U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON ENERGY AND COMMERCE

October 1, 2017

TO: Members, Subcommittee on Environment

FROM: Committee Majority Staff

RE: Hearing entitled "Air Quality Impacts of Wildfires: Perspectives of Key Stakeholders"

I. INTRODUCTION

On Wednesday, October 4, 2017, at 10:00 a.m. in 2123 Rayburn House Office Building, the Subcommittee on Environment will hold a hearing entitled "Air Quality Impacts of Wildfires: Perspectives of Key Stakeholders." The hearing will explore the impacts of wildfires on air quality and air emissions, particularly from the perspective of key stakeholders.

II. WITNESSES

- **John Bailey**, Professor, Oregon State University, College of Forestry;
- **Jim Karels**, State Forester, State of Florida;
- **Knox Marshall**, Vice President of Resources, Murphy Company; and
- **Christopher Topik**, Director, Restoring America's Forest, The Nature Conservancy.

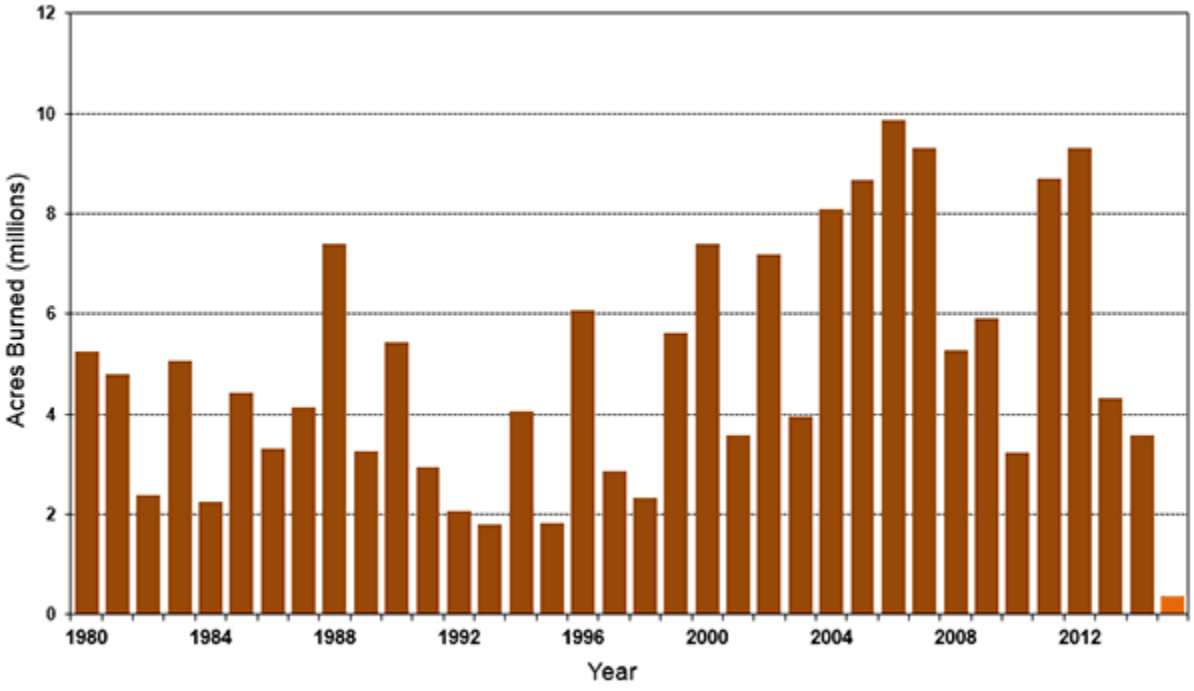
III. BACKGROUND

Through September 25 of this year, there have been 48,850 wildfires in the United States, compared to 44,440 wildfires during the same time period last year.[1] Approximately 8.5 million acres have burned in the United States during this period, compared to 4.8 million acres in 2016. Already in 2017, nearly 3.0 million more acres have burned than the *annual* average from the prior ten years (5.8 million).[2] Oregon alone had 12 fires burning as of September 25, 2017, impacting nearly 475,000 acres of land.[3]

This year is not an anomaly in terms of growing numbers of wildfires in the United States and the acres burned. The 2015 fire season established a new record for the number of acres burned in the United States.[4] Between January 1 and December 30, 2015, 10.1 million acres burned during 68,151 wildfires. Previously, the record was set in 2006 with 9,873,745 acres. The graph below illustrates the number of acres burned in U.S. wildfires from 1980-2015 (for 2015, the graph only goes through June of that year).

