

2010 Alaska Wildfire Emissions Inventory

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November 8, 2011

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2010 Alaska Wildfire 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 2010 prescribed fire emissions as required by the Enhanced Smoke Management Plan. It also reports on the statewide wildfire emissions occurring in 2010.

During the summer of 2010 there were 686 wildfires burning a total of 1,125,499 acres. The acreage burned was the fifth highest of the past 10 years. The fire season began at the end of March, with the majority of reported fires occurring May, June, and July in the northern half of the state. In 2010, there were also 21 prescribed fires conducted, burning a total of 22,136 acres. Most prescribed burns occurred in May 2010 and were conducted by / for the military.

The ten wildfires producing the most PM_{2.5} emissions created approximately 307,692 tons PM_{2.5}, which was close to 56% of the total tons of PM_{2.5} produced by all 686 wildfires. Those same ten wildfires burned approximately 610,342 acres which was about 54% of the total acres burned.

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 wildfire management and suppression in Alaska.²

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.³ The AICC collects most wildfire 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).

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

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

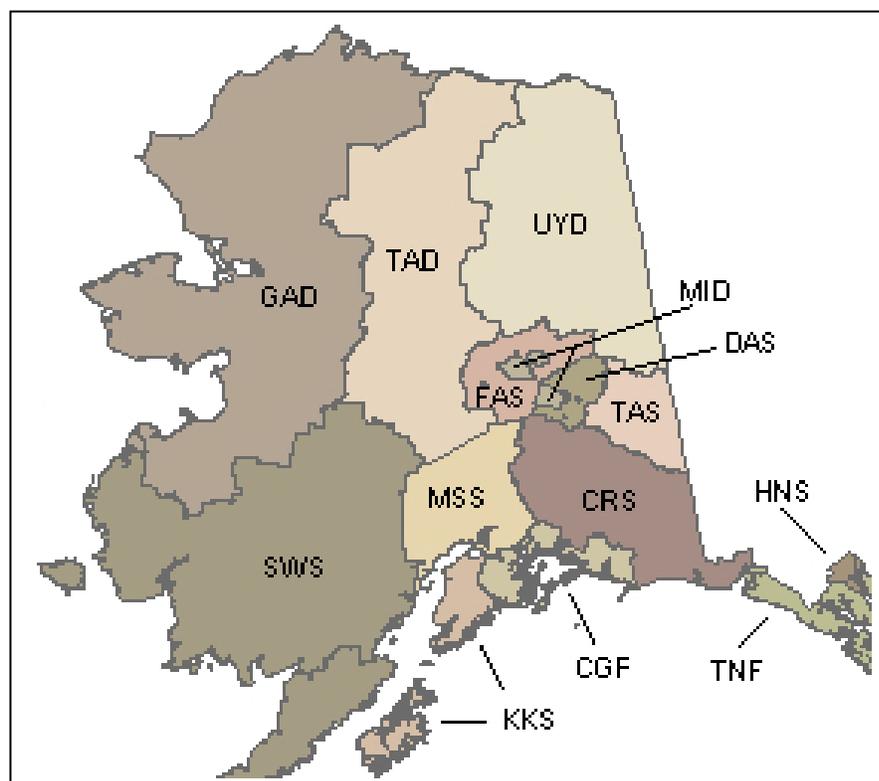
² Alaska Interagency Coordination Center website: <http://fire.ak.blm.gov/aicc.php>

³ ibid

and federal agencies routinely utilize each other's personnel and resources to both manage and fight fires for efficiency and cost effectiveness.⁴

The Alaska Fire Management Zones are shown on 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 (MID)
- 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)



⁴ Division of Forestry Fire Program webpage: <http://forestry.alaska.gov/fire/>
November 8, 2011

Method for 2010 Alaska Wildfire 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 2010 wildfire inventory. A summary of the 2010 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 2010 daily Alaska Interagency Coordination Center situation reports, was entered. One 'short cut' was taken: 276 fires were less than 0.2 acre in size. After reviewing approximately 25 of those listed as 0.1 to 0.2 acre and determining most of them had been grass fires, the emission factor of 0.75 (grass) was used for all fires listed as 0.2 acres or less. This was accomplished using EXCEL. The total acreage of these 276 fires was 29.4 acres, or approximately 0.0026% of the total acreage burned in 2010.

The wildfire acreage in the Emission Inventory is about 80 acres more than reported by the AICC, probably due to rounding issues.

The fires in the emission inventory are categorized into two groups: Prescribed Fires and Wildfires. The category of "Wildland Fire Use" is now obsolete and has not been used by agencies since the 2008 fire season in describing and tracking fires. This category was used in the past to describe the management of either wildfire or prescribed fire to meet resource objectives or benefits. The National Wildfire Coordinating Group has ceased to use this term as a wildland fire may be concurrently managed for one or more objectives and objectives can change as fire moves across the landscape. As a result, this category is not recorded as a separate category in this report.⁵

The following definitions are taken from the 2009 Alaska Enhanced Smoke Management Plan for Planned Fire.

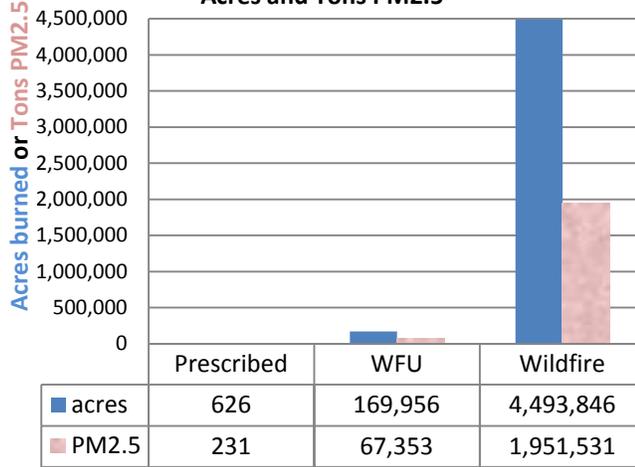
- **Prescribed Fire**, or controlled burn, is any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist. In a federal action, National Environmental Policy Act requirements must be met prior to ignition. Prescribed fire is a type of open burning.
- **Wildfire** 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.

The next page shows six years of Alaska wildfire emissions from Prescribed Fire, Wildland Fire Use (through 2008), and Wildfires for the years 2005 through 2010.

