ATTACHMENT V

Technical Support Document on Agricultural and Forestry Smoke Management in the MANE-VU Region

September 1, 2006

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1. Introduction

This technical support document aims to provide States with information useful in addressing agricultural and forestry smoke management in their State Implementation Plans (SIP). This document may also be useful for tribes in MANE-VU that choose to include smoke management issues in their Tribal Implementation Plans (TIP).

Each State must develop a long-term (10-15 years) strategy for making reasonable progress towards the national goal stated in 40 CFR 51.300(a), "preventing any future, and remedying any existing, impairment of visibility in mandatory Class I Federal Areas which impairment results from man-made air pollution." States are required to develop long-term strategies for each mandatory Class I Federal Area located within the state and each mandatory Class I Federal Area located outside the state that may be affected by sources within the state. According to 40 CFR section 51.308(d)(3)(v)(E), States must consider "smoke management techniques for agricultural and forestry management purposes including plans as currently exist within the State for these purposes" in developing its long-term strategy.

Prior to developing their Regional Haze SIP/TIP, States/tribes must consider the air quality and visibility impacts of fires in the Region and evaluate whether their existing approaches to regulating fires are adequate. States must determine whether or not smoke management is necessary to mitigate the impacts of fires to meet the 2018 reasonable progress goals for Class I Areas. If smoke management policies are required for a particular Class I Area, then a smoke management program (SMP) should be initiated by the affecting States as appropriate. If smoke management policies are not required to meet 2018 goals, then States must include a brief discussion in their SIPs as to why a SMP is not required at this time. If States already have a SMP or other smoke management policy in place, then they are advised by the EPA to mention their policies in the SIP, whether or not they will be used to meet 2018 goals (see EPA's "Interim Air Quality Policy on Wildland and Prescribed Fires," available online at http://www.epa.gov/ttn/oarpg/t1/memoranda/firefnl.pdf).

A primary objective of this document is to provide information on the impact of fires on haze in the MANE-VU Region. Section 2 describes fires and smoke management in the MANE-VU Region, section 3 provides information on the air quality and visibility impacts of pollutants from wildland and prescribed fires, section 4 presents fire emissions inventory data, section 5

presents relevant MANE-VU source apportionment study results. While the contribution of fires to regional haze appears to be minor, fires may cause visibility problems on an episodic basis.

States are not required to include a SMP in their SIP. However, there are incentives for States to certify to the EPA that they have adopted and are implementing a basic SMP, whether or not the State chooses to incorporate the SMP into their SIP or make the SMP federally enforceable. Section 6 describes existing SMPs in the Region, provides an explanation of the incentives for States, and briefly explains the necessary elements in a basic SMP. Section 7 summarizes the key points presented in this paper.

2. Fires and Smoke Management in the MANE-VU Region

While some of the fires that occur in the MANE-VU Region are subject to SMPs, others are not. The definitions provided in this section are consistent with the descriptions included in the EPA's "Interim Air Quality Policy on Wildland and Prescribed Fires" (prepared in 1998 and available online at http://www.epa.gov/ttn/oarpg/t1/memoranda/firefnl.pdf), and the Western Regional Air Partnership's "Policy for Categorizing Fire Emissions" (prepared in 2001 and available online at www.fs.fed.us/pnw/fera/research/FirePolicy.pdf). Agricultural and forestry smoke management applies to all fires that are managed to achieve resource benefits, regardless of the cause of ignition (e.g. deliberate to meet specific objectives, lightning, arson, accidental, etc.) or the purpose of the fire (resource management, hazard reduction, etc.). Agricultural fires include all fires ignited by management actions to achieve benefits on agricultural land, such as croplands and pasture. Prescribed fires include all fires ignited by management techniques to achieve benefits on land other than agricultural land. Prescribed fires can be used for managing forests or rangeland, land on which the historic climax plant community is predominantly grasses, grass-like plants, forbs, or shrubs. Managed burning of logging debris, sometimes called slash burning, may also be used for forest management. Land managers may also manage naturally ignited fires to achieve resource benefits if the proper requirements have been met in the Fire Management Plan. These fires are termed Wildland Fire Use.

Naturally ignited fires in areas without plans for wildland fire use are considered unwanted fires or "wildfires" and are not covered by agricultural and forestry smoke management. Wildfires include any unwanted, non-structural fires that occur on wildlands, where there are a limited number of structures, or agricultural lands. Wildfires may be ignited by lightning, escaped prescribed fires, arson, or accidents, such as fireworks, cigarettes, escaped campfires, or vehicle fires, and are suppressed by management action. High pollutant concentrations attributable to wildfires can be treated as due to a natural event under EPA's Natural Events Policy. Under this policy, EPA may use its discretion not to redesignate areas as nonattainment if the State develops and implements a plan to respond to the health impacts of natural events.

Residential, industrial, and commercial/institutional wood combustion, open burning, slash burning, and structure fires are also not covered by SMPs. Residential industrial, and commercial/institutional wood combustion includes the burning of wood in indoor fireplaces and woodstoves and outdoor equipment. Open burning activities can occur at residential, commercial, or industrial sites and involve the burning of yard waste, including various types of plants and plant growth.

Emissions inventory results from 2002 (see section 4) show that the majority of fire emissions in the MANE-VU Region are from residential wood combustion. The Region is not prone to

wildland fires due to vegetation types and relatively abundant rainfall. Agricultural and prescribed burning are also uncommon in the Region.

Typically, wood smoke is not detected in large amounts at monitoring sites in the MANE-VU Region. Several source apportionment studies that have been conducted in the MANE-VU Region show that wood smoke is a small to moderate contributor to fine particle pollution at monitoring sites (see section 5). Most source apportionment studies cannot distinguish between different types of fires, but smoke from agricultural and forestry activities is unlikely to be significant in the MANE-VU Region.

There are a few documented examples of wildfires producing large quantities of wood smoke and causing visibility impairment in MANE-VU Class I Areas. These fires have typically occurred outside the Region. For example, the July 7, 2002 Quebec Fires resulted in the largest one-day visibility impairment recorded at MANE-VU monitoring sites in recent years.

3. Air Quality and Visibility Impacts of Pollutants from Wildland and Prescribed Fires

Recent management strategies for some Federal, State, and Tribal wildlands involve increased use of wildland and prescribed fires to improve the health of the ecosystems and minimize risks to public and fire fighter safety. However, smoke from wildland and prescribed fires can contribute significantly to regional haze. To address issues associated with how fire managers can effectively use fires to help ecosystems while minimizing visibility impairment, the U.S. EPA, in partnership with other agencies, issued the "Interim Air Quality Policy on Wildland and Prescribed Fires," available on-line at http://www.epa.gov/ttn/oarpg/t1/memoranda/firefnl.pdf. The following description of air quality and visibility considerations includes information presented in this document. Other types of fires that involve vegetative burning (e.g. agricultural fires, open burning, residential wood combustion, etc.) have similar affects on air quality and visibility.

Burning wildland vegetation emits several air pollutants, including particles, NO_x, CO, and organic compounds. The quantity and composition of the emissions depend on the type of material burned, its moisture content, and the combustion temperature. Particle pollution from wildland and prescribed fires includes particles that have a diameter as large as 100 μm. Particles that have diameter less than 10 μm are referred to as PM_{10} and fine particles that have a diameter less than 2.5 μm are referred to as $PM_{2.5}$. There is evidence that particle pollution has serious health effects, particularly for sensitive populations.

Particle pollution also diminishes visibility because particles and gases scatter and absorb light. Fine particles scatter light more efficiently than coarser particles per unit mass. The fine particles that primarily contribute to visibility impairment include sulfates, nitrates, organic compounds, soot, and soil dust. As humidity increases, light scattering efficiencies also increase due to the adsorption of water on fine particles. Since the eastern United States typically has higher relative humidities than the West, the naturally occurring visual range in the East is only 105 to 190 km while the range in the West is 190 to 270 km. Visibility impairment affects the enjoyment of daily activities. Diminished visibility in mandatory Class I Federal areas, "Areas of Great Scenic Importance," is particularly important because haze affects the public's appreciation of scenic views and tourism.

