission factor (0.75)
- *Wildland Fire Use (WFU)* fires were approximately 38.1 % (40,999 acres) of the total 2008 Alaskan fires, producing 27,091 tons of PM_{2.5} (approximately 42.8 %) of the total PM_{2.5} produced.
- *Wildfires* were approximately 58.1 % (62,650 acres) of the total 2008 Alaskan fires, producing 35,785 tons of PM_{2.5} (approximately 56.5 %) of the total PM_{2.5} produced.

**2008 Alaska Fire Emission Inventory
Number of Events by Month and Source Type**

Events are assigned a month by the average of the event start and end dates

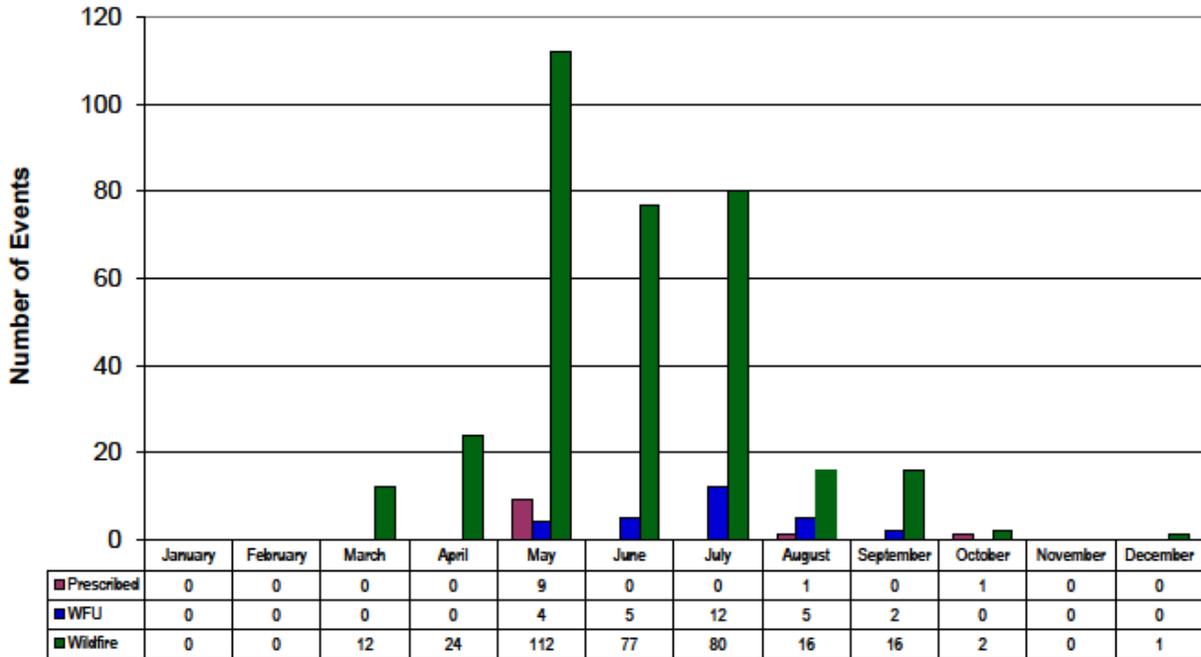


Figure 2

Figure 2 shows the total number of wildland fires in 2008, by month and type of fire (prescribed, WFU, or wildfire).

Most of the Prescribed fires in 2008 occurred in the early season, May (81.8%, 9 fires), with one each in August and October.

Most of the WFU fires occurred in July (42.9%, 12 fires), with 5 or fewer in May, June, August and September.

Most of the Wildfires occurred in May, June and July (79.1%, 269 fires), with a fair number in April (7.0 %, 24 fires) and 16 fires each in August and September (4.7%, 16 fires).

