Idaho: West Silver Valley Nonattainment Area -

Area Designations for the

2012 Primary Annual $PM_{2.5}$ National Ambient Air Quality Standard

Technical Support Document

1.0 Summary

In accordance with Section 107(d) of the Clean Air Act (CAA), the Environmental Protection Agency (EPA) must promulgate designations for all areas of the country. In particular, the EPA must identify those areas that are violating a National Ambient Air Quality Standard (NAAQS) or contributing to a violation of the NAAQS in a nearby area. The EPA is required to complete this process within 2 years of promulgating a new or revised NAAQS, or may do so within 3 years under circumstances not relevant to these designations.[1] This technical support document (TSD) describes the EPA's designation of one area in Idaho as nonattainment for the 2012 primary annual fine particle NAAQS (2012 annual $PM_{2.5}$ NAAQS).[2]

Consistent with section 107(d), states are required to submit area designation recommendations to the EPA for the 2012 annual $PM_{2.5}$ NAAQS no later than 1 year following promulgation of the standard, or by December 13, 2013. On December 6, 2013, Idaho recommended that all of Idaho be designated as "unclassifiable/attainment" for the 2012 annual $PM_{2.5}$ NAAQS based on air quality data from 2010-2012. For two areas, West Silver Valley (Pinehurst, Idaho monitor) and Salmon, Idaho, the state relied on exceptional events as part of the recommendation of "unclassifiable/attainment." In order to review the recommendation for the 2012 annual $PM_{2.5}$ NAAQS based on air quality data from 2011-2013, the EPA worked closely with the Idaho Department of Environmental Quality (IDEQ) to complete the five factor analysis for the West Silver Valley area surrounding the violating monitor in Pinehurst.

After considering the state's recommendation and based on the EPA's and the IDEQ's technical analysis as described in this TSD, the EPA is designating the West Silver Valley area listed in Table 1 as nonattainment for the 2012 annual $PM_{2.5}$ standard and the remainder of the state as unclassifiable/attainment for the 2012 annual $PM_{2.5}$ NAAQS based on air quality data from 2011-2013. Accounting for the EPA's concurrence of exceptional events for Pinehurst and Salmon, the West Silver Valley area does not attain the standard while the Salmon area is attaining the standard. The EPA's analysis of the exceptional events claims for both areas is discussed below.

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[1] Section 107(d) of the CAA requires the EPA to complete the initial designation process within 2 years of promulgation of a new or revised NAAQS, unless the Administrator has insufficient information to make initial designation decisions in the 2-year time frame. In such circumstances, the EPA may take up to 1 additional year to make initial area designation decisions (i.e., no later than 3 years after promulgation of the standard).

[2] On December 14, 2012, the EPA promulgated a revised primary annual $PM_{2.5}$ NAAQS (78 FR 3086, January 15, 2013). In that action, the EPA revised the primary annual $PM_{2.5}$ standard, strengthening it from 15.0 micrograms per cubic meter ($\mu g/m^3$) to 12.0 $\mu g/m^3$.

The EPA must designate an area nonattainment if it has an air quality monitoring site[3] that is violating the standard or if it has sources of emissions that are contributing to a violation of the NAAQS in a nearby area. Legal descriptions (e.g., county boundaries, townships and ranges) of West Silver Valley area are found below in the supporting technical analysis. As provided in CAA section 188(a), the EPA is initially classifying all nonattainment areas as "Moderate" nonattainment areas.