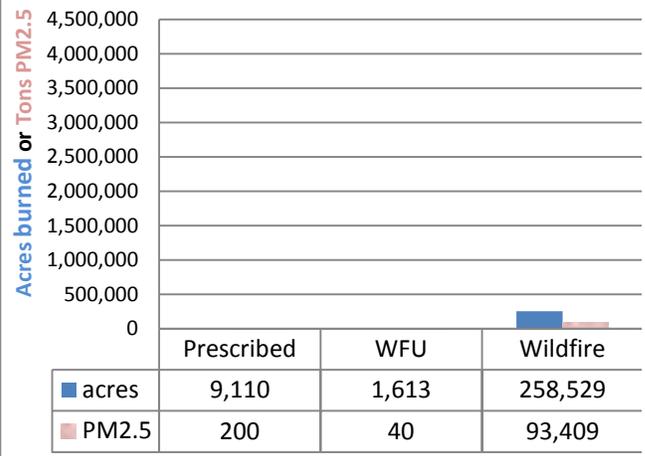
The scale of the acres burned and tons of PM 2.5 was kept the same for each graph to show the differences between the years.

⁵ NWCG Memorandum Ref# NWCG024-2010, Terminology Updated Resulting from Release of the *Guidance for the Implementation of Federal Wildland Fire Management Policy (2009)*, April 30, 2010.

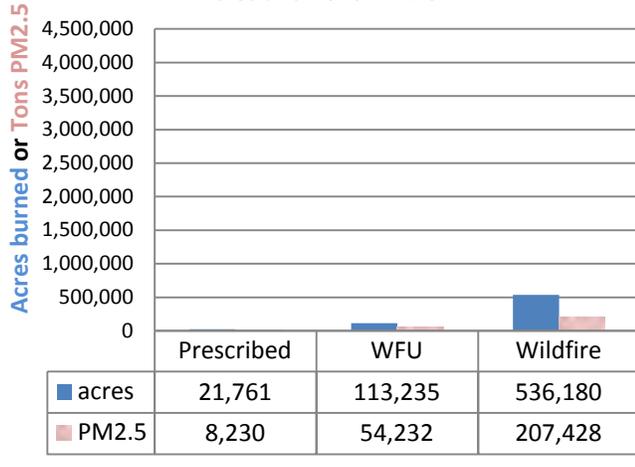
**2005 Alaska Fire Emission Inventory Total
Acres and Tons PM2.5**



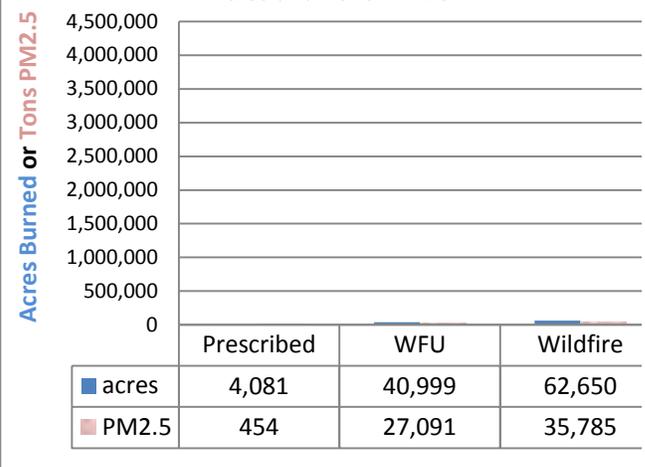
**2006 Alaska Fire Emission Inventory Total
Acres and Tons PM2.5**



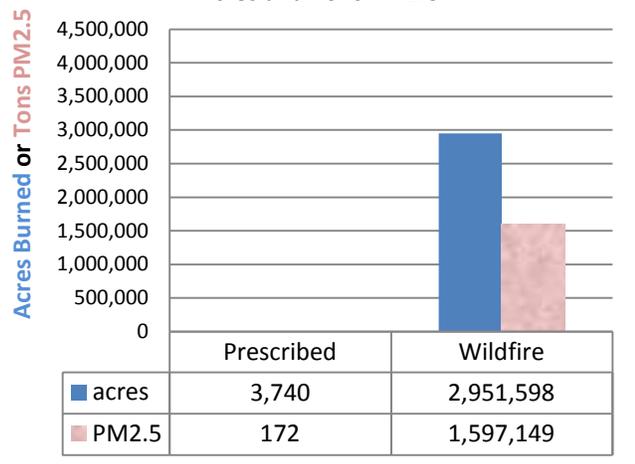
**2007 Alaska Fire Emission Inventory Total
Acres and Tons PM2.5**



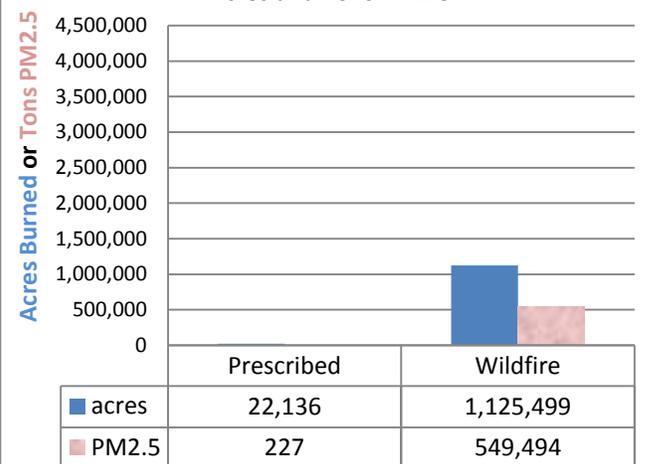
**2008 Alaska Fire Emission Inventory Total
Acres and Tons PM2.5**



**2009 Alaska Fire Emission Inventory Total
Acres and Tons PM2.5**



**2010 Alaska Fire Emission Inventory Total
Acres and Tons PM2.5**



Discussion of Results

The Fire Emission Template presents results through 10 graphs. Figures 1 through 10 are discussed on this and the following pages. A listing of the emission factors used for vegetation groups is provided after Figure 10.