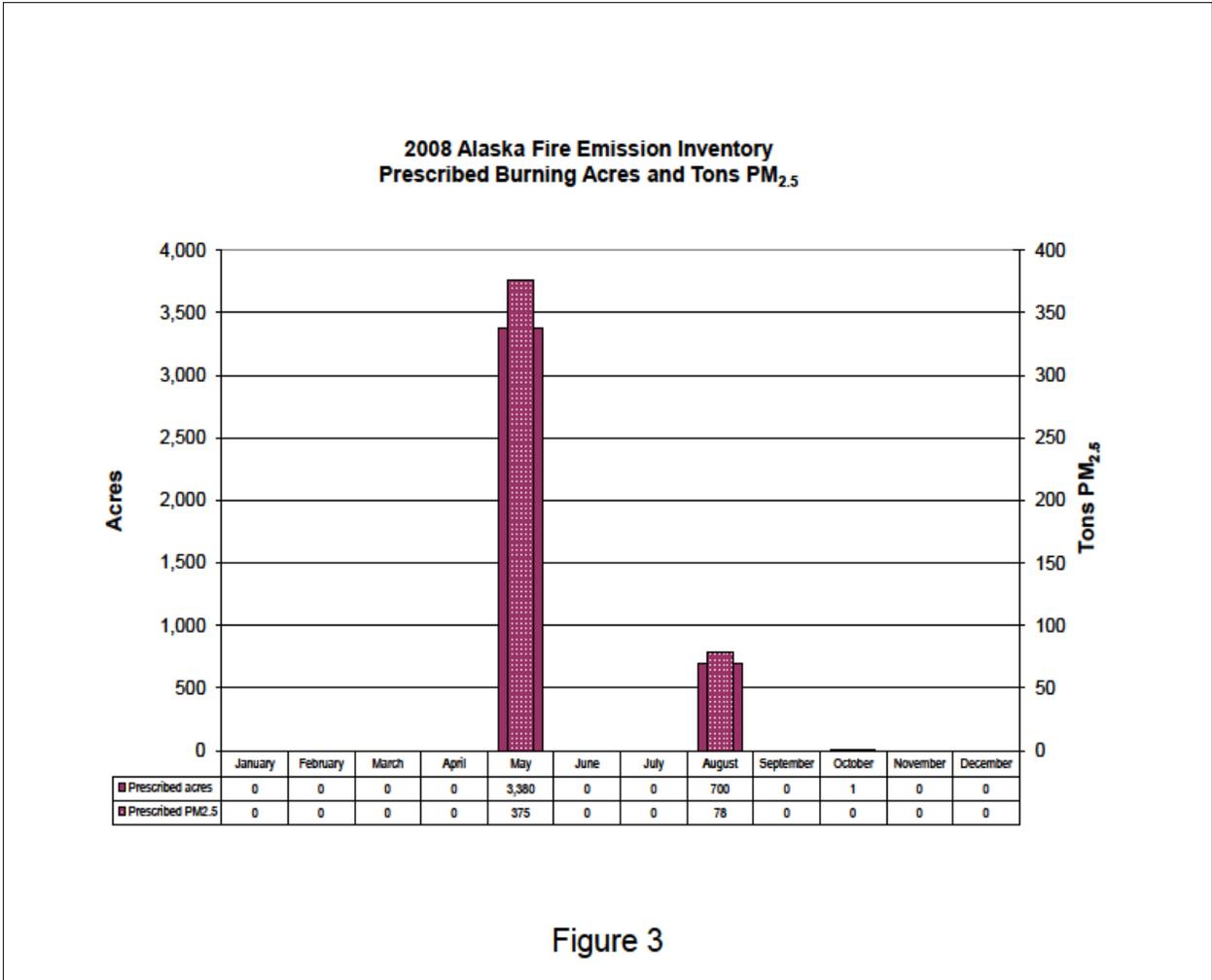


Figure 3

Figure 3 shows the acres of prescribed burns and tons of PM_{2.5} produced in 2008.

Most prescribed burn acreage occurred in May (82.8%, 3,380 acres), producing the largest amount of PM_{2.5} (82.8%, 375 tons). August and October prescribed fires produced very few tons of PM_{2.5} (17.2%, 78 tons).