Table 1. Idaho's Recommended Nonattainment Areas and EPA's Designated Nonattainment Areas for the 2012 annual $PM_{2.5}$ NAAQS

Area	Idaho's Recommended Nonattainment Counties	EPA's Nonattainment Counties
West Silver Valley, ID	None	Shoshone County (partial) – West Silver Valley

In their recommendation letter, Idaho recommended that the EPA designate as "unclassifiable/attainment" the entire State of Idaho and all Air Quality Control Regions based on 2010-2012 data. Based on 2011-2013 data, the Pinehurst, ID monitor exceeded the standard and led to the consideration of the area surrounding the monitor as nonattainment. With the exception of Shoshone County (partial county) identified in Table 1, the EPA agrees with Idaho's recommendation, and the EPA is designating the remainder of Idaho as unclassifiable/attainment based on ambient monitoring data collected during the 2011-2013 period showing compliance with the 2012 annual $PM_{2.5}$ NAAQS, and the EPA's determination/assessment as outlined below that other areas within Idaho and Indian country are not likely contributing to nearby violations, as appropriate.[4,5]

2.0 Nonattainment Area Analyses and Boundary Determination

The EPA evaluated and determined the boundaries for the West Silver Valley, ID nonattainment area (to be referred to as the West Silver Valley nonattainment area) considering the specific facts and circumstances unique to the area. In accordance with CAA section 107(d), the EPA is designating as nonattainment not only

[3] In accordance with 40 CFR 50 Appendix N, $PM_{2.5}$ measurements from the primary monitor and suitable collocated $PM_{2.5}$ FRM, FEM or ARMs may be used in a "combined site data record" to establish a $PM_{2.5}$ design value to determine whether the NAAQS is met or not met at a particular $PM_{2.5}$ monitoring site.

[4] Unless a state or tribe has specifically identified jurisdictional boundaries in their area recommendations, when determining "remainder of the state," EPA will use Federal Information Processing Standard (FIPS) codes maintained by the National Institute of Standards and Technology (NIST), which are used to identify counties and county equivalents (e.g., parishes, boroughs) of the United States and its unincorporated territories (e.g., American Samoa, Guam, Northern Mariana Islands, Puerto Rico, and the US Virgin Islands). Available on EPA's Envirofacts website at *http://www.epa.gov/envirofw/html/codes/state.html*.

[5] EPA uses a designation category of "unclassifiable/ attainment" for areas that are monitoring attainment and for areas that do not have monitoring sites but which the EPA believes are likely attainment and does not include emissions sources that are contributing to nearby violations based on the five factor analysis and other available information.

the area with the monitoring site that violates the 2012 annual $PM_{2.5}$ NAAQS, but also those nearby areas with emissions sources that contribute to the violation in the violating area. Consistent with the EPA guidance,[6] after identifying each monitoring site indicating a violation of the standard in an area, the EPA analyzed those areas with emissions contributing to that violating area by considering those counties in the entire metropolitan area (e.g., Core Based Statistical Area (CBSA) or Combined Statistical Area (CSA)) in which the violating monitoring site is located. The EPA also evaluated counties adjacent to the CBSA or CSA that have emissions sources with the potential to contribute to the violation. The EPA uses the CBSA or CSA as a starting point for the contribution analysis because those areas are nearby for purposes of the $PM_{2.5}$ NAAQS. Based upon relevant facts and circumstances in each area, the designated nonattainment area could be larger or smaller than the CBSA or CSA. The EPA's analytical approach is described in section 3 of this technical support document.

3.0 Technical Analysis

In this technical analysis, the EPA used the latest data and information available to the EPA (and to the states and tribes through the $PM_{2.5}$ Designations Mapping Tool[7] and the EPA PM Designations Guidance and Data web page[8]) and/or data provided to the EPA by states or tribes. This technical analysis identifies the area with a monitoring site that violates the 2012 annual $PM_{2.5}$ standard. The EPA evaluated this area and other nearby areas with emissions sources or activities that potentially contribute to ambient fine particle concentrations at the violating monitor in the area based on the weight of evidence of the five factors recommended in the EPA guidance and any other relevant information. This technical analysis in Factor 1 also explains EPA's concurrence on requested exceptional events claims at both the Pinehurst and Salmon monitors.