[1] *See* National Interagency Fire Center, https://www.nifc.gov/fireInfo/nfn.htm.
[2] *Id.*
[3] *Id.*
[4] *See* Insurance Information Institute, https://www.iii.org/fact-statistic/facts-statistics-wildfires.

NUMBER OF ACRES BURNED IN WILDFIRES, 1980–2015[5]



A. Air Quality Impacts

One of the most significant and apparent effects of wildfires are the impacts on air quality from wildfire emissions.[6] According to "Wildfire Smoke" – a document co-authored by several federal agencies in 2016 – "[w]ildfire smoke can result in significant air quality impacts to public health, particularly for at-risk groups, and impacts to safety and transportation through diminished visibility on roads and aviation corridors."[7] While the composition of smoke can vary greatly and the compounds present in it can number in the thousands, particulate matter (PM) in smoke typically causes the most concern in terms of air quality impacts.[8] Short-term exposures by the public to PM in smoke from wildfires can affect the lungs and heart.[9] Carbon monoxide – "a colorless, odorless gas produced by incomplete combustion of wood or other organic materials" – can also be emitted during wildfires, especially during the smoldering stages.[10]

---

[5] *Id.*
[6] This Memorandum focuses on air quality impacts of wildfires; however, it is important to note that there are other public health effects associated with wildfires, e.g. drinking water impacts. *See* "Western Water Threatened by Wildfire: It's Not Just a Public Lands Issue," American Forest Foundation (Oct. 2015); https://www.forestfoundation.org/western-water-forests-report.
[7] "Wildfire Smoke, A Guide for Public Health Officials," revised May 2016; authored by U.S. Environmental Protection Agency, U.S. Forest Service, U.S. Centers for Disease Control and Prevention, and California Air Resources Board, at 11.
[8] *See id.*
[9] *Id.*
[10] *Id.*, at 8.

1. Air Quality Data from Wildfires

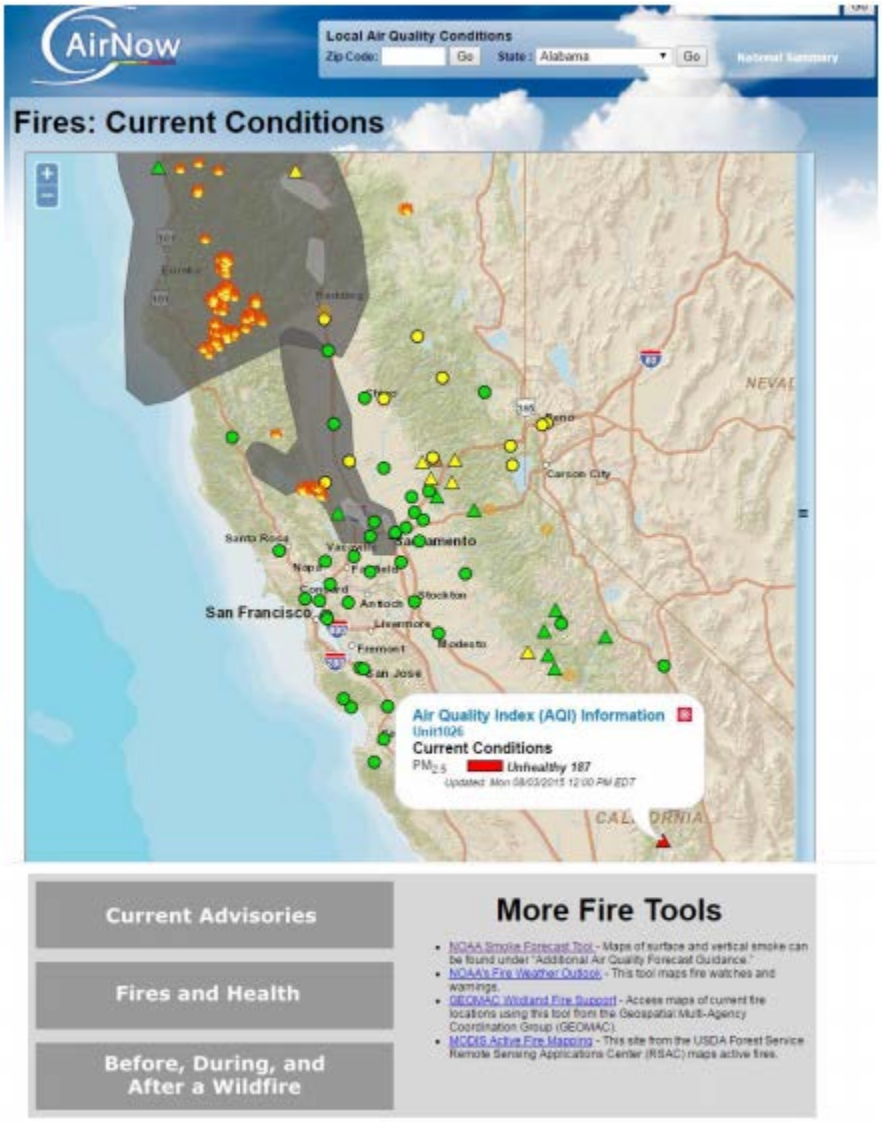
Given the growing number of wildfires and resulting smoke impacts, the U.S. Forest Service[11] has partnered with several other federal agencies, including the U.S. Environmental Protection Agency (EPA), the U.S. National Park Service, and the Bureau of Land Management, to create the Wildland Fire Air Quality Response Program.[12] The program focuses on identifying and addressing the risks associated with wildfire smoke. Monitoring equipment developed through the program can be sent to wildfire events to monitor and measure the magnitude of smoke impacts. The near-real time data from the smoke monitoring equipment – including PM2.5 measurements – is made publicly available on EPA's AirNow website.[13]