**2008 Alaska Fire Emission Inventory
Prescribed Burning Acres and Tons PM_{2.5}**

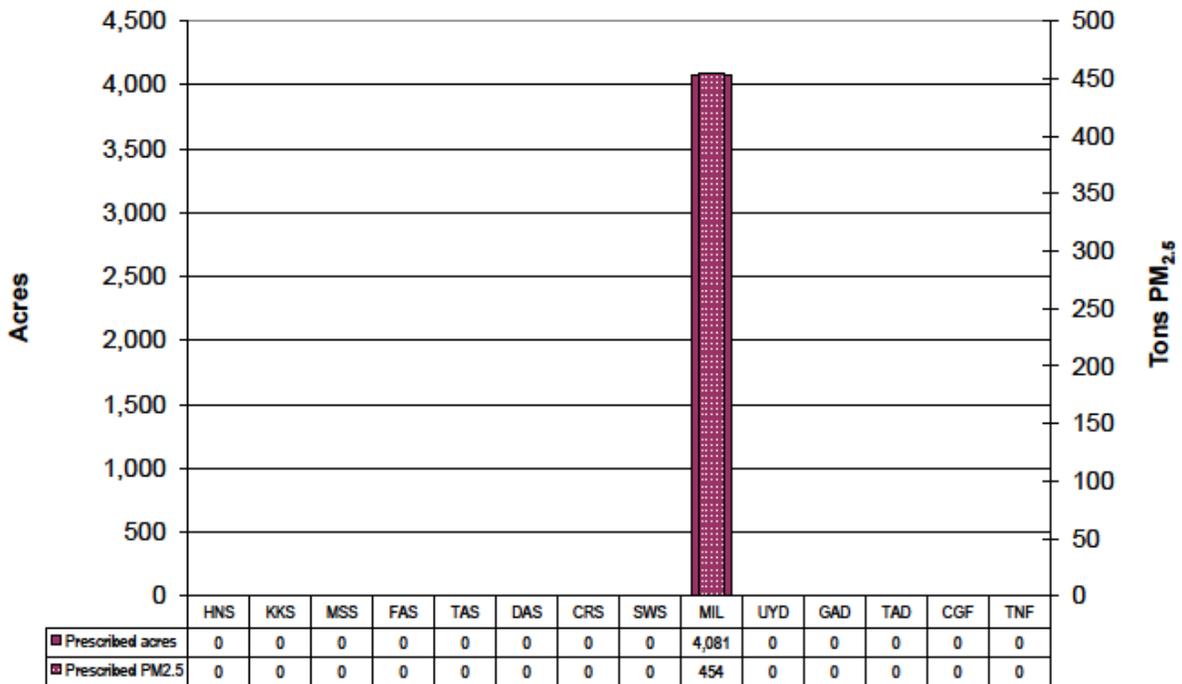


Figure 4

Figure 4 shows the acres of Prescribed Burns and the tons of PM_{2.5} produced by Fire Management Zone. A map of the Fire Management Zones is on Page 2.

The Military burned all the reported prescribed burn acres in 2008 (4,081 acres or 100%) and consequently produced all the tons of PM_{2.5} (454 tons or 100%).

**2008 Alaska Fire Emission Inventory
Wildland Fire Use (WFU) Acres and Tons PM_{2.5}**

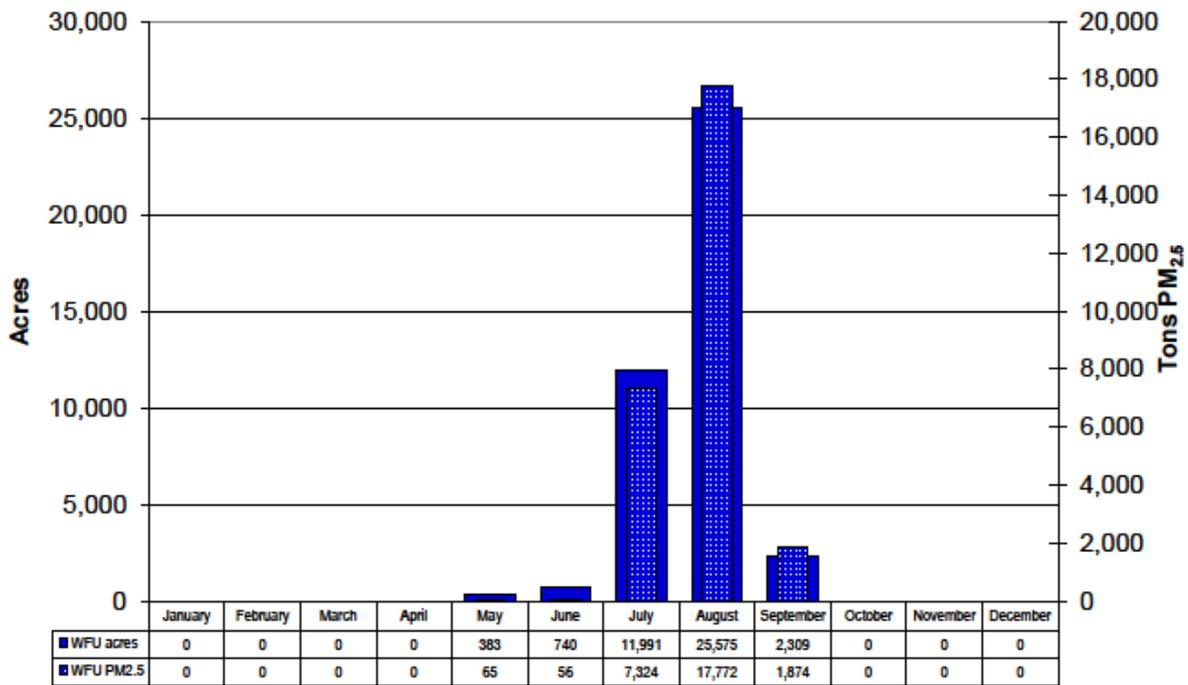


Figure 5

Figure 5 shows Wildland Fire Use (WFU) Acres and Tons PM_{2.5} by month.

July and August were the largest acreage burned months for WFU fires (11,991 and 25,575 acres respectively, or a total 91.6%), producing a total of 25,096 Tons PM_{2.5} or 92.6%). May, June, and September utilized 3,432 acres (8.4%) for WFU, producing 1,995 Tons PM_{2.5} (7.4%).