The five analysis factors are:

Factor 1: Air Quality Data. The air quality data analysis involves examining available ambient $PM_{2.5}$ air quality monitoring data at, and in the proximity of, the violating monitoring locations. This includes reviewing the design values (DV) calculated for each monitoring location in the area based on air quality data for the most recent complete three consecutive calendar years of quality-assured, certified air quality data in the EPA's Air Quality System (AQS). In general, the EPA identifies violations using data from suitable Federal Reference Method (FRM), Federal Equivalent Method (FEM), and/or Approved Regional Method (ARM) monitors sited and operated in accordance with 40 CFR Part 58.[9] Procedures for using the air quality data to determine whether a violation has occurred are given in 40 CFR part 50 Appendix N, as revised by a final action published in the

[6] EPA issued guidance on April 16, 2013, that identified important factors that EPA used to evaluate, in making a recommendation for area designations and nonattainment boundaries for the 2012 annual $PM_{2.5}$ NAAQS. Available at *http://www.epa.gov/pmdesignations/2012standards/docs/april2013guidance.pdf.*

[7] EPA's $PM_{2.5}$ Designations Mapping Tool can be found at *http://geoplatform2.epa.gov/PM_MAP/index.html*.

[8] EPA's PM Designations Guidance and Data web page can be found at *http://www.epa.gov/pmdesignations/2012standards/techinfo.htm*.

[9] Suitable monitors include all FEM and/or ARMs except those specific continuous FEMs/ARMs used in the monitoring agency's network where the data are not of sufficient quality such that data are not to be compared to the NAAQS in accordance with 40 CFR part 58.10(b)(13) and approved by the EPA Regional Administrator per 40 CFR part 58.11(e).

Federal Register on January 15, 2013 (78 FR 3086).[10] In addition to reviewing data from violating monitor sites, the EPA also assesses the air quality data from other monitoring locations to help ascertain the potential contribution of sources in areas nearby to the violating monitoring site. Examples include using chemical speciation data to help characterize contributing emissions sources and the determination of nearby contributions through analyses that differentiate local and regional source contributions.

Factor 2: Emissions and emissions-related data. The emissions analysis examines identified sources of direct $PM_{2.5}$, the major components of direct $PM_{2.5}$ (primary organic carbon/organic mass, elemental carbon, crustal material (and/or individual trace metal compounds)), primary nitrate and primary sulfate, and precursor gaseous pollutants (e.g., SO_2, NO_X, total VOC, and NH_3). Emissions data are generally derived from the most recent National Emissions Inventory (NEI) (i.e., 2011 NEI version 1), and are given in tons per year. In some cases, the EPA may also evaluate emissions information from states, tribes, or other relevant sources that may not be reflected in the NEI. One example of such "other information" could include an inventory or assessment of local/regional area sources that individually does not meet the current threshold for reporting to the NEI but collectively contributes to area $PM_{2.5}$ concentrations. Emissions data indicate the potential for a source to contribute to observed violations, making it useful in assessing boundaries of nonattainment areas.

Factor 3: Meteorology. Evaluating meteorological data helps to determine the effect on the fate and transport of emissions contributing to $PM_{2.5}$ concentrations and to identify areas potentially contributing to the violations at monitoring sites. The Factor 3 analysis includes assessing potential source-receptor relationships in the area identified for evaluation using summaries of air trajectories, wind speed, wind direction, and other meteorological data, as available. To best account for the role of meteorology in driving source-receptor relationships, the IDEQ ran a woodsmoke box model for the portion of the West Silver Valley closest to Pinehurst and ran HYSPLIT to determine how important the local mountains are for wind flow. In addition, the IDEQ provided supplemental Calpuff modeling to more quantitatively identify the effect of prescribed burning and point sources on primary $PM_{2.5}$ at the monitor.