AirNow contains air quality information based upon the Air Quality Index (AQI). The AQI is a "nationally uniform index promulgated by the EPA for reporting and forecasting daily air quality across the country."[14] The AQI uses the following labels to describe the levels of PM and ozone in the air: Good, Moderate, Unhealthy for Sensitive Groups, Unhealthy, Very Unhealthy, and Hazardous. Under the AQI, ambient concentration levels of PM and ozone are converted to a scale from 0 to 500, with 100 being the value that meets the national air quality standard. As the chart below indicates, the descriptors are categorized based upon the 0 to 500 numerical scale.[15]

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
When the AQI is in this range:	*..air quality conditions are:*	*...as symbolized by this color:*
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

[11] The U.S. Forest Service, an agency within the United States Department of Agriculture, "manages and protects 154 national forests and 20 grasslands in 43 states and Puerto Rico. The agency's mission is to sustain the health, diversity, and productivity of the nation's forests and grasslands to meet the needs of present and future generations." *See* https://www.fs.fed.us/about-agency.
[12] *See* https://wildlandfiresmoke.net/.
[13] *See* https://www.airnow.gov/.
[14] "Wildfire Smoke, A Guide for Public Health Officials," at 32.
[15] *See* https://airnow.gov/index.cfm?action=aqibasics.aqi.

The AirNow website also contains a wildfire map webpage (see below), showing the current wildfire conditions across the United States.[16] The Forest Service, EPA, and local and state air quality agencies jointly contribute to and maintain the webpage. The wildfire map displays several categories of data, including the current network of PM2.5 monitors, any temporary monitors operating during a fire event, active wildfires, and smoke plumes.



2. Air Emissions from Wildfires

Wildfires, which release enormous amounts of particulate matter and greenhouse gases, are major contributors to overall national and international emissions. According to EPA, "forest wildfire emissions in the lower 48 states and Alaska released an average of 105.5 million tons

[16] *See* https://www.airnow.gov/index.cfm?action=topics.smoke_wildfires.

(range, 65.3 to 152.8) of carbon dioxide into the air each year from 2000 to 2005."[17] In 2005 alone, wildfires resulted in more than 126 million tons of carbon dioxide in the United States.[18] In a more geographically specific example, the carbon dioxide released during the 2002 Biscuit Fire in southwest Oregon amounted to almost one-quarter of the total carbon dioxide emitted in Oregon that year.[19]

Last year, the Forest Service published a report summarizing air quality measurements and data from the 2015 fire season in the Pacific Northwest.[20] During that wildfire season, a total of 3,800 fires burned more than a million acres in Washington, and almost two-thirds of a million acres in Oregon.[21] The table below shows the tons of PM2.5 and GHGs emitted during the 2015 Washington and Oregon fires, with comparisons to emissions from vehicles and home energy use.[22]

Table 6. Air pollutant emissions from Pacific Northwest wildfires in 2015.