4. MANE-VU Fire Emissions Inventories

4.1 Analysis of the 2002 MANE-VU Modeling Inventory

MANE-VU compiled a regional emissions inventory for 2002 for use in modeling. The inventory includes fire emissions from each State in the MANE-VU region. States provided fire emissions as annual county level estimates. Some States also provided estimates for seasonal and/or daily emissions, but those data are not shown here. Emissions data was collected for CO, NH_3, NO_x, $PM_{2.5}$, PM_{10}, SO_2, and VOC, but not all States provided data for all pollutants or source category codes (SCCs). Fire emissions include industrial wood combustion, commercial/institutional wood combustion, residential wood combustion, open burning, agricultural burning, forest fires, slash burning, prescribed burning, and structure fires.

The data presented here are from Version 3.0 of the MANE-VU Modeling Inventory, with updated residential wood combustion data from New York. Values for State emissions were calculated by adding the county level annual data.

Massachusetts, New Hampshire, and Vermont provided data on industrial wood combustion (SCC 2102008000). Maine, Massachusetts, New Hampshire, and New York provided data on commercial/institutional wood combustion (SCC 2103008000).

All MANE-VU States and the District of Columbia provided data on residential wood combustion from indoor fireplaces and woodstoves. Connecticut, Delaware, Maine, Maryland, Massachusetts, and New Hampshire provided data for total woodstoves and fireplaces (SCC 2104008000). The District of Columbia, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont instead reported data for separate woodstove and fireplace categories (SCC 2104008001, SCC 2104008002, SCC 2104008003, SCC 2104008004, SCC 2104008010, SCC 2104008030, SCC2104008050, SCC 2104008052). The separate category data were added together to get a total woodstoves and fireplaces value for these states. Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, and New Hampshire have data for outdoor equipment (SCC 2104008070). There is no data in Version 3.0 for outdoor equipment from New Jersey, New York, Pennsylvania, Rhode Island, or Vermont.

All States except Connecticut reported data for open burning of yard waste leaf species (SCC 2610000100), yard waste brush species (SCC 2610000400), and household waste (SCC 2610030000). Connecticut, Delaware, Maryland, New Jersey, Pennsylvania, and Vermont included data for open burning of land clearing debris (SCC 2610000500). Only Pennsylvania reported data for industrial open burning (SCC 2610010000) and commercial/institutional open burning (SCC 2610020000). The District of Columbia did not report emissions for any of the open burning categories.

Maine, New Jersey, and Vermont provided emissions data on Agricultural Field Burning (SCC 2801500000), which involves whole fields set on fire and includes the burning of all crop types. No States in the MANE-VU region reported emissions from Agricultural Propaning (SCC 2801501000), which involves tractor-pulled burners being used to burn stubble only, or Agricultural Stack Burning (SCC 280150200), which involves straw stacks being moved from the field prior to burning.

All MANE-VU States provided some emissions data for forest (wildland) fires (SCC 2810001000). The District of Columbia did not report forest fire emissions for 2002. Maine and Maryland reported emissions data for managed/slash burning (SCC 2810005000), which often involves the burning of logging debris. Delaware, the District of Columbia, Maine, Maryland, New Hampshire, New Jersey, New York, Pennsylvania, and Rhode Island included emissions

data on prescribed burning for forest management (SCC 2810015000). Only Maine reported emissions from prescribed burning of rangeland (SCC 2810020000), and the amounts of all pollutants were negligible. All MANE-VU States and the District of Columbia provided emissions data for structure fires (SCC 2810030000).

Relative to other area sources, wood burning is a large source of CO, a moderate source of NO_x, PM_{10}, $PM_{2.5}$, and VOC, and a minor source of NH_3 and SO_2 in the MANE-VU Region. Emissions of CO, NH_3, NO_x, PM_{10}, $PM_{2.5}$, SO_2, and VOC in the MANE-VU Region by wood burning category are included in Table 1. The data for MANE-VU States and the District of Columbia that were used to calculate MANE-VU totals are included in tables in the appendix.

Table 1: Wood Smoke Emissions (Tons/Year) in the MANE-VU Region by source category (Source: 2002 MANE-VU Modeling Inventory, Version 3.0 with updated NY data).

Source Category	CO	NH_3	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Industrial Wood Comb.[1]	19492.3	0	9974.9	15088.3	13060.7	2604.2	572.6
Comm./Inst. Wood Comb.[2]	5180.6	0	1654.9	659	567.2	35.2	50.1
Residential Wood Comb.[3]	902117.8	5704.4	11078.2	119147.5	113594.6	1695.8	566531.7
Agricultural Burning[4]	3029.8	0	54.2	208.4	207.8	0.2	363.4
Wildland Fires[5]	18381.2	237.4	469.5	2406.4	2179.1	18	1967
Managed/Slash Fires[6]	42.1	0	1.2	5.1	5.1	0	5.7
Prescribed Fires[7]	13609.3	70.9	196.2	1361.5	1178.8	55.4	776.6
Structure Fires[8]	4034.9	0	162.5	939.9	900.4	532.5	751.9
Open Burning[9]	189504	152	7069.1	24597.1	23713.4	428.2	17174.2
All Fires	1,155,392	6,164.7	30,660.7	164,413.2	155,407.1	5,369.5	588,193.2

[1]SCC 2102008000; [2]SCC 2103008000; [3]SCC 2104008000 (or SCC 2104008001, SCC 2104008002, SCC 2104008003, SCC 2104008004, SCC 2104008010, SCC 2104008030, SCC2104008050, and SCC 2104008052) and SCC 2104008070; [4]SCC 2801500000; [5]SCC 2810001000; [6]SCC 2810005000; [7]SCC 2810015000 and SCC 2810020000; [8]SCC 2810030000; [9]SCC 2610000100, SCC 2610000400, SCC 2610000500, SCC 2610010000, SCC 2610020000, SCC 2610030000, and SCC 2610040400

While emissions from wood burning activities comprise a significant portion of MANE-VU area source emissions, only a small portion of wood burning activities are relevant to agricultural and forestry smoke management. Agricultural, managed/slash, and prescribed burning are subject to SMPs. On rare occasions, forest (wildland) fires and structure fires that are permitted to burn are also covered by SMPs. Table 2 shows the sum of agricultural, managed/slash, prescribed, structure, and wildland fires, the total area source emissions, and the percentage of area emissions from wood burning for each pollutant.

Table 2: Wood Smoke Emissions (Tons/Year) in the MANE-VU Region by source category (Source: 2002 MANE-VU Modeling Inventory, Version 3.0 with updated NY data).

MANE-VU	CO	NH_3	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Agricultural[1], Wildland[2], Managed/Slash[3], Prescribed[4], and Structure[5] Fires	39,097	308	884	4,921	4,471	606	3,865
Total Area Source Emissions[6]	1,325,853	249,795	262,477	1,455,311	332,729	316,357	1,528,141
% of Area Source Emissions	**2.95%**	**0.12%**	**0.33%**	**0.33%**	**1.34%**	**0.19%**	**0.25%**

[1]SCC 2801500000; [2]SCC 2810001000; [3]SCC 2810005000; [4]SCC 2810015000 and SCC 2810020000; [5]SCC 2810030000, [6]Data from the summary developed by E.H. Pechan and Associates, Inc. of area source emissions included in the 2002 MANE-VU Modeling Inventory, Version 2.0.

While fire emissions are not significant sources in any of the MANE-VU States or the District of Columbia, some States have slightly greater emissions than others. Figure 1 shows emissions from agricultural, managed/slash, prescribed, forest, and structure fires by State.