Factor 4: Geography/topography. The geography/topography analysis includes examining the physical features of the land that might define the airshed and, therefore, affect the formation and distribution of $PM_{2.5}$ over an area. Mountains or other physical features may influence the fate and transport of emissions and $PM_{2.5}$ concentrations. Additional analyses may consider topographical features that cause local stagnation episodes via inversions, such as valley-type features that effectively "trap" air pollution, leading to periods of elevated $PM_{2.5}$ concentrations.

Factor 5: Jurisdictional boundaries. The analysis of jurisdictional boundaries identifies the governmental planning and organizational structure of an area that may be relevant for designations purposes. These jurisdictional boundaries provide insight into how the governing air agencies conduct or might conduct air quality planning and enforcement in a potential nonattainment area. Examples of jurisdictional boundaries

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[10] As indicated in Appendix N to 40 CFR part 50, Interpretation of the National Ambient Air Quality Standards for $PM_{2.5}$, section 3(a) indicates "Except as otherwise provided in this appendix, all valid FRM/FEM/ARM $PM_{2.5}$ mass concentration data produced by suitable monitors that are required to be submitted to AQS, or otherwise available to EPA, meeting the requirements of part 58 of this chapter including appendices A, C, and E shall be used in the DV (design value) calculations. Generally, EPA will only use such data if they have been certified by the reporting organization (as prescribed by § 58.15 of this chapter); however, data not certified by the reporting organization can nevertheless be used, if the deadline for certification has passed and EPA judges the data to be complete and accurate."

include counties, air districts, areas of Indian country, CBSA or CSA, metropolitan planning organizations (MPOs), and existing nonattainment areas.

3.1 Area Background and Overview of West Silver Valley, Idaho

Figure 1a is a map of the EPA's nonattainment boundary for the West Silver Valley nonattainment area. The map shows the location and design value of the ambient air quality monitoring location, county, topography, hydrologic unit codes (HUC), and jurisdictional boundaries. Figure 1b includes a larger geographic area to show the modeling domain used to analyze the regional air quality, and Figure 1c shows the Area of Analysis which included nearby monitors.

The violating monitor in the West Silver Valley is located in Shoshone County, a rural county in the northern panhandle of Idaho; the monitor is located in the city of Pinehurst. The area is sparsely populated and is home to rugged mountainous terrain. The city of Pinehurst itself is situated in the Silver Valley, known for its mining history. Pinehurst, Idaho historically has had elevated particulate matter levels in the 1990s and it is currently a PM_{10} nonattainment area although its PM_{10} design value is well below the standard. In 2009, EPA designated Shoshone County as unclassifiable/attainment for the 2006 24-hour $PM_{2.5}$ standard based on the design value for the 2006-2008 period which was below the standard. In prior years, the area experienced violations of that standard. Residential wood combustion in the cold, winter months is most responsible for elevated particulate matter in the area, while prescribed burning in the late autumn and in the spring also contributes substantially. Smoke from wildfires can affect the area in the summer. Smoke from crop residue burning is a negligible contributor to $PM_{2.5}$ in the West Silver Valley. For this designation process, the Area of Analysis was chosen to include all known sources that contribute to high $PM_{2.5}$ levels at the Pinehurst monitor as well as a wider area to include a representative sample of nearby monitoring stations and potentially important sources.