	Oregon	Washington
Acres Burned by Wildfire (all land owners)	685,809	1,089,966
PM2.5 (tons)	90,341	161,369
Greenhouse Gases (tons)		
Carbon Dioxide (CO_2)	13,345,004	24,998,017
Methane (CH_4)	36,699	61,115
CO_2 equivalent [1]	14,262,479	26,525,892
Equivalent passenger vehicles driven for one year [1]	3,002,627	5,584,398
Homes' energy use for one year[1]	1,301,321	2,420,246

[1] www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

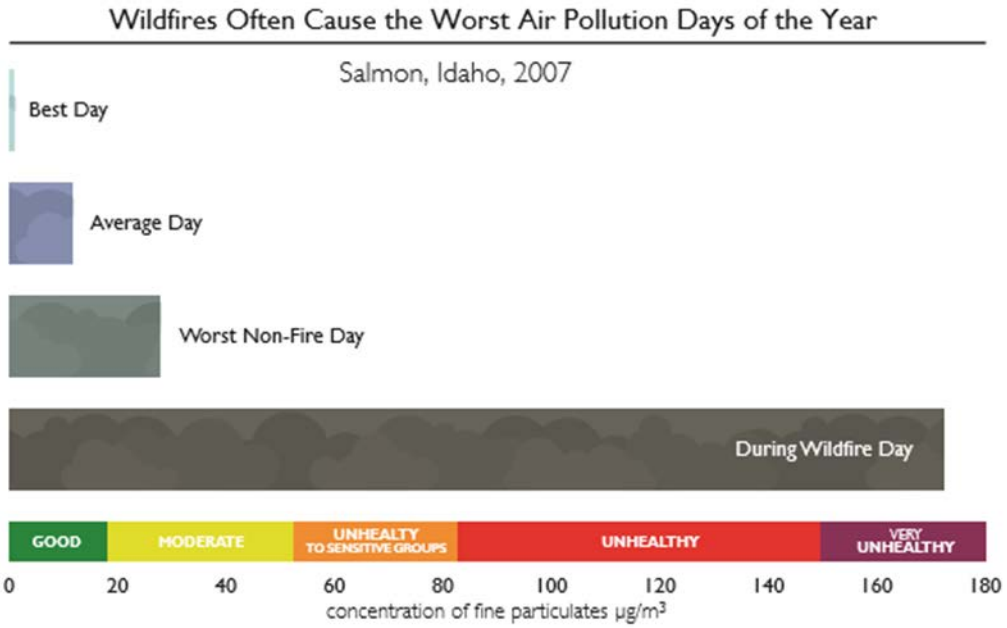
This summer, researchers from Georgia State University released a study, in which they determined that "[w]ildfires burn much more biomass per area than professional prescribed burns, and pollute at a much higher rate."[23] Based upon data gathered during flights over the plumes of the 2013 Rim Fire in California, the Georgia State researchers found that the plumes

[17] "Forest Management Solutions for Mitigating Climate Change in the United States," Journal of Forestry (April/May 2008), at 141; https://www.ntc.blm.gov/krc/uploads/399/Forest%20Management%20Solutions%20for%20Mitigating%20Climate%20Change.pdf.
[18] *Id.*
[19] "State of Fire," Oregon Forest Resources Institute; http://www.oregonforests.org/sites/default/files/2017-05/OFRI_2014_Fire_Report_0.pdf.
[20] "Air Quality Summary Report for the 2015 Pacific Northwest Fire Year," USDA Forest Service (Sept. 2016); http://www.oregon.gov/ODF/Board/Documents/USFS%20Air%20Quality%20Summary%20Report%20for%20the%202015%20PNW%20Fire%20Year.pdf.
[21] *Id.* at ES-1.
[22] *Id.* at 12.
[23] Georgia Institute of Technology, "Wildfires pollute much more than previously thought: Data from flights through plumes reveal three times the fine particle levels than officially inventoried," *Science Daily* (June 14, 2017); https://www.sciencedaily.com/releases/2017/06/170614112819.htm.

contained three times as much particulate matter as the emissions inventoried by EPA.[24] In other words, statistics may be capturing only a fraction of the actual emissions from wildfires.