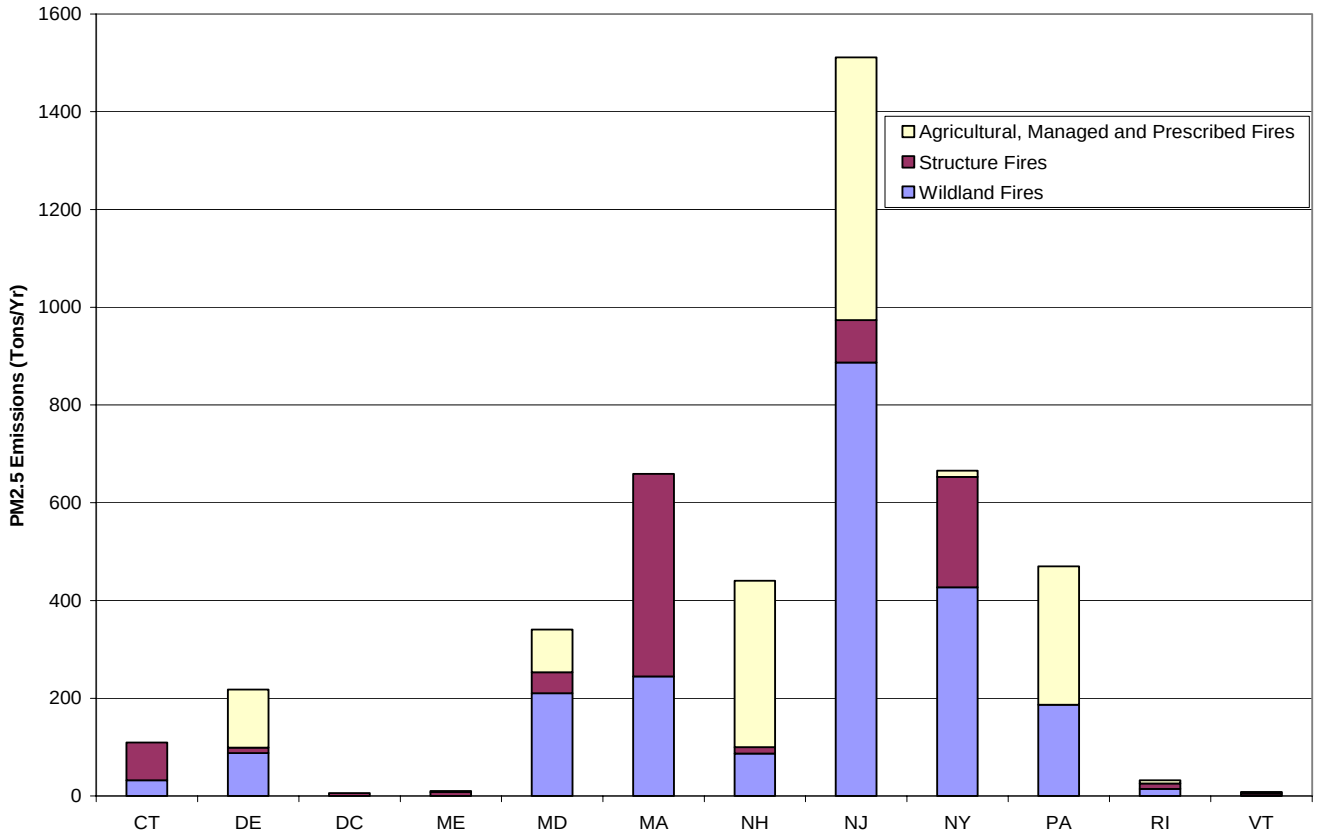

Figure 1: Fire emissions in the MANE-VU Region by state. (Source: 2002 MANE-VU Modeling Inventory, Version 3.0 with updated NY data).

Fires only account for approximately 2% of CO area source emissions, 1% of $PM_{2.5}$ area source emissions, and less than 1% of NH_3, NO_x, PM_{10}, SO_2, and VOC area source emissions in the MANE-VU Region. Considering that most forest and structure fires in the Region are unwanted "wildfires," fires used for resource benefits are a very minor contributor to regional area source emissions.

Other sources of wood smoke are significantly larger sources of pollutants than fires used for resource benefits. Figure 2 shows the relative contributions of $PM_{2.5}$ emissions from the various wood burning source categories. The largest source categories for $PM_{2.5}$ are residential wood combustion (73%), open burning (15%), and industrial, commercial, and institutional wood combustion (9%). Structure fires and wildland fires, which are generally characterized as unwanted fires, only make up a minor portion of the wood burning emissions. Fires that are covered under SMPs, including fires due to agricultural, managed, and prescribed burning, comprise less than 1% of the total wood smoke emissions.

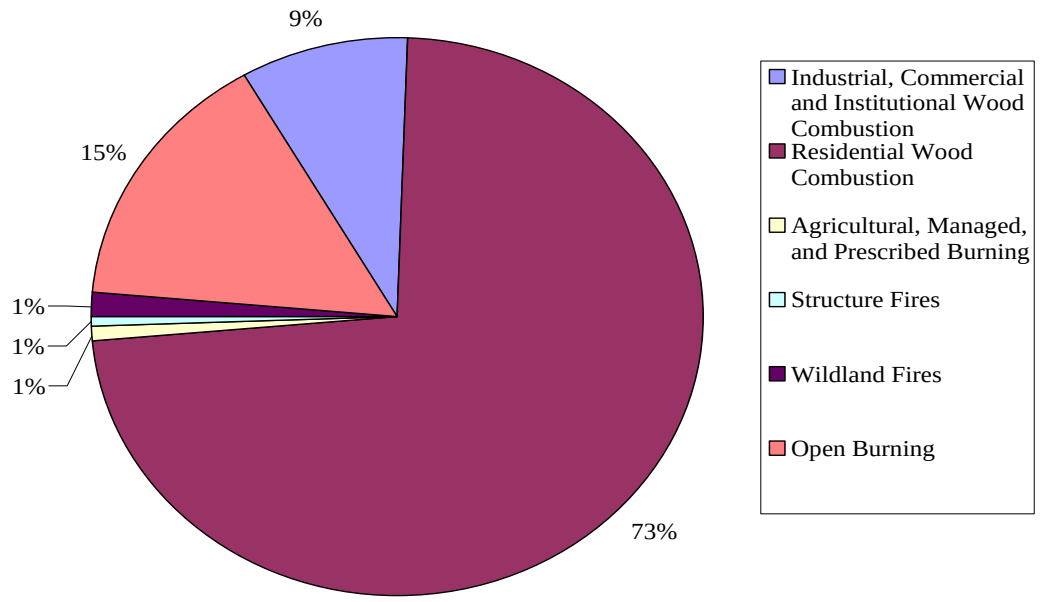

Figure 2: 2002 $PM_{2.5}$ Emissions from Wood Burning by Source Category (Source: 2002 MANE-VU Modeling Inventory, Version 3.0 with updated residential wood combustion data from New York)

4.2 Future Year Inventory Considerations

In setting reasonable progress goals and devising long term strategies, States must project the 2002 base year inventory to future years. Fire emissions are held constant from 2006 through 2018 for National Forests within the MANE-VU states. This is because variables such as weather, staff, budget, priorities, and other programs limit the Forest Services ability to project through 2018.

5. Relevant MANE-VU Source Apportionment Study Results

States must include a contribution assessment and pollution apportionment analysis in their regional haze SIPs. MANE-VU is in the process of using a weight of evidence approach that relies on several methods for assessing the contribution of different emissions to regional haze at federal Class I Areas. Preliminary findings of this work show that sulfate comprises one-half to two-thirds of $PM_{2.5}$ mass on the 20% haziest days and more than 40% of $PM_{2.5}$ mass on the 20% clearest days. Sulfates also have a much larger impact on visibility than the same mass of other pollutants. As a result, sulfates account for an even greater percentage of the particle–induced

visibility impairment in the Region. The second most important contributor to $PM_{2.5}$ mass and also haze is organic carbon.

As part of the contribution assessment work, Serpil Kayin of MARAMA and Richard Poirot of the Vermont Department of Environmental Conservation summarized the results of studies that have used receptor-based models to apportion pollution sources at several sites within the Mid-Atlantic/Northeast Region and a few sites within the upwind or downwind influence area of the Region. The technical summary by Kayin and Poirot will appear as "Appendix B: Source Attribution by Receptor-Based Methods" in the MANE-VU document, *Tools and Techniques for Identifying Contributions to Regional Haze in the Northeast and Mid-Atlantic United States.* The most recent draft of Appendix B is available online at http://bronze.nescaum.org/Em/Haze-Contrib/AppendixB-04-07-05.pdf.

The primary goal of the receptor-based studies was to describe and quantify the major source categories that contribute to the observed $PM_{2.5}$ concentrations. Several methods were used to apportion $PM_{2.5}$ concentrations including mathematical receptor models and ensemble trajectory analysis techniques. Descriptions of the monitoring sites that were investigated by Kayin and Poirot are included in Table 3. For more information on the periods of data collection, analysis technique(s), and references, see the draft of "Appendix B: Source Apportionment by Receptor-Based Methods."