Figure 1a. EPA's Nonattainment Boundary for the West Silver Valley Area

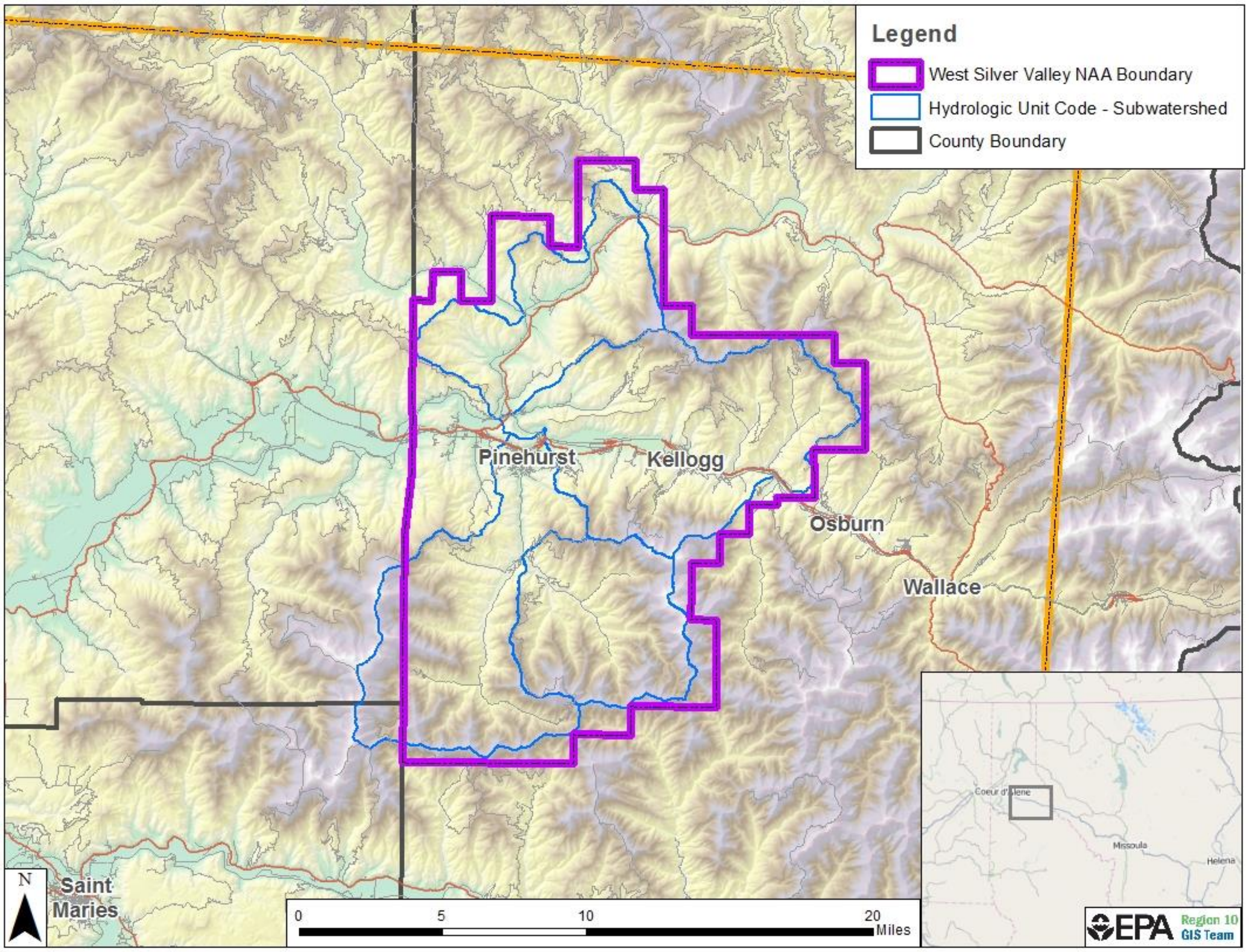


Figure 1b. Modeling Domain for the West Silver Valley Nonattainment Area (based on IDEQ modeling)