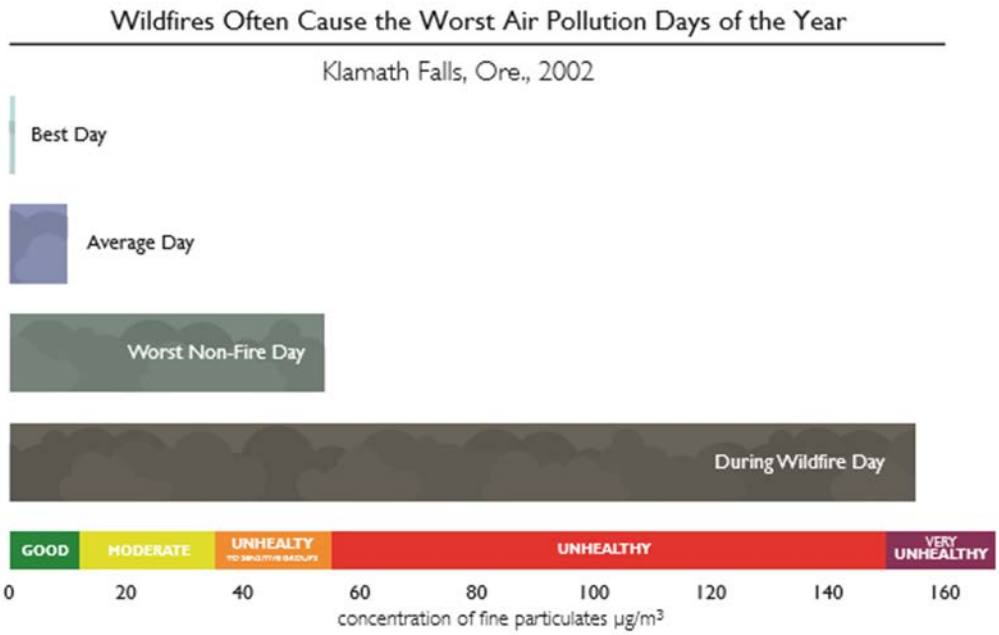
Emissions released during wildfires are significantly greater than what the impacted areas will experience at any point during the year or fire season. As a result, smoke from wildfires often results in the worst air quality days of the year for those areas. According to a 2013 analysis of wildfires and air pollution, researchers from Climate Central determined that "[s]moke from all of the fires … analyzed caused the worst air quality days of the year. …Wildfires burning within 100 miles of a city routinely caused air quality to be 5-15 times worse than normal, and often 2-3 times worse than the worst non-fire day of the year."[25] The three charts below illustrate how much worse air quality can be during wildfires as opposed to an average day in an area.[26]

Salmon, Idaho (2007)

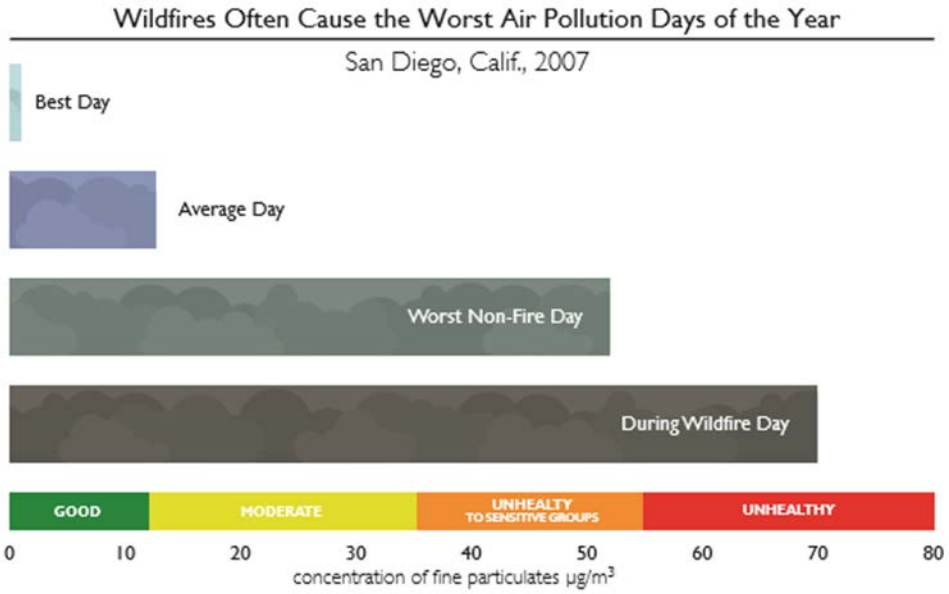


[24] *Id.*
[25] "Wildfires and Air Pollution: The Hidden Health Hazards of Climate Change," Climate Central (2013), at 12; http://www.climatecentral.org/news/report-wildfires-and-air-pollution-a-hidden-hazard-16651.
[26] *Id.*, at 17; 26; and 29.