Table 3: Monitoring sites in the MANE-VU Region where source apportionment analyses have been conducted

Site	Location	Elevation (meters)	Type of Monitoring Network
Acadia National Park, ME	44 N, 68 W	150	IMPROVE
Lye Brook Wilderness, VT	43 N, 73 W	1010	IMPROVE
Underhill, VT	45 N, 73 W	400	IMPROVE
New York, NY (three sites in the Bronx, one site in Queens)	41 N, 74 W		Urban STN
Brigantine Wilderness, NJ	39 N, 74 W	15	IMPROVE
Baltimore-Washington Corridor (Fort Meade, MD)	39 N, 77 W	46	Site included in a University of Maryland study
Washington, DC	39 N, 77 W	30	McMillan IMPROVE
Shenandoah National Park, VA	39 N, 78 W	1098	IMPROVE
Jefferson/James River Face Wilderness Area, VA	38 N, 79 W	280	IMPROVE
Dolly Sodds Wilderness Area, WV	39 N, 79 W	1158	IMPROVE
Mammoth Cave National Park, KY	37 N, 86 W	248	IMPROVE
Great Smoky Mountains National Park, TN	36 N, 84 W	815	IMPROVE
Boundary Waters canoe area, MN	48 N, 91 W	524	IMPROVE
Charlotte, NC	35 N, 81 W	230	EPA Trends
Boston, MA (residential site in Watertown, MA)	42 N, 71 W		Site included in the Harvard Six Cities Study
Potsdam and Stockton, NY (one Potsdam site, one Stockton site)	47 N, 75 W 42 N, 79 W		Site included in a Clarkson University study
Toronto, Canada			Site located at the University of Toronto

The data presented in the report by Kayin and Poirot are source apportioned $PM_{2.5}$ mass and the percentage of $PM_{2.5}$ mass. While the sources for $PM_{2.5}$ and haze are the same, the relative importance of those sources on $PM_{2.5}$ concentration and visibility impairment differ somewhat. In addition to being related to $PM_{2.5}$ concentration, light extinction is also a function of the components of $PM_{2.5}$ and relative humidity. Thus, while source apportioned $PM_{2.5}$ mass data is highly relevant to regional haze, there are limitations to making direct comparisons. Certain pollutants, such as sulfate, make up a larger contribution to regional haze than to $PM_{2.5}$ mass.

The major sources of $PM_{2.5}$ identified were coal burning (primary and secondary sulfate aerosols), secondary organic matter from possibly mobile sources, nitrate aerosols, biomass burning (wood smoke and forest fires indicated by the presence of organic carbon, elemental carbon, and potassium), industrial sources (a variety of sources, including smelters, incinerators, and oil burning, indicated by the presence of elemental carbon and characteristic trace metals), a crustal source (dust and soil indicated by the presence of silicon, aluminum, calcium, iron, and titanium), and a sea salt source (identified by the presence of sodium and chloride).

A wood smoke or biomass burning source was identified at most of the rural sites, but was generally not detected or of small magnitude in larger urban areas, including Boston, New York City, Toronto, and Washington D.C. Wood smoke was also a negligible or low contributor (less than 10%) in Acadia National Park, Boundary Waters, Brigantine Wilderness, Charlotte, Dolly Sods Wilderness Area, Great Smoky Mountains National Park, and Potsdam and Stockton.

Wood smoke was identified as a significant source of average $PM_{2.5}$ mass (greater than 10%) in the Baltimore-Washington corridor, Lye Brook Wilderness, Mammoth Cave National Park, Shenandoah National Park, Jefferson/James River Face Wilderness Area, and Underhill. In Lye Brook Wilderness and Underhill, wood smoke was the second largest source, following regional secondary sulfate.

In the Lye Brook Wilderness Area, wood smoke comprised a relatively high percentage (35%) of the average $PM_{2.5}$ mass. However, the smoke source was not identified as especially important there on either the 20% best or worst visibility days.

Smoke also contributed significantly to the $PM_{2.5}$ mass at Underhill, VT. This source was found to make up a large portion (25%) of the $PM_{2.5}$ mass on the 20% clearest days but a smaller portion (7%) on the 20% dirtiest days. It was predicted that the site was influenced by Canadian fires.

In addition studies on source categories, there has also been work to investigate the source regions for wood smoke. Figure 3 is based on source apportionment and back trajectory results in the Eastern United States. The results for various IMPROVE sites are aggregated for the Northeast Region (Acadia National Park, Presidential Mountain Range, and Lye Brook Wilderness Area), the Mid-Atlantic Region (Washington D.C., Shenandoah National Park, and James River Face Wilderness Area), and the Southeast Region (Great Smoky Mountains National Park and Mammoth Cave National Park).

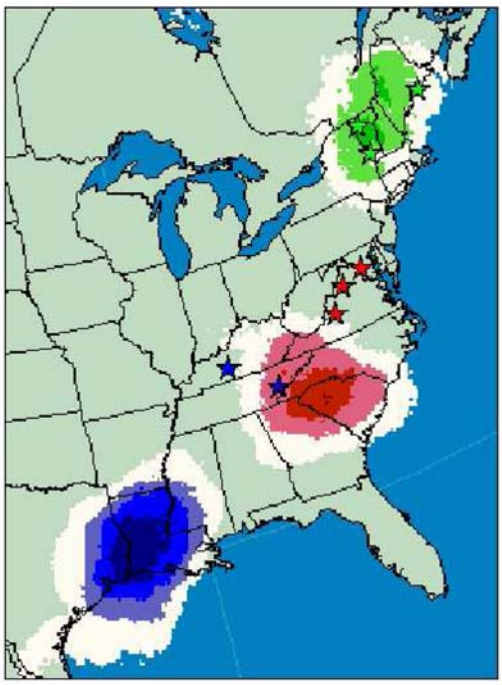

Figure 3: Wood smoke source regional aggregations (Source "Appendix B: Source Attribution by Receptor-Based Methods" in the MANE-VU document, *Tools and Techniques for Identifying Contributions to Regional Haze in the Northeast and Mid-Atlantic United States*. The most recent draft of Appendix B is available online at http://bronze.nescaum.org/Em/Haze-Contrib/AppendixB-04-07-05.pdf.) The results are aggregated for New England in green (Acadia National Park, Presidential Mountain Range, and Lye Brook Wilderness Area), the Mid-Atlantic in red (Washington D.C., Shenandoah National Park, and James River Face Wilderness Area), and the Southeast in blue (Great Smoky Mountains National Park and Mammoth Cave National Park).

The results shown in the figure demonstrate that in the Northeast wood smoke emissions are local, indicating that the smoke is mostly from residential wood combustion. However, in the Mid-Atlantic and Southeast Regions, the source regions for the wood smoke lie far from the monitoring sites, showing the probable influence of fires to the south.

Although source apportionment studies have not been conducted at all the Class I Areas in the MANE-VU Region, it is reasonable to conclude that throughout the Region, wood smoke is a small to moderate contributor to average fine mass. There are other general statements conclusions made in "Appendix B: Source Attribution by Receptor-Based Methods." In general, contributions are higher in rural areas than urban areas. There are also winter peaks in northern areas from residential wood burning, and occasional summer impacts from wildfires.

Although wood smoke is typically not a large contributor to $PM_{2.5}$ mass, there are exceptions, generally involving wildfires. A notable exception occurred on July 7, 2002. This event affected urban and rural sites and resulted in the largest one-day regional fine mass concentrations and visibility impacts recorded in recent years.

6. Smoke Management Programs in the MANE-VU Region

MARAMA, on behalf of MANE-VU, sent out a smoke management plan questionnaire to MANE-VU States and tribes in August 2004. The District of Columbia, Delaware, Maine, Maryland, New York, the Penobscot Indian Nation, the St. Regis Mohawk Tribe, and Vermont responded to the survey. All five states and the District of Columbia have the legal authority to

allow or prohibit burning. Delaware, Maine, Maryland, and New York have a formal permitting system in place. Vermont has a SMP that applies to the nuisance of smoke. In 2004, Maine was in the development phase of a SMP being devised by the state forest service. States that do have a process for approving burns may choose to reference their program in the Regional Haze SIP as advised by the EPA.

There are incentives for States to adopt a SMP. The following statement is included in the "Interim Air Quality Policy on Wildland and Prescribed Fires," issued by the US EPA on April 23, 1998 (http://www.epa.gov/ttn/oarpg/t1/memoranda/firefnl.pdf).