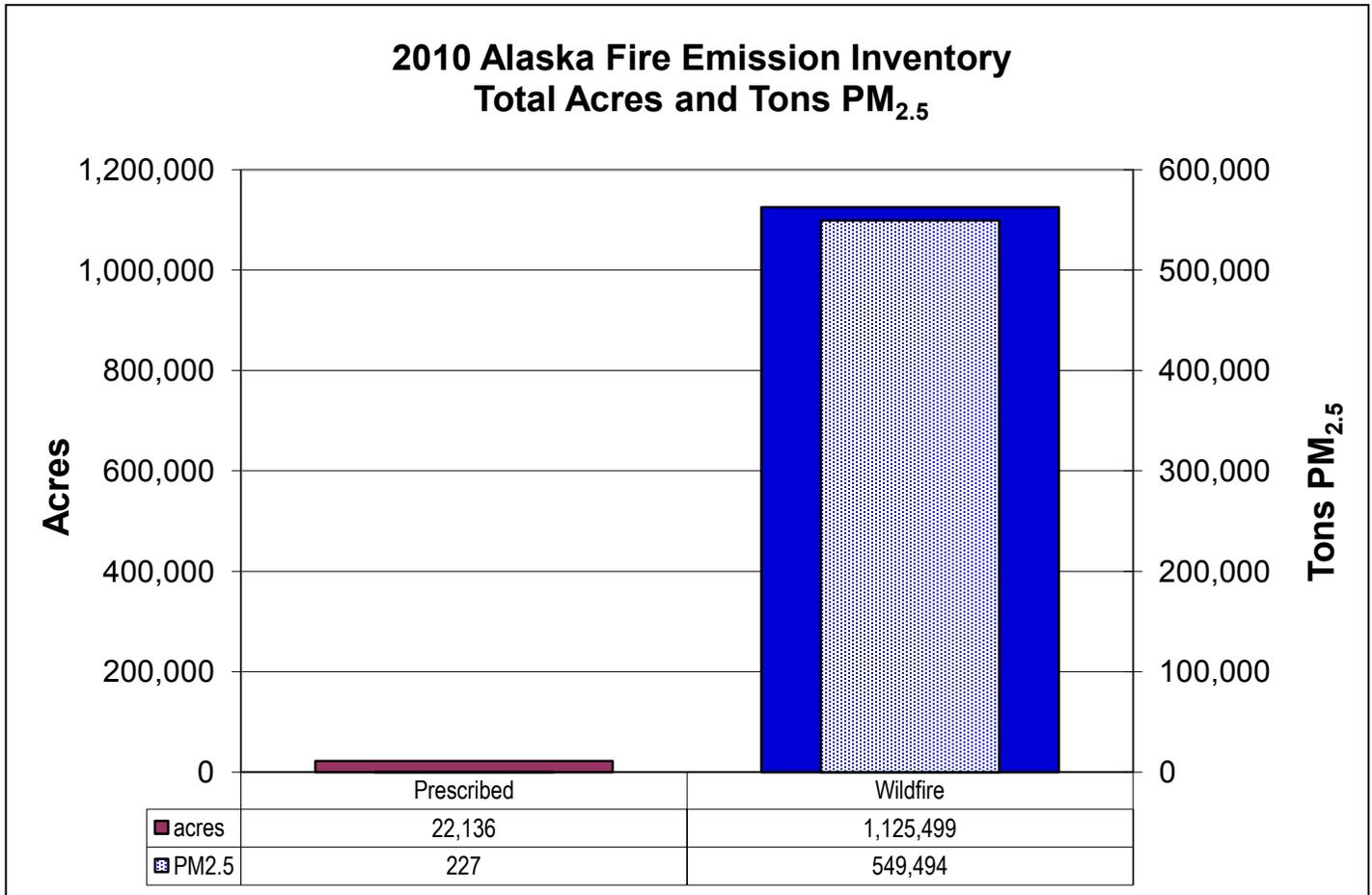


FIGURE 1

Figure 1 shows the number of acres burned and the tons of PM_{2.5} produced for both fire types (prescribed and wildfire) during the 2010 season.

- *Prescribed fires* were approximately 1.9% (22,136 acres) of the total 2010 Alaskan fires, producing 227 tons of PM_{2.5} (approximately 0.04%) of the total PM_{2.5} produced.
- *Wildfires* were approximately 98.1% (1,125,499 acres) of the total 2010 Alaskan fires, producing 549,494 tons of PM_{2.5} (approximately 99.96%) of the total PM_{2.5} produced.

2010 Alaska Fire Emission Inventory Number of Events by Month and Source Type

In the template, events are assigned a month by the average of the event start and end dates

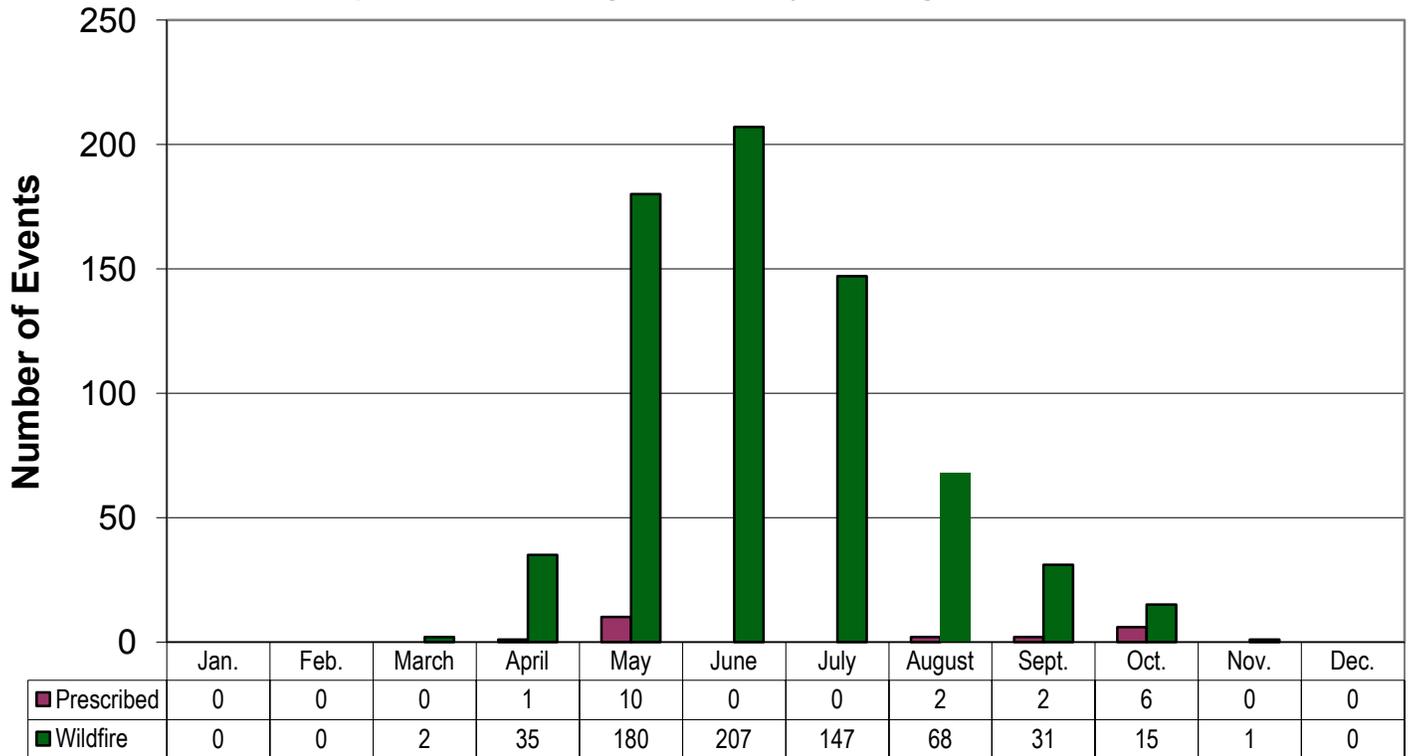


FIGURE 2

Figure 2 shows the total number of wildfires in 2010, by month and type of fire, prescribed or wildfire.