**2008 Alaska Fire Emission Inventory
Wildland Fire Use (WFU) Acres and Tons PM_{2.5}**

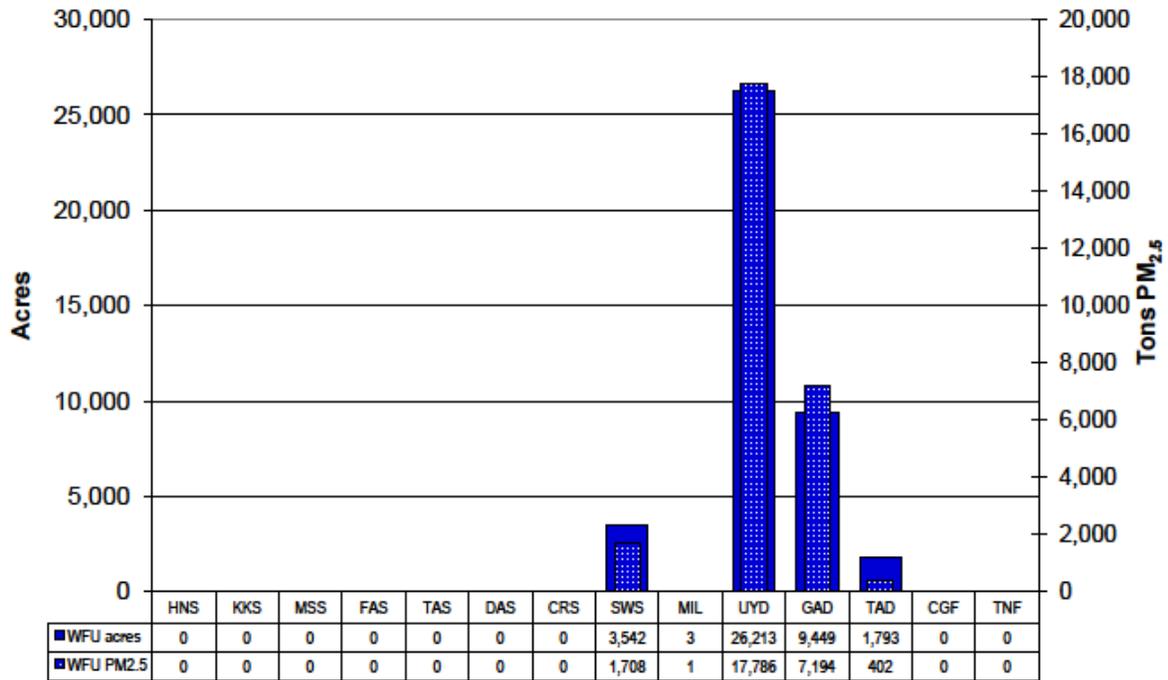


Figure 6

Figure 6 shows the Wildland Fire Use (WFU) Acres and Tons PM_{2.5} (by Fire Management Zone). A map of the Fire Management Zones is on Page 2.

Four main areas utilized WFU acres in 2008: the Southwest District Fire Management Zone, SWS, (3,542 acres or 8.6%); Upper Yukon Fire Management Zone, UYD (26,213 acres or 63.9%); the Galena Fire Management Zone, GAD (9,449 acres or 23.1%); and the Tanana Fire Management Zone, TAD (1,793 acres or 4.4%).

The two Fire Management Zones with the largest acreage utilizing WFU, UYD and GAD, also produced the most tons of PM_{2.5} (total 24,091 tons or 92.2%) while burning a total 35,662 acres (87%). The remaining 13% of the tons of PM_{2.5} were produced by the SWS, TAD, and MIL zones.