> *If a certified SMP has not been implemented, EPA will not give special consideration to the high PM concentrations attributed to fires managed for resource benefits that cause or significantly contribute to: (1) violations of $PM_{2.5}$ or PM_{10} NAAQS, (2) visibility impairment in mandatory Class I Areas, or (3) failure to achieve reasonable progress toward the national visibility goal. Rather, EPA will call for adoption of the basic SMP, described in section IV of the Interim policy as part of the SIP/TIP for PM and visibility. The EPA will also notify the governor of the State or the tribal government that the area should be redesignated as nonattainment.*

The EPA also states in the Interim Policy that if State/tribal air quality managers certify in a letter to the EPA that at least a basic SMP has been adopted and implemented, "special consideration will be given under this policy to air quality data resulting from fires managed for resource benefits. When PM concentrations are attributable to wildfires that are treated under the Natural Events Policy, the EPA will "exercise its discretion, under section 107(d)(3) of the CAA, not to redesignate areas as nonattainment if the State develops and implements a plan to respond to the health impacts of natural events."

If States choose to adopt a SMP to to lessenthe future possibility of being re-designated as non-attainment, there are several elements that should be included. These elements are described in EPA's "Interim Air Quality Policy on Wildland and Prescribed Fires," available on-line at http://www.epa.gov/ttn/oarpg/t1/memoranda/firefnl.pdf.

7. Summary

Smoke Management Programs are only required when smoke impacts from fires managed for resource benefits contribute significantly to regional haze. The results of the emissions inventory indicate that emissions from agricultural, managed, and prescribed burning are very minor source categories. Although source apportionment results show that wood smoke is a moderate contributor to visibility impairment at some Class I Areas in the MANE-VU Region, most of the wood smoke is attributable to residential wood combustion. It is unlikely that fires for agricultural or forestry management cause large impacts on visibility in any of the Class I Areas in the MANE-VU Region. On rare occasions, smoke from major fires degrades the air quality and visibility in the MANE-VU Area. However, these fires are generally unwanted wildfires that are not subject to SMPs.

Table X: Carbon Monoxide Wood Smoke Emissions (Tons/Year) by Source (Source: 2002 MANE-VU Modeling Inventory, Version 3.0 with updated NY data).

Source Category	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT	TOTAL
Industrial Wood Comb.[1]						12,780	6,439		0			273.3	19,492.3
Comm./Inst. Wood Comb.[2]				398.4		539.9	125.3		4117				5,180.6
Residential Wood Comb.[3]	6,5252.8	9,108.6	1,141.6	99,653.2	61,174.5	10,4461.9	63,713.5	74,311	313,179.5	74,914.9	3,666.9	31,539.4	902,117.8
Agricultural Burning[4]				1,368				1,661.8				0	3,029.8
Wildland Fires[5]	384.3	1054		0.1	1,729.9	2,018.5	1,043	4,599.1	5,120.1	2,234	175.4	22.8	18,381.2
Managed/Slash Fires[6]				0.1	42								42.1
Prescribed Fires[7]		1,430.6	0	0	457		4,084.1	4,005.1	155.8	3,396.9	79.8	0	13,609.3
Structure Fires[8]	471.8	66.7	37.1	49.6	263.7	414.2	79.2	481.7	1377.7	765.9	1.6	25.7	4,034.9
Open Burning[9]	244	998.3	0	6,318.2	70,978.5	2,418.4	1,895.7	1,70.1	8,003.6	86,714.5	294.9	11,467.8	189,504
All Fires	**66,352.9**	**12,658.2**	**1178.7**	**107,787.6**	**134,645.6**	**122,632.9**	**77,379.8**	**85,228.8**	**331,953.7**	**168,026.2**	**4,218.6**	**43,329**	**1,155,392**

[1]SCC 2102008000; [2]SCC 2103008000; [3]SCC 2104008000 (or SCC 2104008001, SCC 2104008002, SCC 2104008003, SCC 2104008004, SCC 2104008010, SCC 2104008030, SCC2104008050, and SCC 2104008052) and SCC 2104008070; [4]SCC 2801500000; [5]SCC 2810001000; [6]SCC 2810005000; [7]SCC 2810015000 and SCC 2810020000; [8]SCC 2810030000; [9]SCC 2610000100, SCC 2610000400, SCC 2610000500, SCC 2610010000, SCC 2610020000, SCC 2610030000, and SCC 2610040400

Table X: Carbon Monoxide Wood Smoke Emissions (Tons/Year) by SCC (Source: 2002 MANE-VU Modeling Inventory, Version 3.0 with updated NY data).

SCC	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT	TOTAL
2102008000						12,780.0	6,439.0		0.0			273.3	19,492.3
2103008000				398.4		539.9	125.3		4,117.0				5,180.6
Indoor RWC[1]	61,903.3	8,290.4	605.6	97,150.2	56,108.0	98,315.6	61,753.6	67,230.4	293,760.9	74,914.9	2690.7	30,407.5	853,131.1
2104008070	3349.5	818.2	536.0	25,03.0	5,066.5	6,146.3	1959.9	7,080.6	19,418.6		976.2	1,131.9	48,986.8
2610000100		22.3	0.0	2,93.8	437.4	69.1	1002.5	60.3	1,290.9	1,743.1	7.3	635.2	5,561.9
2610000400		107.4	0.0	367.2	28,86.2	1,284.1	250.6	19.5	1,627.3	2,288.8	9.2	793.9	9,634.4
2610000500	244.0	739.5			66,601.1			0.0		69,750.9		9,240.5	14,6576.0
2610010000										9,81.8			981.8
2610020000										2,516.4			2,516.4
2610030000		129.1	0.0	5,657.2	1,053.8	16.3	151.0	90.3	5,085.4	9,433.5	278.4	439.7	22,334.7
2610040400			0.0			1,048.9	491.6	0.0	0.0			358.5	1,899.0
2801500000				1,368.0				1,661.8					3,029.8
2810001000	3,84.3	1,054.0		0.1	1,729.9	2,018.5	1,043.0	4,599.1	5,120.1	22,34.0	175.4	22.8	18,381.3
2810005000				0.1	42.0								42.1
2810015000		1,430.6	0.0	0.0	457.0		4,084.1	4,005.1	155.8	3,396.9	79.8		13,609.4
2810020000				0.0									0.0
2810030000	4,71.8	66.7	37.1	49.6	263.7	4,14.2	79.2	481.7	1,377.7	765.9	1.6	25.7	4,034.9
All Fires	**66,352.9**	**12,658.3**	**1,178.8**	**107,787.7**	**134,645.7**	**122,633.1**	**77,379.6**	**85,228.8**	**331,953.9**	**168,026.4**	**4,218.6**	**433,29.0**	**1,155,392.5**

[1] For indoor residential wood combustion, CT, DE, ME, MD, MA, and NH provided data for total woodstoves and fireplaces (SCC 2104008000). DC, NJ, NY, PA, RI, and VT instead reported data for separate woodstove and fireplace categories (SCC 2104008001, SCC 2104008002, SCC 2104008003, SCC 2104008004, SCC 2104008010, SCC 2104008030, SCC2104008050, SCC 2104008052). The separate category data were added together to get a total woodstoves and fireplaces value for these states.

Table X: Ammonia Wood Smoke Emissions (Tons/Year) by Source (Source: 2002 MANE-VU Modeling Inventory, Version 3.0 with updated NY data).

Source Category	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT	TOTAL
Industrial Wood Comb.[1]						0	0		0			0	0
Comm./Inst. Wood Comb.[2]				0		0	0		0				0
Residential Wood Comb.[3]	470.4	65.6	3.8	719.3	441.1	752.7	459.7	535	2,241.7	0	7	8.1	5,704.4
Agricultural Burning[4]				0				0				0	0
Wildland Fires[5]	1.7	4.7		0	0	47.7	4.7	127.4	50.3	0	0.8	0.1	237.4
Managed/Slash Fires[6]				0	0								0
Prescribed Fires[7]		6.4	0	0.5	0		18.4	6.9	0	15.3	0.4	23	70.9
Structure Fires[8]	0	0	0	0	0	0	0	0	0	0	0	0	0
Open Burning[9]	0	1.3	0	0	30.9	21.8	11.3	0	29.1	40.2	0	17.4	152
All Fires	**472.1**	**78**	**3.8**	**719.8**	**472**	**822.2**	**494.1**	**669.3**	**2,321.1**	**55.5**	**8.2**	**48.6**	**6,164.7**

[1]SCC 2102008000; [2]SCC 2103008000; [3]SCC 2104008000 (or SCC 2104008001, SCC 2104008002, SCC 2104008003, SCC 2104008004, SCC 2104008010, SCC 2104008030, SCC2104008050, and SCC 2104008052) and SCC 2104008070; [4]SCC 2801500000; [5]SCC 2810001000; [6]SCC 2810005000; [7]SCC 2810015000 and SCC 2810020000; [8]SCC 2810030000; [9]SCC 2610000100, SCC 2610000400, SCC 2610000500, SCC 2610010000, SCC 2610020000, SCC 2610030000, and SCC 2610040400

Table X: Ammonia Wood Smoke Emissions (Tons/Year) by Source (Source: 2002 MANE-VU Modeling Inventory, Version 3.0 with updated NY data).