The majority of Prescribed burns in 2010 were split between May (10 burns, 47.6%) and October (6 burns, 28.6%). The other prescribed burns occurred in April, August, and September, for a total of 5 burns or 23.8%.

Most of the Wildfires occurred during the summer months of May, June, July, and August (87.8%, 602 fires), with a couple fires in March and April (5.4%, 37 fires) and 47 fires spread through-out September through November (6.8%). Many of the fires in the first couple weeks of May were small, escaped residential grass fires or small burn pile fires.

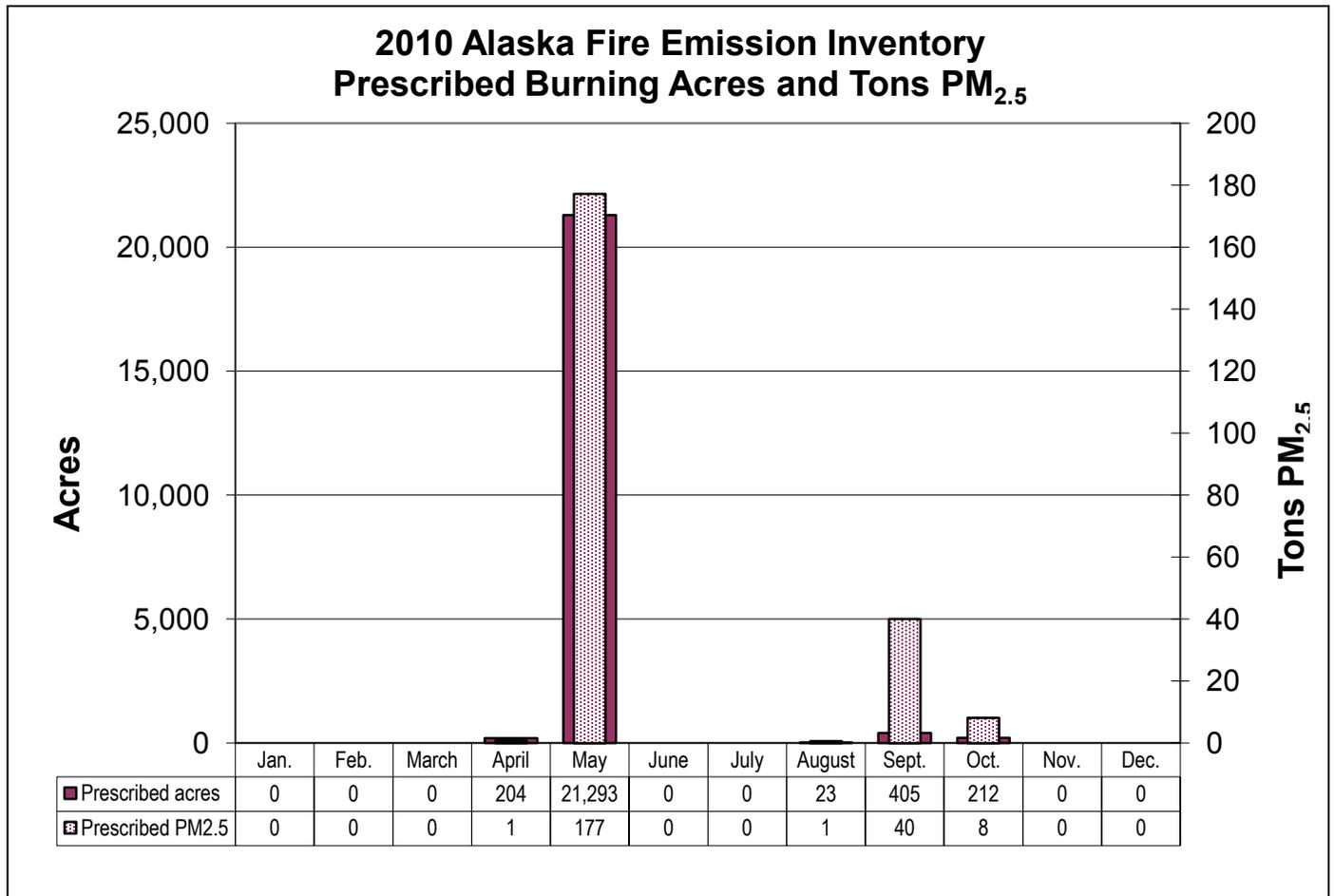


FIGURE 3

Figure 3 shows the acres of prescribed burns and tons of PM_{2.5} produced in 2010.

Almost all of the prescribed fire burn acreage occurred in May (21,293 acres, 96.2%), producing the largest amount of PM_{2.5} (177 tons, 78.0%). September with 405 acres (1.8%) and 40 tons of PM_{2.5} (17.6%) was the second largest month for prescribed burns in 2010.