**2008 Alaska Fire Emission Inventory
Wildfire Acres and Tons PM_{2.5}**

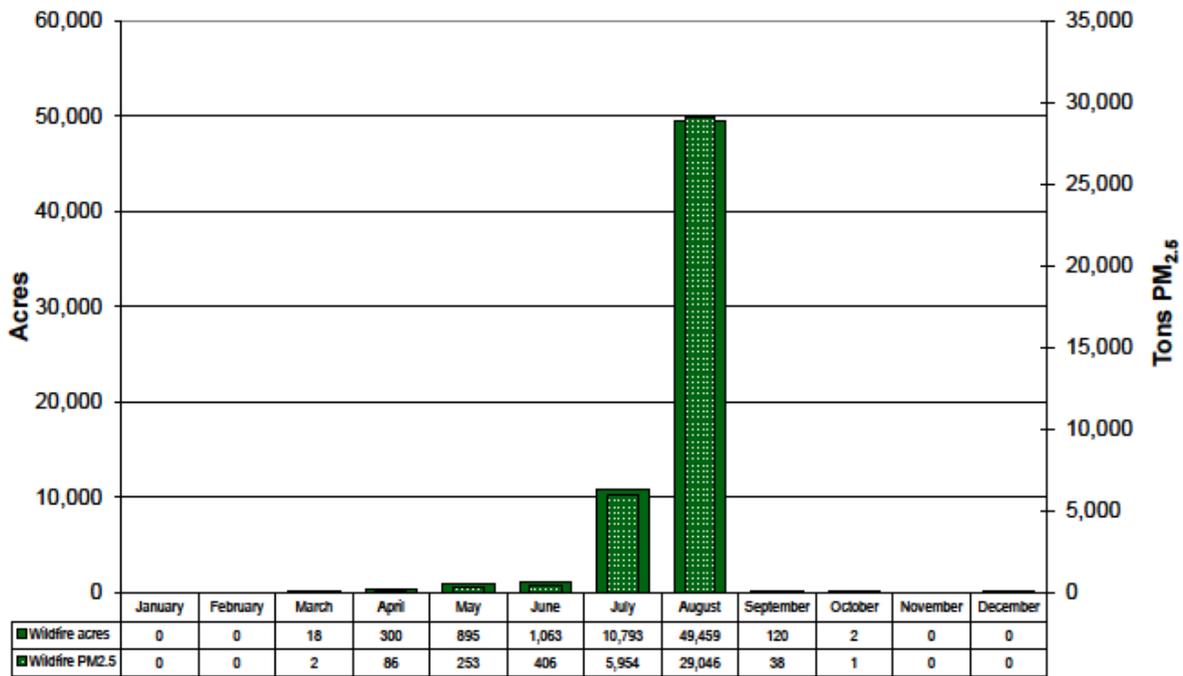


Figure 7

Figure 7 shows the Wildfire Acres and Tons PM_{2.5} (by month)

Wildfire starts occurred March through October in 2008, but August was the month with the largest acreage burned (49,459 acres or 78.9 %) and tons PM_{2.5} produced (29,046 tons or 81.2%).

Note: The template averages the 'month' of the fire between the start and end dates.

The second largest acreage burned month was July with 10,793 acres burned (17.2%) and 5,954 tons PM_{2.5} produced (16.6 %)

**2008 Alaska Fire Emission Inventory
Wildfire Acres and Tons PM_{2.5}**

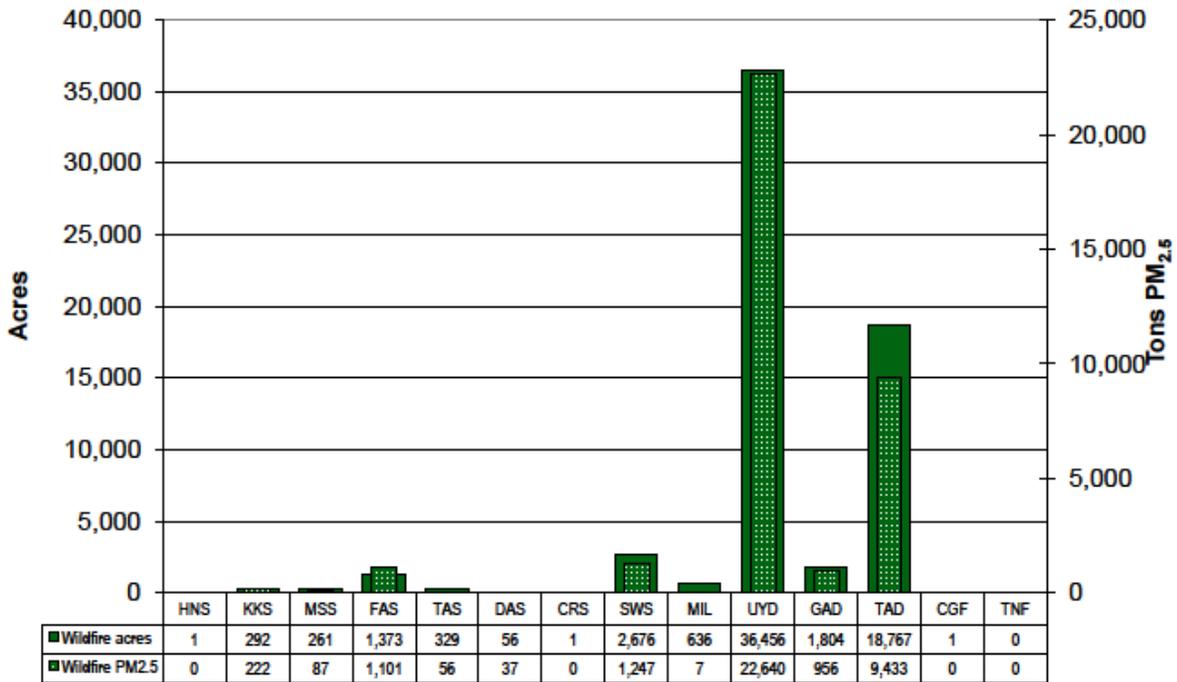


Figure 8

Figure 8 shows the Wildfire Acres and Tons PM_{2.5} (by Fire Management Zone). A map of the Fire Management Zones is on Page 2.

Of the 14 Fire Management Zones, 13 reported wildfires; 10 zones reported wildfires over 40 acres. The only Fire Management Zone not reporting any wildland fires was the Tongass National Forest(TNF), although the Haines (HNS), Valdez-Copper River (CRS), and Chugach National Forest (CG) zones only reported 1 acre each of wildlands burned.

The two Fire Management Zones reporting the most acreage burned by wildfire were the Upper Yukon Fire Management Zone, UYD (36,456 acres or 58.2%) and the Tanana Fire Management Zone, TAD (18,767 acres or 30%). The preceding two Fire Management Zones also produced the most tons PM_{2.5}. UYD produced 22,640 tons PM_{2.5} or 63.3 %, and TAD produced 9,433 tons PM_{2.5} or 26.4 %. The remaining 11 Fire Management Zones reported 11.8 % of the total acreage burned and 10.3% of the PM_{2.5} produced.