SCC	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT	TOTAL
2102008000													
2013008000													
Indoor RWC[1]	446.5	59.8	0.0	701.5	405.0	708.9	445.7	484.5	2,103.3	0.0	0.0	0.0	5,355.2
2104008070	23.9	5.8	3.8	17.8	36.1	43.8	14.0	50.5	138.4		7.0	8.1	349.1
2610000100		0.3	0.0		4.9	0.8	11.3		14.5	19.6		7.1	58.5
2610000400		1.0	0.0		26.0	11.6			14.6	20.6		7.1	80.9
2610000500													
2610010000													
2610020000													
2610030000													
2610040400			0.0			9.4			0.0			3.2	12.7
2801500000													
2810001000	1.7	4.7				47.7	4.7	127.4	50.3		0.8	0.1	237.4
2810005000													
2810015000		6.4	0.0	0.5			18.4	6.9		15.3	0.4	23.0	70.8
2810020000													
2810030000													
All Fires	**472.1**	**78.0**	**3.8**	**719.8**	**472.0**	**822.2**	**494.0**	**669.3**	**2,321.1**	**55.5**	**8.1**	**48.6**	**6,164.6**

[1] For indoor residential wood combustion, CT, DE, ME, MD, MA, and NH provided data for total woodstoves and fireplaces (SCC 2104008000). DC, NJ, NY, PA, RI, and VT instead reported data for separate woodstove and fireplace categories (SCC 2104008001, SCC 2104008002, SCC 2104008003, SCC 2104008004, SCC 2104008010, SCC 2104008030, SCC2104008050, SCC 2104008052). The separate category data were added together to get a total woodstoves and fireplaces value for these states.

Table X: Nitrogen Oxides Wood Smoke Emissions (Tons/Year) by Source (Source: 2002 MANE-VU Modeling Inventory, Version 3.0 with updated NY data).

Source Category	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT	TOTAL
Industrial Wood Comb.[1]						4,686.1	5,258.6		0			30.2	9,974.9
Comm./Inst. Wood Comb.[2]				1,206.4		197.9	102.3		148.3				1,654.9
Residential Wood Comb.[3]	821.3	120.2	13.2	1,265.1	751.1	1,331.8	815.1	943	3647	929.7	44.3	396.4	11,078.2
Agricultural Burning[4]				54				0.2				0	54.2
Wildland Fires[5]	8.2	22.6		0.4	49.4	57.2	22.4	131.4	109.8	63.8	3.8	0.5	469.5
Managed/Slash Fires[6]				0	1.2								1.2
Prescribed Fires[7]		30.7	0	0	0		87.6	0	3.3	72.9	1.7	0	196.2
Structure Fires[8]	11	1.6	0.9	1.2	6.2	9.7	1.8	11.2	32.1	17.9	68.3	0.6	162.5
Open Burning[9]	6.6	36	0	399.3	2,402	88.4	83.7	10.4	488.2	3,154	19.7	380.8	7,069.1
All Fires	**847.1**	**211.1**	**14.1**	**2,926.4**	**3,209.9**	**6,371.1**	**6,371.5**	**1,096.2**	**4,428.7**	**4,238.3**	**137.8**	**808.5**	**30,660.7**

[1]SCC 2102008000; [2]SCC 2103008000; [3]SCC 2104008000 (or SCC 2104008001, SCC 2104008002, SCC 2104008003, SCC 2104008004, SCC 2104008010, SCC 2104008030, SCC2104008050, and SCC 2104008052) and SCC 2104008070; [4]SCC 2801500000; [5]SCC 2810001000; [6]SCC 2810005000; [7]SCC 2810015000 and SCC 2810020000; [8]SCC 2810030000; [9]SCC 2610000100, SCC 2610000400, SCC 2610000500, SCC 2610010000, SCC 2610020000, SCC 2610030000, and SCC 2610040400

Table X: Nitrogen Oxides Wood Smoke Emissions (Tons/Year) by SCC (Source: 2002 MANE-VU Modeling Inventory, Version 3.0 with updated NY data).

SCC	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT	TOTAL
2102008000						4,686.1	5,258.6		0.0			30.2	9,974.8
2103008000				1,206.4		197.9	102.3		148.3				1,655.0
Indoor RWC[1]	786.8	111.8	7.7	1,239.3	699.0	1,268.5	794.9	870.1	3,447.1	929.7	34.3	384.7	10,573.9
2104008070	34.5	8.4	5.5	25.8	52.1	63.3	20.2	72.9	199.9		10.0	11.7	504.2
2610000100		1.2	0.0		24.2	3.8	55.5	3.3	71.5	96.5		35.2	291.2
2610000400		3.8	0.0		103.1	45.9		0.7	58.1	81.7		28.4	321.7
2610000500	6.6	21.9			2,200.4			0.0		2,063.6		273.4	4,565.9
2610010000										69.3			69.3
2610020000										177.6			177.6
2610030000		9.1	0.0	399.3	74.3	1.2	10.6	6.4	358.6	665.3	19.7	31.0	1,575.5
2610040400			0.0			37.5	17.6	0.0	0.0			12.8	67.8
2801500000				54.0				0.2					54.2
2810001000	8.2	22.6		0.4	49.4	57.2	22.4	131.4	109.8	63.8	3.8	0.5	469.6
2810005000				0.0	1.2								1.2
2810015000		30.7	0.0	0.0	0.0		87.6	0.0	3.3	72.9	1.7		196.2
2810020000				0.0									0.0
2810030000	11.0	1.6	0.9	1.2	6.2	9.7	1.9	11.2	32.1	17.9	68.4	0.6	162.5
All Fires	**847.1**	**211.1**	**14.1**	**2,926.4**	**3,210.0**	**6,370.9**	**6,371.5**	**1,096.2**	**4,428.8**	**4,238.3**	**137.8**	**808.4**	**30,660.6**

[1] For indoor residential wood combustion, CT, DE, ME, MD, MA, and NH provided data for total woodstoves and fireplaces (SCC 2104008000). DC, NJ, NY, PA, RI, and VT instead reported data for separate woodstove and fireplace categories (SCC 2104008001, SCC 2104008002, SCC 2104008003, SCC 2104008004, SCC 2104008010, SCC 2104008030, SCC2104008050, SCC 2104008052). The separate category data were added together to get a total woodstoves and fireplaces value for these states.

Table X: PM_{10} Wood Smoke Emissions (Tons/Year) by Source (Source: 2002 MANE-VU Modeling Inventory, Version 3.0 with updated NY data).

Source Category	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT	TOTAL
Industrial Wood Comb.[1]						11,012.1	4,045.9		0			30.3	15,088.3
Comm./Inst. Wood Comb.[2]				0		465.3	78.7		115				659
Residential Wood Comb.[3]	8,520.7	1,227.9	157.9	12,569.5	8,194.3	13,689.3	8,019.3	9,900.7	41,980	10,285.6	508.9	4,093.4	11,9147.5
Agricultural Burning[4]				2.4				203.6				2.4	208.4
Wildland Fires[5]	37.4	102.6		0	210.1	244.9	101.4	985.5	497.8	207.4	17.1	2.2	2,406.4
Managed/Slash Fires[6]				0	5.1								5.1
Prescribed Fires[7]		139.2	0	0	82		397.1	389.9	15.2	330.3	7.8	0	1,361.5
Structure Fires[8]	84.9	12	6.7	8.9	47.5	414.2	14.3	86.7	248	0	12.1	4.6	939.9
Open Burning[9]	30.8	122.3	0	2,673.4	8,205.6	345.9	329.8	34.3	1,599.9	9,753.5	128.1	1,373.5	24,597.1
All Fires	**8,673.8**	**1,604**	**164.6**	**15,254.2**	**16,744.6**	**26171.7**	**12,986.5**	**11,600.7**	**44,455.9**	**20,576.8**	**674**	**5,506.4**	**164,413.2**

[1]SCC 2102008000; [2]SCC 2103008000; [3]SCC 2104008000 (or SCC 2104008001, SCC 2104008002, SCC 2104008003, SCC 2104008004, SCC 2104008010, SCC 2104008030, SCC2104008050, and SCC 2104008052) and SCC 2104008070; [4]SCC 2801500000; [5]SCC 2810001000; [6]SCC 2810005000; [7]SCC 2810015000 and SCC 2810020000; [8]SCC 2810030000; [9]SCC 2610000100, SCC 2610000400, SCC 2610000500, SCC 2610010000, SCC 2610020000, SCC 2610030000, and SCC 2610040400

Table X: PM_{10} Wood Smoke Emissions (Tons/Year) by SCC (Source: 2002 MANE-VU Modeling Inventory, Version 3.0 with updated NY data).