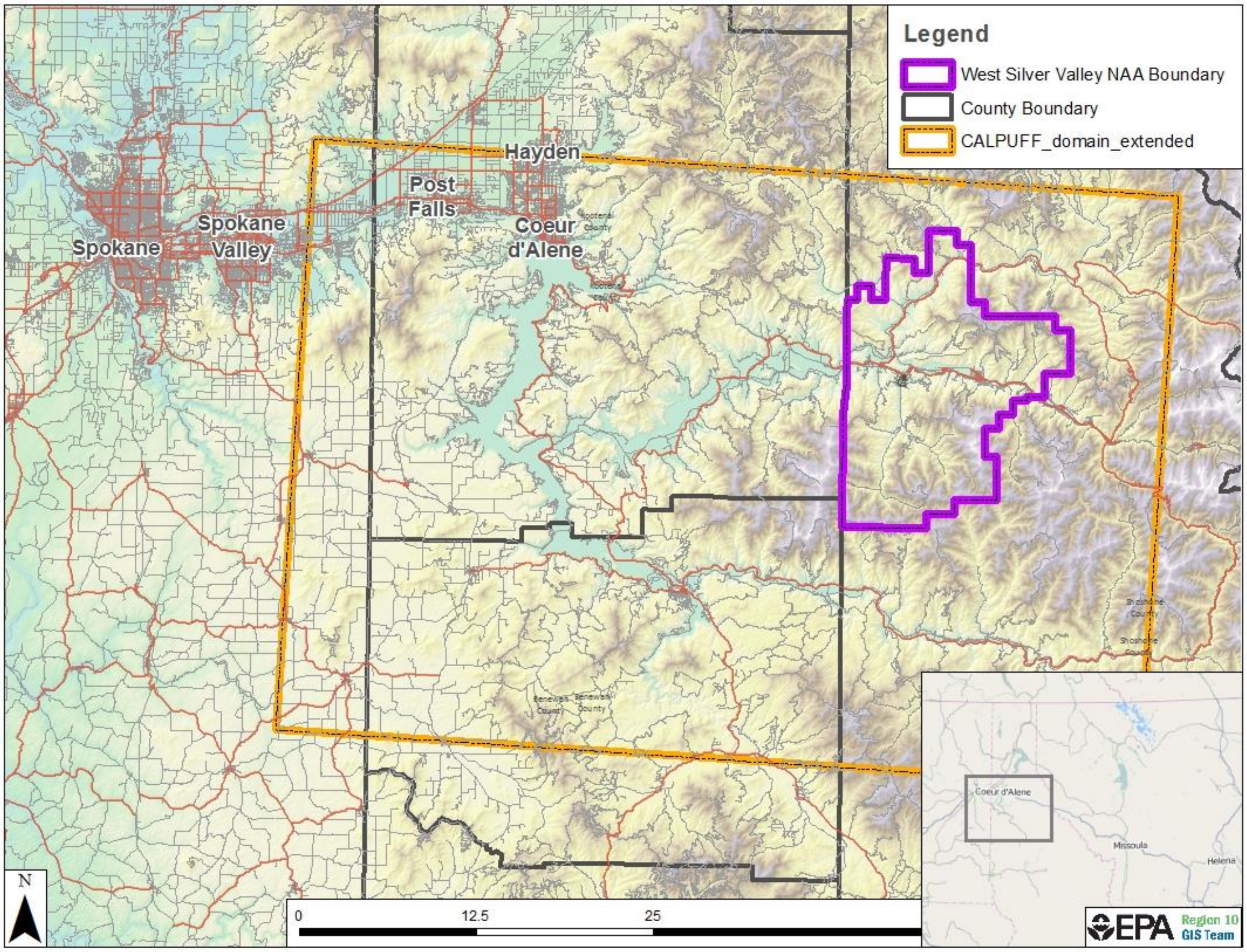