Biscuit Fire – Klamath Falls, Oregon (2002)



Southern California Fires – San Diego, California (2007)



3. Health Effects from Wildfire Smoke Exposure

Wildfires expose the public to numerous "environmental hazards, e.g. fire, smoke, and the byproducts of combustion wood, as well as, plastics and other chemicals that can be released from burning structures and furnishings, and also hazards such as psychological stress. During the most severe phases of a wildfire, the major hazards are from the wildfire itself and associated smoke exposures."[27] With respect to health impacts, short-term exposure to particulate matter in smoke is typically the chief concern during wildfires. Those impacts can include eye and respiratory irritation, impaired lung function, bronchitis, and exacerbation of asthma.[28] Also, there can be heightened concerns if members of sensitive populations, i.e. children, elderly and pregnant women, are exposed to particulate matter in wildfire smoke.[29]

Additionally, smoke from wildfires can contain carbon monoxide (CO), which can impair the delivery of oxygen to the body's organs and tissues. Typically, CO concentrations from wildfire smoke do not create a substantial risk except potentially to "some sensitive individuals and to firefighters very close to the fire line."[30] Sizeable quantities of respiratory irritants, such as formaldehyde and acrolein, may be present in wildfire smoke, too. Those irritants can result in eye and respiratory irritation, and possibly aggravate asthma conditions.

The multi-federal agency 2016 guide on wildfire smoke also included the following determinations:

- With respect to wildfire smoke, "in general, the long-term risks from short-term exposures are quite low."[31]

- "It is important to recognize that not everyone who is exposed to thick smoke from wildfires will have health problems. The level and duration of exposure, age, individual susceptibility, including the presence or absence of pre-existing lung (e.g., asthma, COPD) or heart disease, and other factors play significant roles in determining whether someone will experience smoke-related health problems."[32]

When catastrophic wildfires break out, like some of the ones experienced in the United States this year, understanding the potential health effects from exposure to wildfire smoke is critical. This summer alone, public pools in Portland, Oregon closed to encourage children to remain inside; the University of Idaho (Moscow) gave out masks to filter smoke from Montana wildfires; and a Denver, Colorado school district canceled recess because of smoke from Pacific Northwest fires.[33]

---

[27] "Wildfire Smoke, A Guide for Public Health Officials," at 13.
[28] *Id.*, at 13.
[29] *Id.*
[30] *Id.*
[31] *Id.*
[32] *Id.*, at 14.
[33] *See* "Resources 'stretched thin' fighting massive wildfires in the West," Erin Ross, Axios (Sept. 7, 2017); https://www.axios.com/resources-stretched-thin-fighting-massive-wildfires-in-the-west-2482331015.html.

4. National Air Quality Standards

On the regulatory front, emissions from wildfires can lead to exceedances of national ambient air quality standards (NAAQS), especially for particulate matter and ozone. Under the Clean Air Act, EPA sets national standards for criteria pollutants such as particulate matter (PM2.5) and ozone. States and localities must meet those standards to be designated in "attainment" by EPA. In October 2016, EPA finalized a new Exceptional Events Rule, which governs the exclusion of "event-affected air quality data." [34] Simultaneously, EPA released final "Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that May Influence Ozone Concentrations," which applies the revised Exceptional Events Rule to wildfire events that could influence monitored ozone levels.[35]

The Forest Service made the following statements in a September 12, 2017 briefing paper on wildfire smoke and NAAQS:

> The pollutants in smoke can cause exceedances of the [EPA's] air quality standards for ozone and PM2.5. This could lead to a designation by EPA of a nonattainment area which can have substantial economic ramifications and can complicate future use of prescribed fire. States impacted by fires that cause an exceedance will need to follow the Exceptional Event Rule and demonstrate to EPA that it was caused by the fire. This is costly and resource consuming for states through wildfire smoke frequently exceed standards.[36]

The Committee has heard testimony on numerous occasions, including earlier this year, about how a NAAQS "nonattainment" designation can stymie economic development and job creation in the impacted area.[37]

B. Reducing the Risk of Wildfires through Forest Management

According to a September 26, 2017 briefing by Secretary of Agriculture Sonny Perdue, the Forest Service has spent approximately $2 billion this year in fighting fires – making 2017 the most expensive year on record already.[38] They expect that number to rise to $2.4 billion by the end of September of this year.[39] Between 2005-2014, the federal government spent almost

---

[34] *See* 81 Fed. Reg. 68216 (Monday, Oct. 3, 2016); https://www.epa.gov/sites/production/files/2016-09/documents/exceptional_events_rule_revisions_2060-as02_final.pdf.
[35] *Id.*
[36] "Forest Service Wildland Fire Smoke Efforts" Briefing Paper, USDA Forest Service (Sept. 12, 2017).
[37] *See* https://energycommerce.house.gov/hearings/hr-806-ozone-standards-implementation-act-2017/.
[38] *See* "Democrats cautiously back forest management bills as fires rage," Jeremy Dillon, CQ (Sept. 27, 2017); http://plus.cq.com/doc/news-5184549?0.
[39] *Id.*

$16 billion on wildfire suppression.[40] Many of these costs – and the air quality impacts discussed herein – may have been avoided or minimized with better management of our forests, particularly on federal lands.