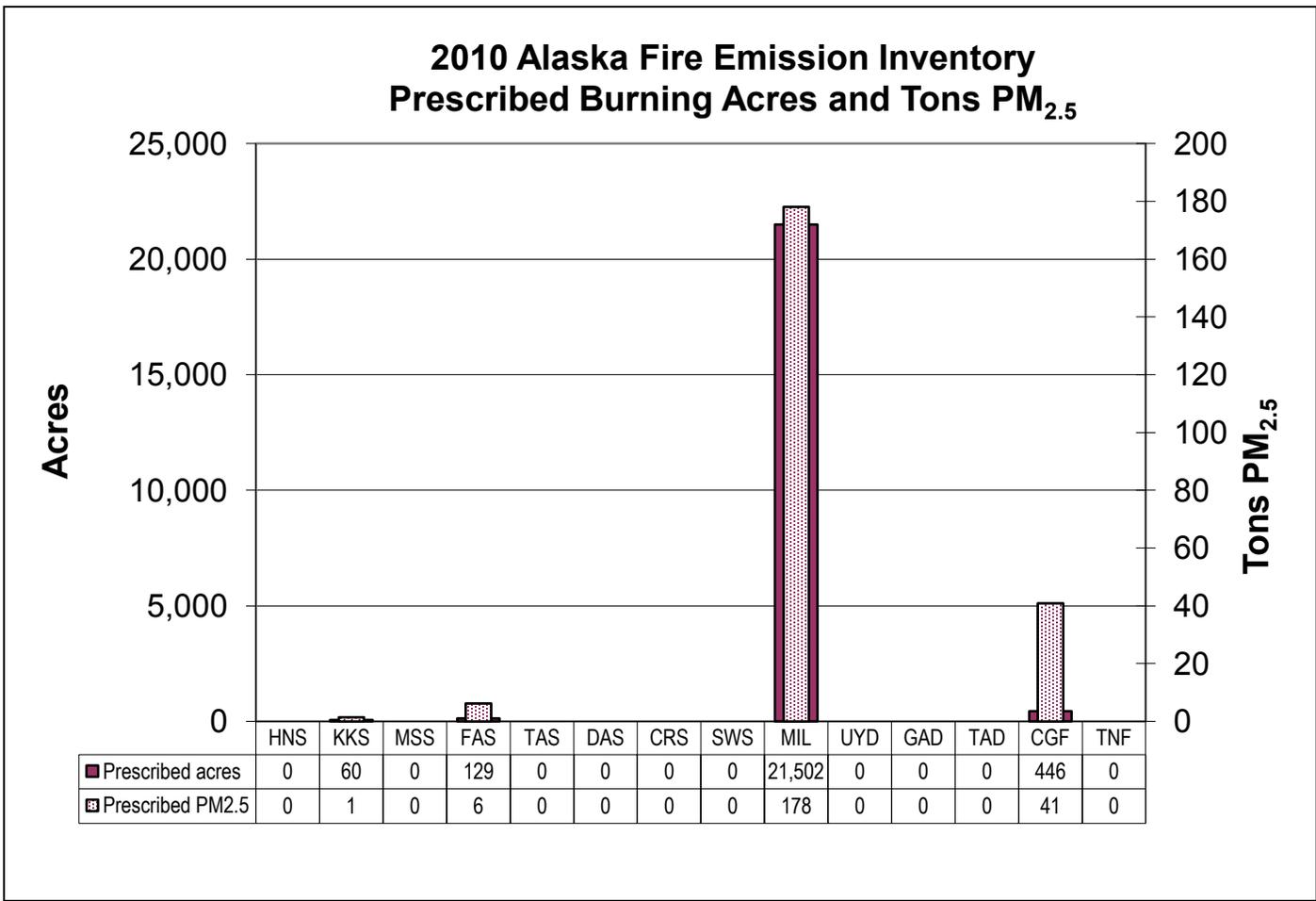


FIGURE 4

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 most of the reported prescribed burn acres in 2010 (21,502 acres or 97.1%) and consequently produced most of the tons of PM_{2.5} (178 tons or 78.4%).

The Chugach National Forest had the 2nd highest prescribed burn acreage (2.0%) and PM_{2.5} tons (41 tons, 18.1%) produced in 2010.

2010 Alaska Fire Emission Inventory Wildfire Acres and Tons PM_{2.5}

In the template, events are assigned a month by the average of the event start and end dates

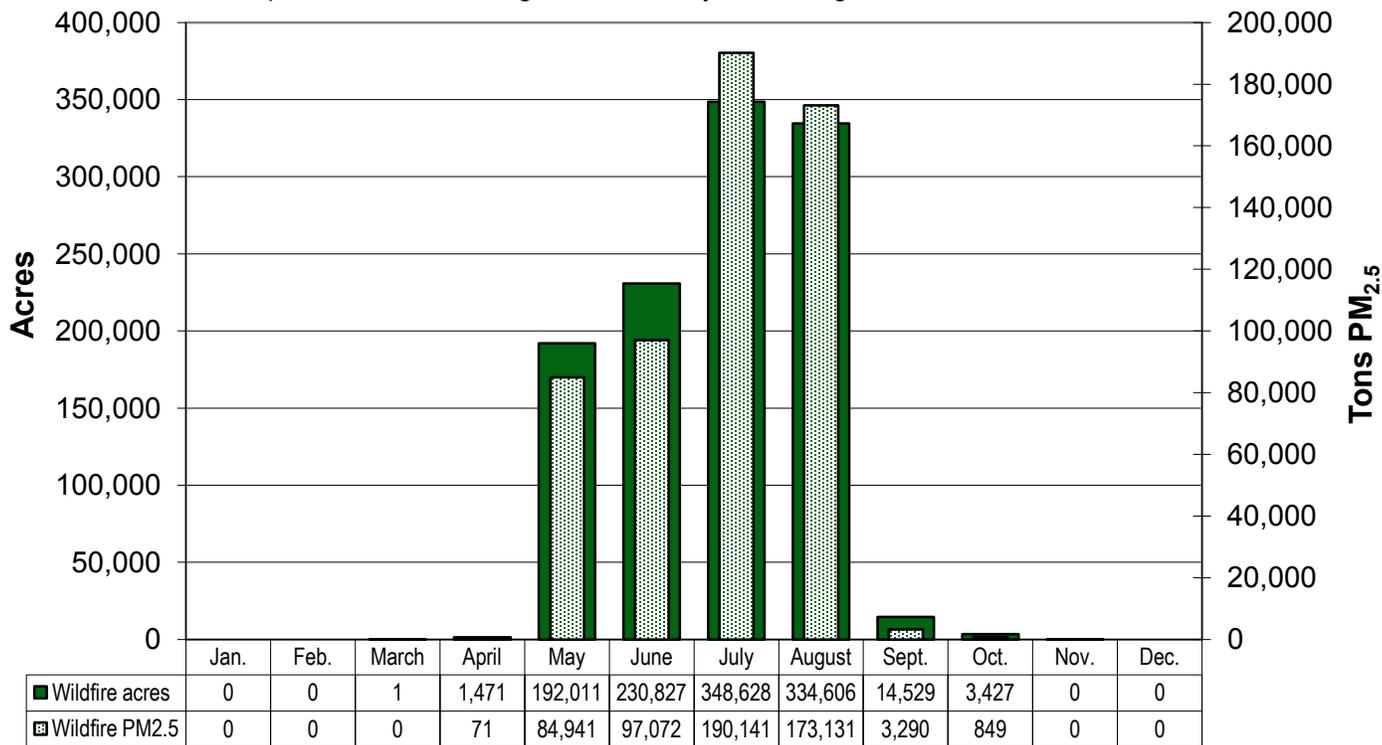


FIGURE 5

Figure 5 shows the Wildfire Acres and Tons PM_{2.5} by month.

Wildfire starts occurred March through November in 2010, but July and August were the months with the largest acreage burned (683,234 acres or 60.7%) and tons PM_{2.5} produced (363,272 tons or 66.1%).

May and June were the months with the second largest wildfire acreage burned: 442,838 acres burned (37.6%) and 182,013 tons PM_{2.5} produced (33.1%).

The months of March, April, September, and October accounted for 19,428 (1.7%) acres burned and produced 4,210 (0.8%) tons PM_{2.5}.

Note: As mentioned in the graph, the template averages the 'month' of the fire between the start and end dates, i.e., a fire with a start in June may not be called out until August; the template would call this fire a 'July' fire whether or not most of the active burning was in June, July, or August. This leads to the discrepancy between the 2010 AICC fire report and this report. In the AICC 2010 Fire Season report, June (not July as shown in the template graph above) was the month with the most acreage burned. The AICC report shows May with the most number of fires, while the template (Figure 2, page 9) indicates June had the most number of fires.