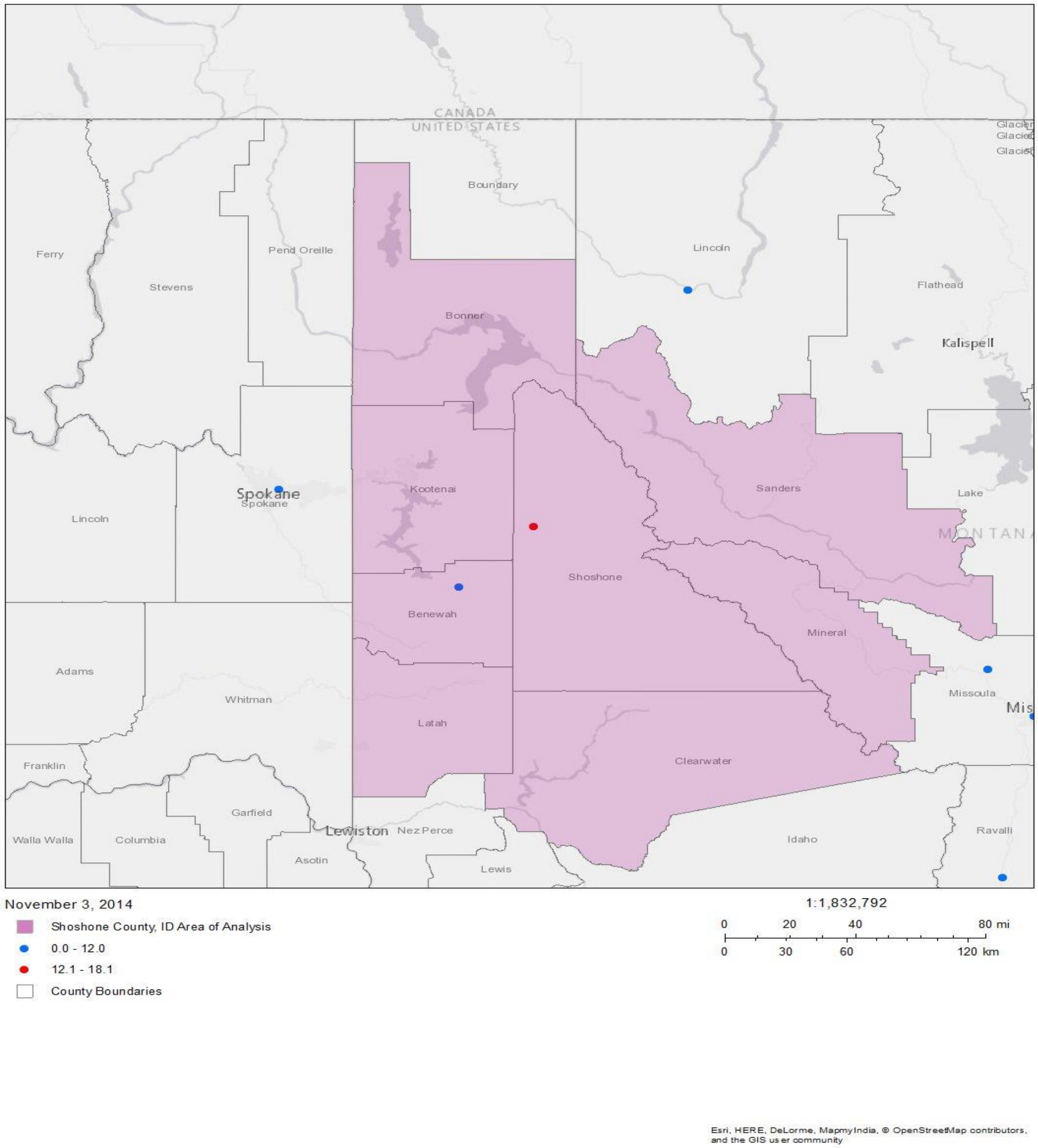