1. History of Federal Fire Policy

Up until the 1970s, the federal government pursued an aggressive fire control policy. It operated under policies such as the *10-acre policy* – all wildfires should be contained before exceeding 10 acres – and the *10:00 a.m. policy* – if a fire grew beyond 10 acres, then firefighting activities should focus on containment prior to the next burning period began at 10:00 a.m.[41] In the late 1970s, the Forest Service and the National Park Service shifted their approaches and began implementing "prescribed natural fire" or "let-burn" policies.[42] "Under these policies, fires burning within prescribed areas (such as wilderness areas) would be monitored, rather than actively suppressed; if weather or other conditions changed or the wildfire threatened to escape the specified area, it would then be suppressed."[43] Current federal fire policies focus more on fire management plans. "[U]nplanned fire ignitions" – whether started by lightning or humans – are condoned if they take place within locations and under weather conditions identified in the fire management plans.[44]

Since the 1990s, there have been growing concerns expressed about "unnatural fuel loads."[45] *Fuel loads* are continuous brush, downed vegetation, or small trees within forests. A 1994 report from the Congressionally-established National Commission on Wildfire Disasters determined that fuel loads were "dangerously high."[46] GAO reports issued in 1999 echoed these sentiments, recommending that the Forest Service and the Bureau of Land Management develop a unified strategy to address firefighting weaknesses. Excessively high fuel loads have continued to be a source of concern through the years, from President Clinton's National Fire Plan to the Bush Administration's Healthy Forest Initiative.[47]

2. Fuel Reduction

With the number and strength of wildfires growing every year, it is imperative that more aggressive steps be taken to reduce the risk of wildfires. The most important of those steps is reducing the fuel loads – the burnable biomass – in our forests. The primary means of fuel reduction are (1) *prescribed burns*; and (2) *mechanical treatments*.[48]

---

[40] *See* Wildland Fires and Air Quality, U.S. EPA, U.S. Department of Interior, and U.S.D.A. (April 4, 2016); https://www.epa.gov/sites/production/files/2016-04/documents/2016_04_04_joint_wildland_fire_air_quality_messages.epa_usda_doi.final_.pdf.
[41] *See* "Forest Fire/Wildfire Protection," Kelsi Bracmort, Congressional Research Service (May 22, 2013), at 2.
[42] *Id.*, at 2.
[43] *Id.*
[44] *Id.*
[45] *Id.*, at 3.
[46] *Id.*
[47] *Id.*
[48] "Wildfire Damages to Homes and Resources: Understanding Causes and Reducing Losses," Kelsi Bracmort, Congressional Research Service (May 23, 2013), at 9.

a. Prescribed Burning

"Prescribed burning is intentionally setting fires in specified areas when fuel and weather conditions are within prescribed limits (e.g., fuel moisture content, relative humidity, wind speed.)"[49] It is used to reduce biomass fuels because it is the only workable way to remove *fine fuels* – grasses, needles, leaves, etc., that enable wildfires to spread. The Forest Service, EPA, and the Department of Interior are supportive of using prescribed fires as a means of removing or lessening vegetation in fire-prone areas, and thereby reducing the risk of wildfires.[50] Prescribed burns also involve substantially less smoke than catastrophic wildfires, so any resulting air quality impacts tend to be nominal. In fact, emissions and air quality impacts from prescribed burns must be kept to a minimum because of federal and state air quality standards. The table below illustrates some of the advantages of prescribed burning versus wildfires, particularly with respect to air quality and emissions.[51]

Table 12. Comparison of prescribed fire and wildfire characteristics in Oregon and Washington in 2015.