SCC	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT	TOTAL
2102008000						11,012.1	4,045.9		0.0			30.3	15,088.2
2103008000						465.3	78.7		115.0				659.1
Indoor RWC[1]	8,061.9	1,115.8	84.5	12,226.7	7,500.3	12,847.4	7,750.8	8,930.8	39,320.1	10,285.6	375.2	3,938.4	11,2437.5
2104008070	458.8	112.1	73.4	342.8	694.0	841.9	268.5	969.9	2,659.9		133.7	155.0	6,710.0
2610000100		4.4	0.0	99.7	85.9	13.6	196.9	11.8	253.6	342.4	2.5	124.8	1,135.5
2610000400		15.1	0.0	44.6	406.8	180.9	30.4	2.7	229.3	322.6	1.1	111.9	1,345.5
2610000500	30.8	74.4			7,481.4			0.0		7,016.4		929.5	15,532.4
2610010000													
2610020000													
2610030000		28.4	0.0	2,529.1	231.5	3.6	33.2	19.8	1,117.0	2,072.1	124.5	156.8	6,316.0
2610040400			0.0			147.8	69.3	0.0	0.0			50.5	267.6
2801500000				2.4				203.6				2.4	208.3
2810001000	37.4	102.6		0.0	210.1	244.9	101.4	985.5	497.8	207.4	17.1	2.2	2,406.4
2810005000				0.0	5.1								5.1
2810015000		139.2	0.0	0.0	82.0		397.1	389.9	15.2	330.3	7.8		1,361.5
2810020000				0.0									0.0
2810030000	84.9	12.0	6.7	8.9	47.5	414.2	14.3	86.7	248.0		12.1	4.6	939.9
All Fires	**8,673.8**	**1,603.9**	**164.6**	**15,254.3**	**16,744.4**	**26,171.7**	**12,986.4**	**11,600.9**	**44,455.9**	**2,0576.8**	**673.9**	**5,506.5**	**16,4413.1**

[1] For indoor residential wood combustion, CT, DE, ME, MD, MA, and NH provided data for total woodstoves and fireplaces (SCC 2104008000). DC, NJ, NY, PA, RI, and VT instead reported data for separate woodstove and fireplace categories (SCC 2104008001, SCC 2104008002, SCC 2104008003, SCC 2104008004, SCC 2104008010, SCC 2104008030, SCC2104008050, SCC 2104008052). The separate category data were added together to get a total woodstoves and fireplaces value for these states.

Table X: $PM_{2.5}$ Wood Smoke Emissions (Tons/Year) by Source (Source: 2002 MANE-VU Modeling Inventory, Version 3.0 with updated NY data).

Source Category	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT	TOTAL
Industrial Wood Comb.[1]						9,521.1	3,509.3		0			30.3	13,060.7
Comm./Inst. Wood Comb.[2]				0		402.3	68.3		96.6				567.2
Residential Wood Comb.[3]	8,520.7	1,227.9	157.9	12,569.5	8,194.3	13,689.3	8,019.3	9,900.7	36,702.8	10,285.6	508.9	3,817.7	11,3594.6
Agricultural Burning[4]				2.1				203.6				2.1	207.8
Wildland Fires[5]	32	87.9		0	210.1	244.9	87	887	427	186.7	14.6	1.9	2179.1
Managed/Slash Fires[6]				0	5.1								5.1
Prescribed Fires[7]		119	0	0	82		340.6	334.2	13	283.3	6.7	0	1,178.8
Structure Fires[8]	77.3	10.9	6.1	8.1	43.2	414.2	13	86.7	225.7	0	11	4.2	900.4
Open Burning[9]	30.8	116.5	0	2,460.4	8,092.9	270.4	311.1	32.1	1,453.4	9,505.1	117.6	1,323.1	23,713.4
All Fires	**8,660.8**	**1,562.2**	**164**	**15,040.1**	**16,627.6**	**24,542.2**	**12,348.6**	**11,444.3**	**38,918.5**	**20,260.7**	**658.8**	**5,179.3**	**155,407.1**

[1]SCC 2102008000; [2]SCC 2103008000; [3]SCC 2104008000 (or SCC 2104008001, SCC 2104008002, SCC 2104008003, SCC 2104008004, SCC 2104008010, SCC 2104008030, SCC2104008050, and SCC 2104008052) and SCC 2104008070; [4]SCC 2801500000; [5]SCC 2810001000; [6]SCC 2810005000; [7]SCC 2810015000 and SCC 2810020000; [8]SCC 2810030000; [9]SCC 2610000100, SCC 2610000400, SCC 2610000500, SCC 2610010000, SCC 2610020000, SCC 2610030000, and SCC 2610040400

Table X: $PM_{2.5}$ Wood Smoke Emissions (Tons/Year) by SCC (Source: 2002 MANE-VU Modeling Inventory, Version 3.0 with updated NY data).

SCC	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT	TOTAL
2102008000						9,521.1	3,509.3		0.0			30.3	13,060.7
2103008000						402.3	68.3		96.6				567.1
Indoor RWC[1]	8,061.9	1,115.8	84.5	12,226.7	7,500.3	12,847.4	7,750.8	8,930.8	34,468.5	10,285.6	375.2	3,662.7	107,310.2
2104008070	458.8	112.1	73.4	342.8	694.0	841.9	268.5	969.9	2,234.3		133.7	155.0	6,284.4
2610000100		4.4	0.0	99.7	85.9	13.6	196.9	11.8	253.6	342.4	2.5	124.8	1,135.5
2610000400		11.7	0.0	44.6	313.6	139.5	30.4	2.1	176.8	248.7	1.1	86.3	1,054.7
2610000500	30.8	74.4			7,481.4			0.0		7,016.4		929.5	15,532.4
2610010000													
2610020000													
2610030000		26.0	0.0	2,316.1	212.0	3.3	30.4	18.2	1,023.0	1,897.6	114.0	143.6	5,784.1
2610040400			0.0			114.0	53.4	0.0	0.0			38.9	206.3
2801500000				2.2				203.6				2.1	207.9
2810001000	32.0	87.9		0.0	210.1	244.9	87.0	887.0	427.0	186.7	14.6	1.9	2,179.1
2810005000				0.0	5.1								5.1
2810015000		119.0	0.0	0.0	82.0		340.6	334.2	13.0	283.3	6.7		1,178.7
2810020000				0.0									0.0
2810030000	77.3	10.9	6.1	8.1	43.2	414.2	13.0	86.7	225.7		11.0	4.2	900.4
All Fires	**8,660.8**	**1,562.1**	**164.0**	**15,040.3**	**16,627.5**	**24,542.1**	**12,348.5**	**11,444.3**	**38,918.3**	**20,260.6**	**658.8**	**5,179.4**	**155,406.7**

[1] For indoor residential wood combustion, CT, DE, ME, MD, MA, and NH provided data for total woodstoves and fireplaces (SCC 2104008000). DC, NJ, NY, PA, RI, and VT instead reported data for separate woodstove and fireplace categories (SCC 2104008001, SCC 2104008002, SCC 2104008003, SCC 2104008004, SCC 2104008010, SCC 2104008030, SCC2104008050, SCC 2104008052). The separate category data were added together to get a total woodstoves and fireplaces value for these states.

Table X: Sulfur Dioxide Wood Smoke Emissions (Tons/Year) by Source (Source: 2002 MANE-VU Modeling Inventory, Version 3.0 with updated NY data).