**2008 Alaska Fire Emission Inventory
Total Tons of Pollutant**

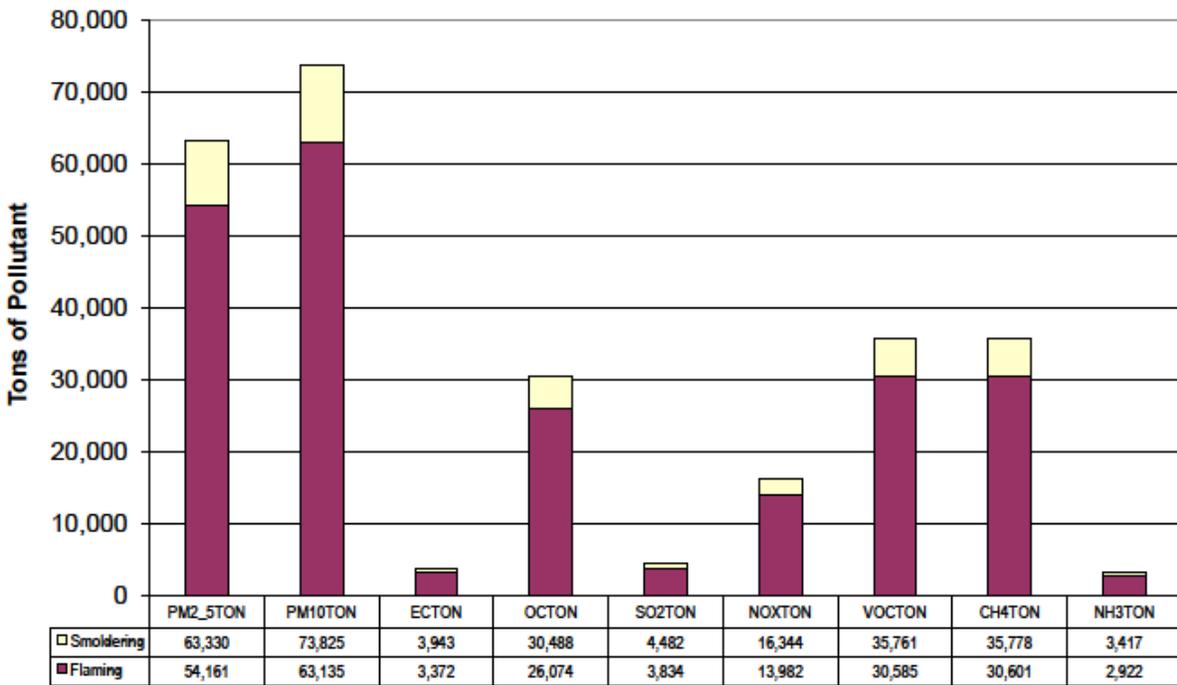


Figure 9

Figure 9 shows the Total Tons of Pollutant produced by the 2008 fires for nine different air pollutants: fine particulate matter (PM2.5), coarse particulate matter (PM10), elemental carbon (EC), organic carbon (OC), sulfur dioxide (SO2), nitrogen oxides (NOx), volatile organic compounds (VOC), methane (CH4), and ammonia (NH3).

This graph shows the flaming and smoldering tons of nine different air quality pollutants from all of the 2008 wildfires, wildland fire use fires and prescribed burns.

The total tons of pollutant shown under the 'smoldering' category are the total tons. Tons from smoldering are not listed separately.

The template calculated smoldering tons only if the acreage of the fire was 5 acres or greater.