Characteristic	Prescribed Fire	Wildfire
Acres Burned (including piles)	242,415	1,775,775
Acres Burned (not including piles)	35,796	1,775,775
Fatalities	0	3
Homes and Structures Lost	0	634
GHG Emissions (tons of CO2eq)	2,615,163	40,788,371
GHG Emissions (tons/acres)	10.79	22.97
PM2.5 Emissions (tons)	29,066	251,710
	0.12	0.14
Smoke Intrusions	10	n/a
Number of Days AQI > USG	1	407
Population Exposure to > USG	81,310	10,056,547

There can be limitations on prescribed burning: it can be risky because no fire can be controlled completely; it can be an "indiscriminate tool" for removing vegetation and fuel loads; and it can have monetary costs associated with it.[52]

---

[49] *Id.*, at 10.
[50] *See* Wildland Fires and Air Quality, U.S. EPA, U.S. Department of Interior, and U.S.D.A. (April 4, 2016); https://www.epa.gov/sites/production/files/2016-04/documents/2016_04_04_joint_wildland_fire_air_quality_messages.epa_usda_doi.final_.pdf.
[51] *See* "Air Quality Summary Report for the 2015 Pacific Northwest Fire Year," USDA Forest Service (Sept. 2016), at 35; http://www.oregon.gov/ODF/Board/Documents/USFS%20Air%20Quality%20Summary%20Report%20for%20the%202015%20PNW%20Fire%20Year.pdf.
[52] "Wildfire Damages to Homes and Resources: Understanding Causes and Reducing Losses," Kelsi Bracmort, Congressional Research Service (May 23, 2013), at 10.

b. Mechanical Treatment

Reducing biomass in forests and other areas through mechanical fuel treatment can take many different forms, e.g., thinning, pruning, release, and salvage harvesting.[53] These mechanical treatments, such as thinning, are advantageous means of reducing fuel loads because they can be done in a precise manner and target certain trees or stands.[54] There also can be economic benefits because the removed trees may be sold.[55] Federal agencies have recognized that mechanical treatment of fuels can slow down the spread of wildfire and reduce the intensity of wildfires.[56] Disadvantages of mechanical treatments have been recognized as well, such as the potential to create more surface fuels if the thinned fine fuels are not removed.

Fuel reduction – whether it is prescribed burns or mechanical treatments – must be undertaken on both public and private lands. There is a growing awareness that federal lands are lacking in adequate forestry management, particularly with respect to reducing fuel loads. As a result, those unmanaged federal forestry lands can pose greater wildfire risks. For example, 474,482 acres of forestry lands burned in the Sierra Nevada area of California (covering 22 counties) in 2012.[57] Of the total acres burned that year, 82 percent were federal lands while only 18 percent of the burned acres were non-federal lands.[58] Over a fifteen-year period (1998-2012), an average of 75 percent of the total acres burned in the Sierra Nevada area are federal lands.[59] Wildfires do not distinguish between federal and non-federal boundaries when they are burning and spreading. Consequently, forest management on federal lands also affects private and state managed lands.

c. Federal Decision-Making

Another problem associated with undertaking fuel treatments are the delays in related federal decisions and processes, such as consultations under Endangered Species Act (ESA) and reviews under the National Environmental Policy Act (NEPA).[60] "Over a 10-year period, the likelihood of an area burning is more than 6 [percent]...."[61] Consequently, long delays in ESA and NEPA decisions by the federal government can increase the risks of wildfires, as forestry land goes untreated.

---

[53] *Id.*, at 10-11.
[54] A *stand* is a contiguous group of trees that are similar enough in size, type, quality, age, etc., to distinguish from another group of trees. A forest is a collection of stands.
[55] *Id.*, at 11-13.
[56] *See* Wildland Fires and Air Quality, U.S. EPA, U.S. Department of Interior, and U.S.D.A. (April 4, 2016); https://www.epa.gov/sites/production/files/2016-04/documents/2016_04_04_joint_wildland_fire_air_quality_messages.epa_usda_doi.final_.pdf.
[57] *See* "Systems Indicators Fire Threats," Sierra Nevada Conservancy (Sept. 2013), at 27; http://www.sierranevada.ca.gov/our-region/sys_ind_docs/FINALFireThreatSI92713.pdf.
[58] *See* "Systems Indicators Fire Threats," Sierra Nevada Conservancy (Sept. 2013), at 12; http://www.sierranevada.ca.gov/our-region/sys_ind_docs/FINALFireThreatSI92713.pdf.
[59] *Id.*
[60] "Wildfire Damages to Homes and Resources: Understanding Causes and Reducing Losses," Kelsi Bracmort, Congressional Research Service (May 23, 2013), at 15-22.
[61] *Id.*, at 16.

IV. ISSUES

The following issues may be examined at the hearing:

- Air quality and other public health impacts from wildfires;
- States' roles in addressing air quality impacts from wildfires;
- The role of forest management on reducing catastrophic wildfires and the resulting air quality impacts; and
- Factors that affect implementation of effective forest management policies.

V. STAFF CONTACTS

If you have any questions regarding this hearing, please contact Mary Martin or Tom Hassenboehler of the Committee staff at (202) 225-2927.