2010 Alaska Fire Emission Inventory Wildfire Acres and Tons PM_{2.5}

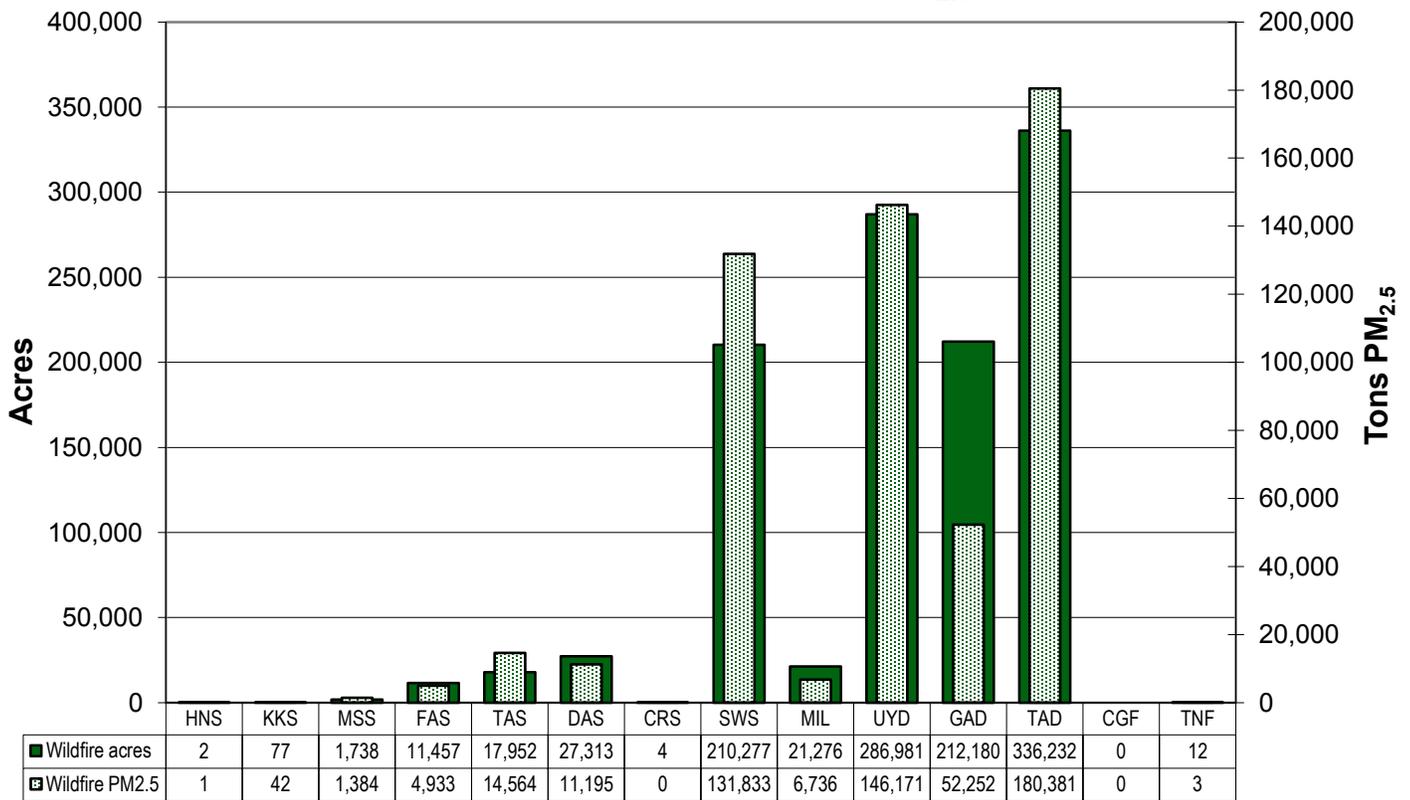


FIGURE 6

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

Thirteen of the 14 Fire Management Zones reported wildfires; 9 zones reported wildfires totalling over 80 acres. Four zones - Haines (HNS), Kenai-Kodiak (KKS), Valdez-Copper River (CRS), and Tongass National Forest (TNF) - reported less than 80 acres of wildfire acreage burned. The Chugach National Forest (CGF) did not report any wildfire acreage burned.

The four Fire Management Zones reporting the most acreage burned by wildfire were the SouthWest District, SWS (210,277 acres or 18.7%), Upper Yukon Fire Management Zone, UYD (286,981 acres or 25.5%), the Galena Fire District GAD (212,180 acres or 18.8%), and the Tanana Fire Management Zone, TAD (336,232 acres or 29.9%). The preceding four Management Zones also produced the most tons PM_{2.5} :

- SWS produced 131,833 tons PM_{2.5} or 24.0%,
- UYD produced 146,171 tons PM_{2.5} or 26.6%,
- GAD produced 52,252 tons PM_{2.5} or 9.5%, and
- TAD produced 180,381 tons PM_{2.5} or 32.8%

The remaining 5 Fire Management Zones (MSS, FAS, TAS, DAS, and MIL) reported 7.1% of the total acreage burned and 7.1% of the PM_{2.5} produced.