**2008 Alaska Fire Emission Inventory
Total Tons of PM_{2.5} Averted by Applying ERT**

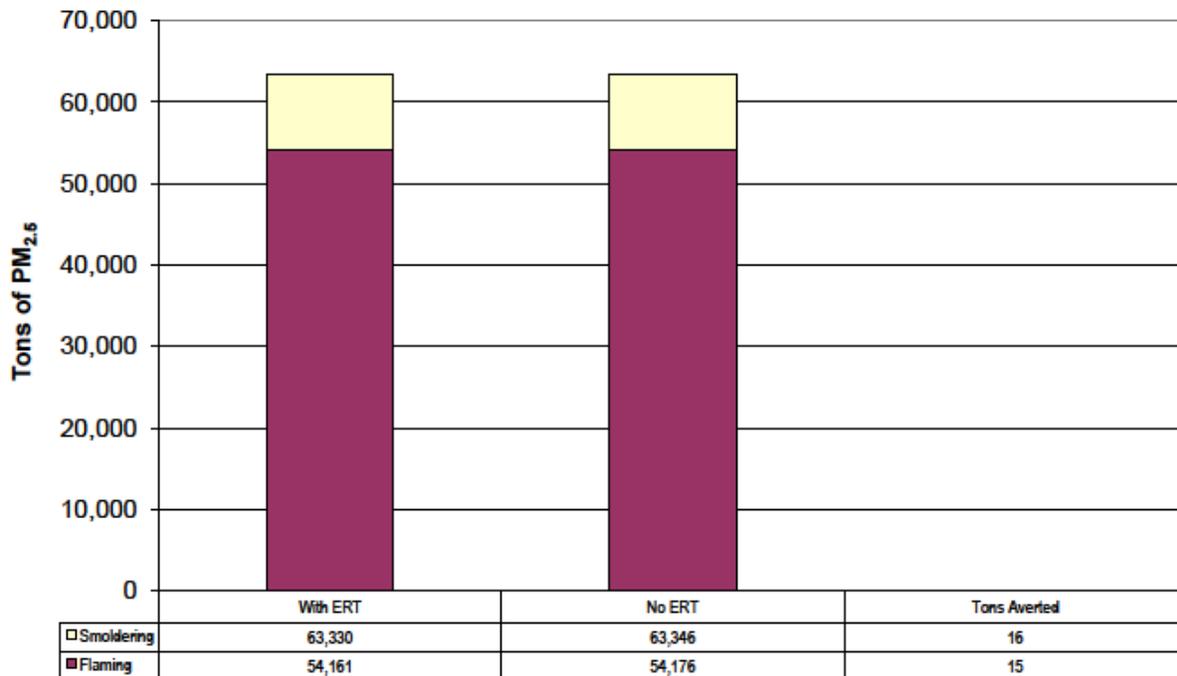


Figure 10

Figure 10 shows the Total Tons of PM_{2.5} Averted by Applying ERT (Emission Reduction Technique)

This graph shows the tons PM_{2.5} with Emission Reduction Techniques, what the numbers would be without ERTs, and the 16 tons PM_{2.5} (0.03 %) averted with use of an ERT during prescribed fires.

**2008 Alaska Fire Emission Inventory
Number of Fire Events by Federal Size Class**

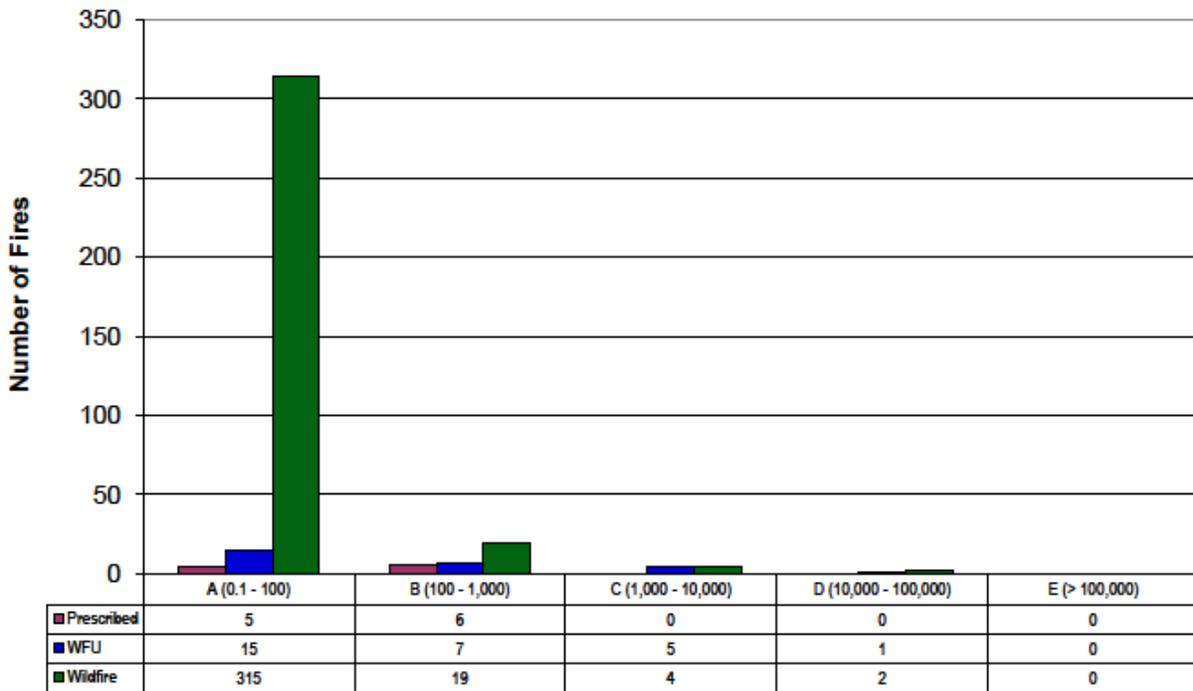


Figure 11

Figure 11 shows the Number of Fire Events by Federal Size Class

The wildfire category is the largest in each of the Federal fire size classes, ranging from Class A (0.1 – 100 acres) to Class E (greater than 100,000 acres).