Source Category	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT	TOTAL
Industrial Wood Comb.[1]						532.5	268.3		0			1,803.4	2,604.2
Comm./Inst. Wood Comb.[2]				0		22.4	5.2		7.6				35.2
Residential Wood Comb.[3]	120.1	16.1	1.9	184	107	193.5	119	132.4	614.9	142	6.7	58.2	1,695.8
Agricultural Burning[4]				0				0.2				0	0.2
Wildland Fires[5]	2.3	6.2		0	0	0	6.1	0	0	2.4	1	0	18
Managed/Slash Fires[6]				0	0								0
Prescribed Fires[7]		8.4	0	1.6	0		24	0	0.9	20	0.5	0	55.4
Structure Fires[8]	0	0	0	0	0	532.5	0	0	0	0	0	0	532.5
Open Burning[9]	0	3	0	66.6	49.6	28.2	14.4	1.7	88.1	150.1	3.3	23.2	428.2
All Fires	**122.4**	**33.7**	**1.9**	**252.2**	**156.6**	**1,309.1**	**437**	**134.3**	**711.5**	**314.5**	**11.5**	**1,884.8**	**5,369.5**

[1]SCC 2102008000; [2]SCC 2103008000; [3]SCC 2104008000 (or SCC 2104008001, SCC 2104008002, SCC 2104008003, SCC 2104008004, SCC 2104008010, SCC 2104008030, SCC2104008050, and SCC 2104008052) and SCC 2104008070; [4]SCC 2801500000; [5]SCC 2810001000; [6]SCC 2810005000; [7]SCC 2810015000 and SCC 2810020000; [8]SCC 2810030000; [9]SCC 2610000100, SCC 2610000400, SCC 2610000500, SCC 2610010000, SCC 2610020000, SCC 2610030000, and SCC 2610040400

Table X: Sulfur Dioxide Wood Smoke Emissions (Tons/Year) by SCC (Source: 2002 MANE-VU Modeling Inventory, Version 3.0 with updated NY data).

SCC	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT	TOTAL
2102008000						532.5	268.3		0.0			1,803.4	2,604.2
2103008000						22.4	5.2		7.6				35.2
Indoor RWC[1]	114.8	14.8	1.1	180.0	99.0	183.8	115.9	121.2	584.2	142.0	5.2	56.4	1,618.4
2104008070	5.3	1.3	0.8	4.0	8.0	9.7	3.1	11.2	30.8		1.5	1.8	77.6
2610000100		0.2	0.0		3.0	0.5	6.8	0.4	8.8	11.8		4.3	35.7
2610000400		1.3	0.0		34.2	15.1		0.2	19.3	27.1		9.4	106.7
2610000500					0.0								0.0
2610010000													
2610020000													
2610030000		1.5	0.0	66.6	12.4	0.2	1.8	1.1	60.0	111.2	3.3	5.2	263.2
2610040400			0.0			12.4	5.8	0.0	0.0			4.3	22.5
2801500000								0.2					0.2
2810001000	2.3	6.2				0.0	6.1	0.0		2.4	1.0		18.0
2810002000													
2810003000								0.0					0.0
2810015000		8.4	0.0	1.6			24.0	0.0	0.9	20.0	0.5		55.4
2810030000						532.5		0.0					532.5
All Fires	**122.4**	**33.6**	**1.9**	**252.1**	**156.6**	**1,309.2**	**437.1**	**134.3**	**711.5**	**314.6**	**11.5**	**1,884.7**	**5,369.5**

[1] For indoor residential wood combustion, CT, DE, ME, MD, MA, and NH provided data for total woodstoves and fireplaces (SCC 2104008000). DC, NJ, NY, PA, RI, and VT instead reported data for separate woodstove and fireplace categories (SCC 2104008001, SCC 2104008002, SCC 2104008003, SCC 2104008004, SCC 2104008010, SCC 2104008030, SCC2104008050, SCC 2104008052). The separate category data were added together to get a total woodstoves and fireplaces value for these states.

Table X: VOC Wood Smoke Emissions (Tons/Year) by Source (Source: 2002 MANE-VU Modeling Inventory, Version 3.0 with updated NY data).

Source Category	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT	TOTAL
Industrial Wood Comb.[1]						362.1	182.4		0			28.1	572.6
Comm./Inst. Wood Comb.[2]				27.3		15.3	3.6		3.9				50.1
Residential Wood Comb.[3]	41,067.8	5,952.1	732.9	5,9815.6	39,433.8	66,217.4	38,652	49,989.2	226,181.7	25,537.3	1,981.9	10,970	566,531.7
Agricultural Burning[4]				128.4				235				0	363.4
Wildland Fires[5]	18.1	49.6		0	92.9	345.4	49.1	778.6	240.9	383	8.3	1.1	1,967
Managed/Slash Fires[6]				0	5.7								5.7
Prescribed Fires[7]		67.4	0	0	70.3		192.2	275.7	7.3	159.9	3.8	0	776.6
Structure Fires[8]	86.5	12.2	6.8	9.1	48.3	76	14.5	88.3	252.6	140.4	12.5	4.7	751.9
Open Burning[9]	20	77.4	0	2,119.9	5,124.5	334.7	358.8	22.2	795.1	7,235.2	101.3	985.1	17,174.2
All Fires	**41,192.4**	**6,158.7**	**739.7**	**62,100.3**	**44,775.5**	**67,350.9**	**39,452.6**	**51,389**	**227,481.5**	**33,455.8**	**2,107.8**	**11,989**	**588,193.2**

[1]SCC 2102008000; [2]SCC 2103008000; [3]SCC 2104008000 (or SCC 2104008001, SCC 2104008002, SCC 2104008003, SCC 2104008004, SCC 2104008010, SCC 2104008030, SCC2104008050, and SCC 2104008052) and SCC 2104008070; [4]SCC 2801500000; [5]SCC 2810001000; [6]SCC 2810005000; [7]SCC 2810015000 and SCC 2810020000; [8]SCC 2810030000; [9]SCC 2610000100, SCC 2610000400, SCC 2610000500, SCC 2610010000, SCC 2610020000, SCC 2610030000, and SCC 2610040400

Table X: VOC Wood Smoke Emissions (Tons/Year) by SCC (Source: 2002 MANE-VU Modeling Inventory, Version 3.0 with updated NY data).

SCC	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT	TOTAL
2102008000						362.1	182.4		0.0			28.1	572.7
2103008000				27.3		15.3	3.6		3.9				50.1
Indoor RWC[1]	38,031.2	5,210.4	246.9	57,546.5	34,840.6	60,645.3	36,875.2	43,570.1	208,577.3	25,537.3	1,096.9	9,943.8	522,121.5
2104008070	3,036.6	741.7	486.0	2,269.1	4,593.2	5,572.1	1,776.8	6,419.1	17,604.4		885.0	1,026.2	44,410.1
2610000100		5.6	0.0	73.4	109.3	17.3	250.6	15.1	322.7	435.8	1.8	158.8	1,390.5
2610000400		14.6	0.0	49.8	391.7	174.2	34.0	2.6	220.9	310.6	1.2	107.7	1,307.5
2610000500	20.0	50.8			4,571.4			0.0		4,787.6		634.3	10,064.1
2610010000										346.5			346.5
2610020000										888.1			888.1
2610030000		6.4	0.0	1,996.7	52.1	0.8	7.5	4.5	251.5	466.6	98.3	35.6	2,919.9
2610040400			0.0			142.4	66.7	0.0	0.0			48.7	257.7
2801500000				128.4				235.0					363.4
2810001000	18.1	49.6		0.0	92.9	345.4	49.1	778.6	240.9	383.0	8.3	1.1	1,966.9
2810005000				0.0	5.7								5.7
2810015000		67.4	0.0	0.0	70.3		192.2	275.7	7.3	159.9	3.8		776.6
2810020000				0.0									0.0
2810030000	86.5	12.2	6.8	9.1	48.3	76.0	14.5	88.3	252.6	140.4	12.5	4.7	752.0
All Fires	**41,192.3**	**6,158.6**	**739.7**	**62,100.4**	**44,775.6**	**67,350.9**	**39,452.6**	**51,389.0**	**227,481.6**	**33,455.8**	**2,107.8**	**11,989.0**	**588,193.2**

[1] For indoor residential wood combustion, CT, DE, ME, MD, MA, and NH provided data for total woodstoves and fireplaces (SCC 2104008000). DC, NJ, NY, PA, RI, and VT instead reported data for separate woodstove and fireplace categories (SCC 2104008001, SCC 2104008002, SCC 2104008003, SCC 2104008004, SCC 2104008010, SCC 2104008030, SCC2104008050, SCC 2104008052). The separate category data were added together to get a total woodstoves and fireplaces value for these states.