2010 Alaska Fire Emission Inventory Total Tons of Pollutant

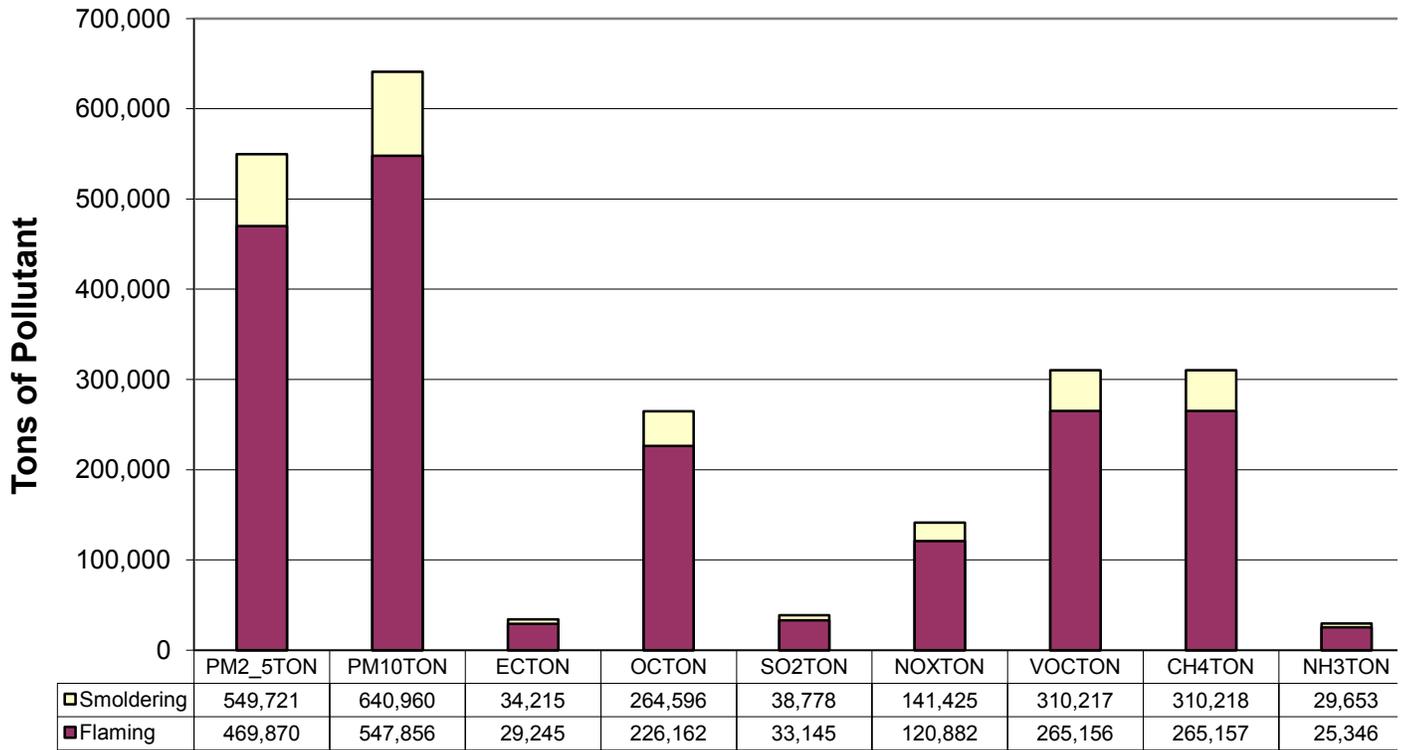


FIGURE 7

Figure 7 shows the Total Tons of Pollutant produced by the 2010 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).

The graph shows the flaming and smoldering tons of the nine air quality pollutants from all of the 2010 wildfires and prescribed burns.

The 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.

2010 Alaska Fire Emission Inventory Total Tons of PM_{2.5} Averted by Applying ERT

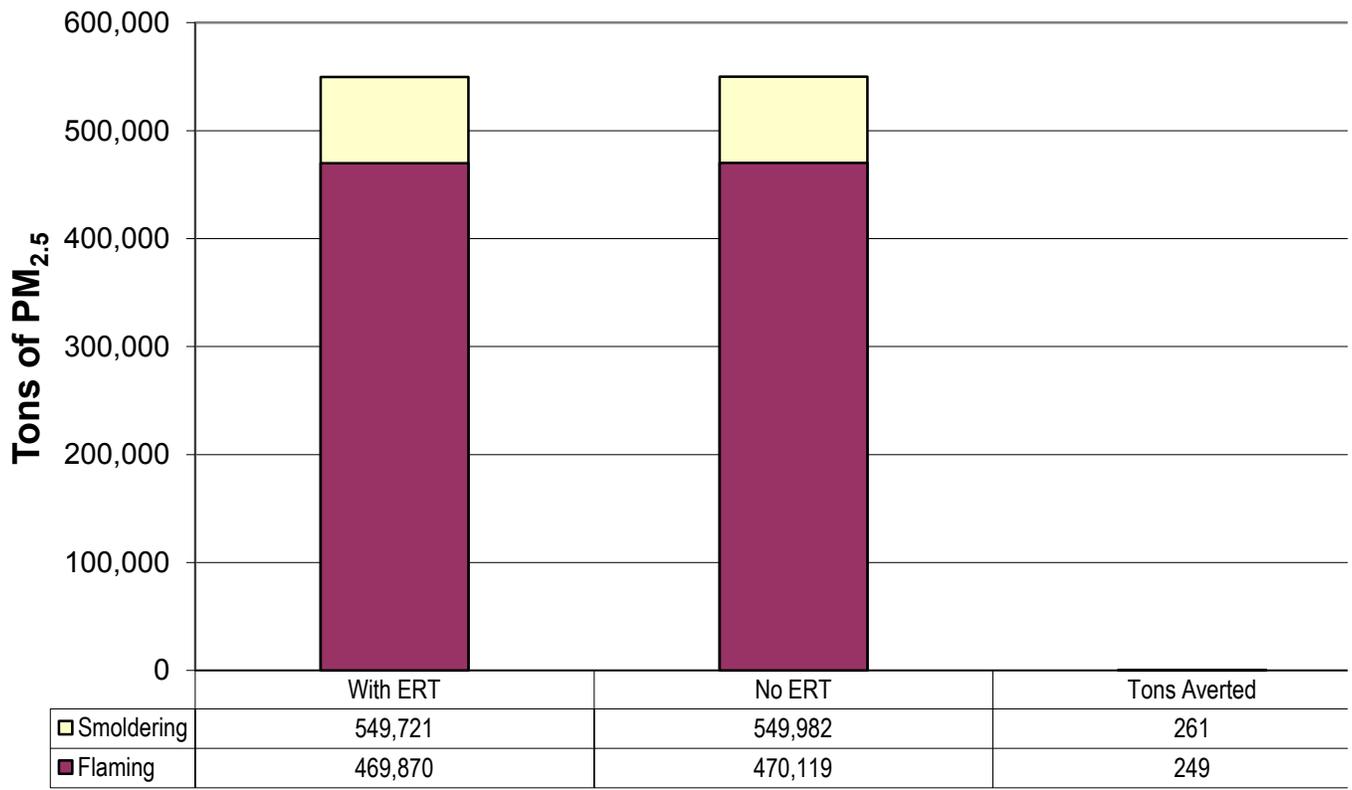


FIGURE 8

Figure 8 shows the Total Tons of PM_{2.5} Averted by Applying an Emission Reduction Technique (ERT) before or during a Prescribed Burn.

The graph shows the tons PM_{2.5} with Emission Reduction Techniques, what the numbers would have been without ERTs, and the 261 tons PM_{2.5} (0.05 %) averted with use of an ERT during prescribed burns.