In 2008, there were a total of 335 fires (88.4%) in the Class A size (less than 100 acres); three total fires in Class D, and no fires in Class E.

**2008 Alaska Fire Emission Inventory
Number of Fire Events by NWFCG Size Class**

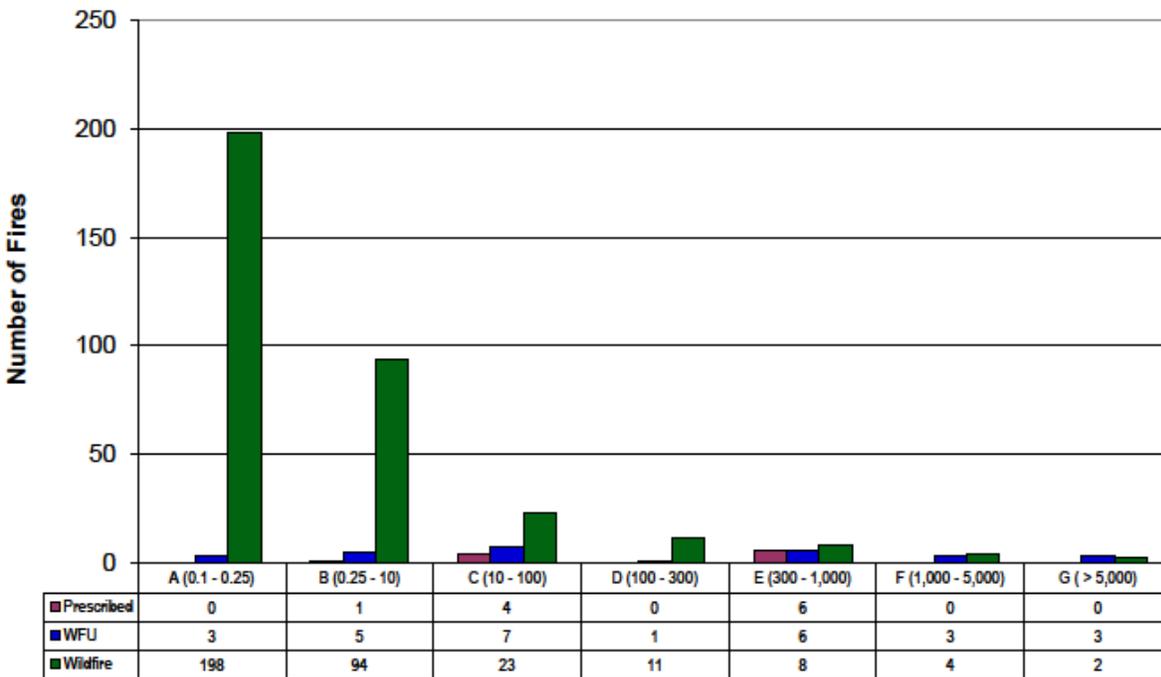


Figure 12

Figure 12 shows the Number of Fire Events by NWFCG (National Wildland Fire Coordinating Group) Size Class

The wildfire category is also the largest in each of the NWFCG fire size classes, ranging from Class A (0.1 – 0.25 acres) to class G (greater than 5,000 acres.)

Class size A (201 fires) and Class size B (100 fires) were the two largest classes – 79.4% of the fires were less than 10 acres. In 2008, only 5 fires (1.3%) were larger than 5,000 acres.

Emission Factors Used

The following Emission Factors (tons/acre) were used for the various vegetation types and mixes shown below. When two vegetation types were listed in the AICC sit rep for a specific fire, the two vegetation emission factors were added together and roughly divided by two, to come up with an average emission factor for the fire.

The Canadian Forest Fire Danger Rating System (CFFDRS) served as the primary source of fuels information as it is used by the BLM Alaska Fire Service.⁶

	Wildfire / WFU	Prescribed
Grasses - Western perennial	0.75	0.75
Intermediate brush	15	15
Black spruce Alaskan	57.57	48.76
Black spruce (57.57) and brush (15)	36	
Black spruce (57.57) and tundra (12)	34.5	
Black spruce (57.57) and grass (0.75)	29	
Black spruce (57.57) and white spruce (30.35)	45	
Spruce and hardwoods estimate	44	
Tundra (~avg 19.05 and 4.45)	12	
Tundra (12) and grass (0.75)	6.5	
Tundra (12) and brush (15)	15	
Tundra (12) and white spruce (30.35)	24	
Brush (15) and grass (0.75)	8	
Grass (0.75) and hardwoods (30.35) estimate ⁷	6	
Grass (0.75) and slash (14.35)	7.5	
Tussocks / peat estimate	5	
old burn estimate	20	
unknown vegetation type estimate	30	
unknown pile estimate	10	
"light fuels" estimate	10	

⁶ 2005 Alaska Wildland Fire Emissions Inventory and Wildland Fire Emissions Inventory Template, prepared by Air Sciences, Inc., for the Alaska Department of Environmental Conservation, project no. 217-2, June 2007, section 1.4.

⁷ estimate "low" as only grass/slash understory may burn