2010 Alaska Fire Emission Inventory Number of Fire Events by Federal Size Class

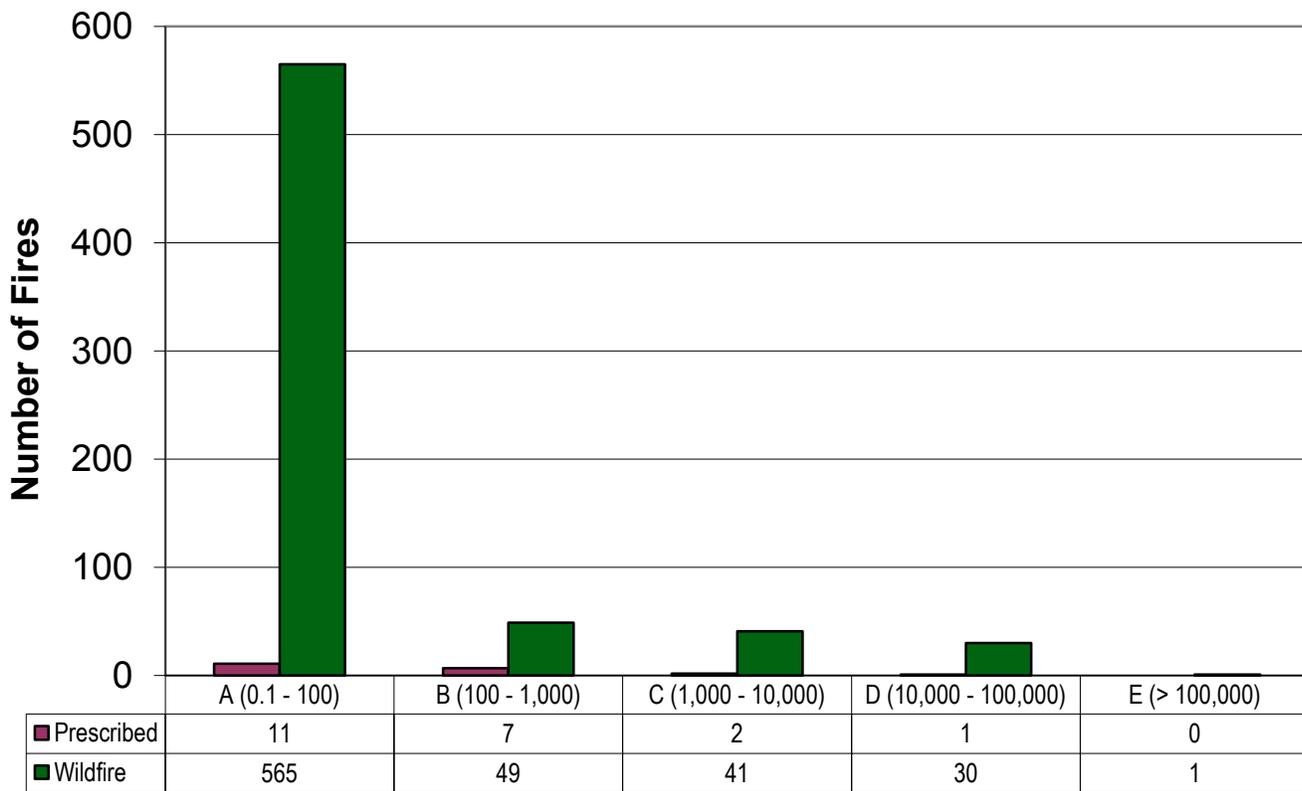


FIGURE 9

Figure 9 shows the Number of Fire Events by Federal Size Class

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

In 2010, there were a total of 576 fires (81.5%) in the Class A size (less than 100 acres); 31 fires (4.4%) in Class D (10,000 to 100,000 acres), and one fire (0.1%) in Class E (greater than 100,000 acres).

2010 Alaska Fire Emission Inventory Number of Fire Events by NWFCG Size Class

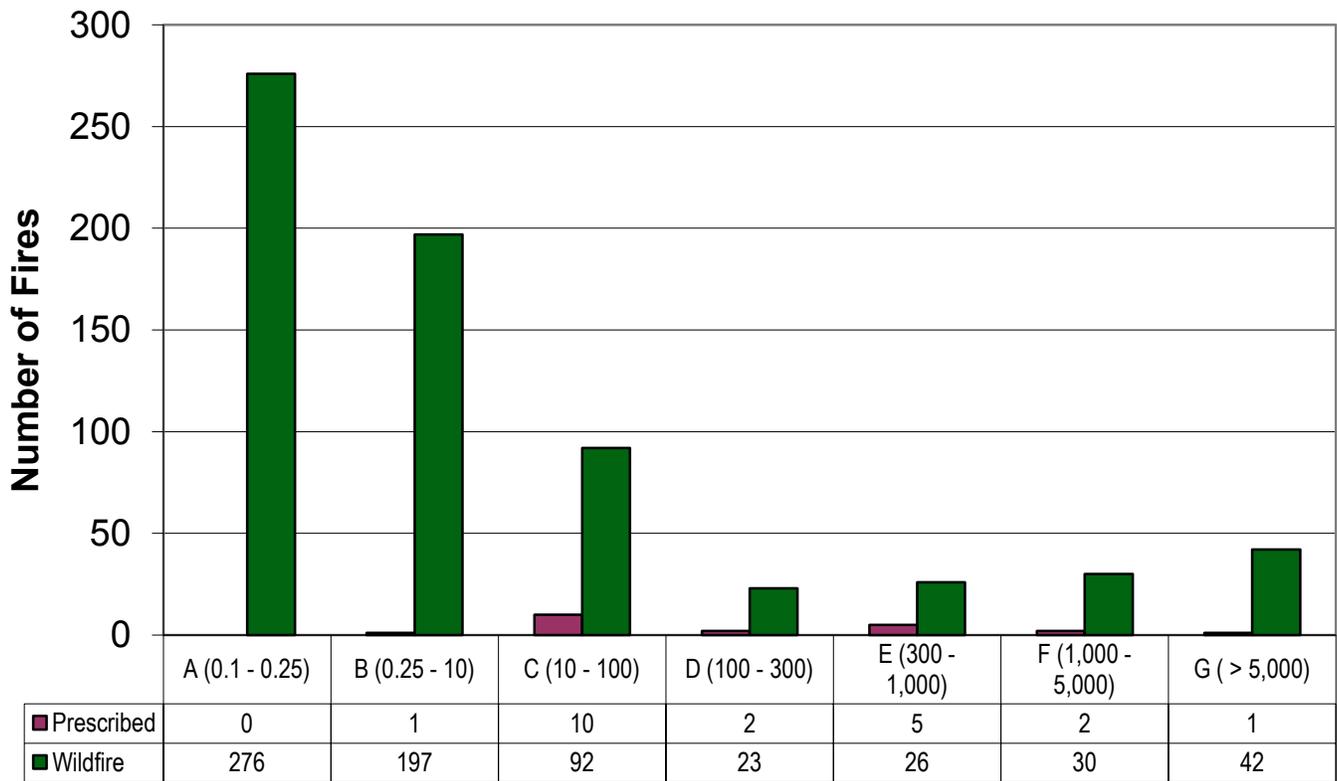


FIGURE 10

Figure 10 shows the Number of Fire Events by National Wildland Fire Coordinating Group (NWFCG) Size Class

The wildfire category is also the larger 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 (276 fires) and Class size B (198 fires) were the two largest classes; 67.0% of the fires were less than 10 acres. In 2010, there were 43 fires (6.1%) 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 situation report 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	20 or 30*	
unknown pile estimate	10	
"light fuels" estimate	10	

* Previous years "30" was used as the emission factor estimate for an unknown vegetation type. During the 2010 fire season, an emission factor of either "20" or "30" was used depending upon location of the fire; i.e., fires located in the SWS or GAD were estimated to have an emission factor of "20", the rest were estimated as "30." Overall, only a small percentage of fires did not list at least one vegetative type.

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