Figure 1c. Area of Analysis for the West Silver Valley Nonattainment Area ($PM_{2.5}$ Designations Mapping Tool)



The EPA must designate as nonattainment areas those areas that violate the NAAQS and nearby areas that contribute to the violation in the violating area. Shoshone County, Idaho shows a violation of the 2012 $PM_{2.5}$ NAAQS, therefore a portion of Shoshone County is included in the nonattainment area. The EPA evaluated each county without a violating monitoring site located near the county with the violating monitoring site based on the five factors and other relevant information and determined as outlined below that the neighboring counties did not contribute to the nearby violation. The following sections describe this five factor analysis process. While the factors are presented individually, they are not independent. The five factor analysis process carefully considers their interconnections and the dependence of each factor on one or more of the others.

Factor 1: Air Quality Data

All data collected during a particular year are important when determining contributions to an annual standard such as the 2012 annual $PM_{2.5}$ NAAQS. Compliance with an annual NAAQS is dependent upon monitor readings throughout the year, including days with monitored ambient concentrations below the level of the NAAQS. For the 2012 annual $PM_{2.5}$ NAAQS, the annual mean is calculated as the mean of quarterly means. A high quarter can drive the mean for an entire year, which, in turn, can drive an elevated 3-year DV. Although all data are important, seasonal or episodic emissions can provide insight as to relative contributors to measured $PM_{2.5}$ concentrations. For these reasons, for the Factor 1 air quality analysis, the EPA assessed and characterized air quality at, and in the proximity of, the violating monitoring site locations first, by evaluating trends and the spatial extent of measured concentrations at monitors in the area of analysis, and then, by identifying the conditions most associated with high average concentration levels of $PM_{2.5}$ mass in the area of analysis.

In the case of the Pinehurst monitor, the EPA assessed air quality data on a seasonal and monthly basis.[11] $PM_{2.5}$ in the West Silver Valley is characterized by various seasons. The monitor measures high values in the winter due to a combination of residential wood combustion, low wind speeds, and low mixing heights. In the springtime prescribed burning contributes to the elevated $PM_{2.5}$ values. The monitor generally records lower values in the summer except for occasional impacts from wildfires, which can be Exceptional Events provided that an exceptional event demonstration is submitted that meets exceptional event criteria and timeframes as per *Treatment of Data Influenced by Exceptional Events* (Exceptional Events Rule or EER, 72 FR 13560). In the autumn season the monitor is again influenced by prescribed burning. Accordingly, the seasonality of $PM_{2.5}$ in West Silver Valley is more accurately characterized when analyzed on a monthly basis as opposed to quarterly basis. This is depicted in Figure 2a.

The EPA also identified the spatial extent of these high $PM_{2.5}$ concentrations. The mass and composition at the design value location represents contributions from various emission sources including local, area-wide (which may comprise nearby urban and rural areas) and regional sources. To determine the source mix (by mass) at the design value monitoring site, the EPA examined the chemical composition of the monitored $PM_{2.5}$ concentrations (Figure 3) analyzed in the 2008 Neil Frank study[12]. The EPA compared the design value at the Pinehurst monitor to other sites in the region, including IMPROVE sites (Interagency Monitoring of Protected Visual Environments, i.e. visibility). (Table 2a and 2b). This comparison of local/area-wide $PM_{2.5}$ data to

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[11] Although compliance with the annual NAAQS depends on contributions from all days of the year, examining data on a monthly or seasonal basis can inform the relationship between the temporal variability of emissions and meteorology and the resulting $PM_{2.5}$ mass and composition. In some areas of the country where there may be noticeable month-to-month variations in average $PM_{2.5}$, the quarterly averages may not adequately represent seasonal variability. In these areas, air quality data may be presented by those months that best correspond to the local "seasons" in these areas.

[12] http://www.epa.gov/airquality/particlepollution/designations/2006standards/techinfo/available_new_speciation_data_pm2.5_naa.pdf

regional data derives an "urban increment," which helps differentiate the influence of more distant emissions sources from the influence of closer emissions sources, thus representing the portion of the measured violation that is associated with nearby emission contributions. For the West Silver Valley area, the urban increment was defined as the difference between the monthly averaged Pinehurst data and the average of the remote and rural area values in Figure 2a and 2b. [13,14,15]

<u>$PM_{2.5}$ Design Values and Total Mass Measurements</u> – The EPA examined ambient $PM_{2.5}$ air quality monitoring data represented by the DVs at the violating monitoring site and at other monitors in the area of analysis. The EPA calculated DVs based on air quality data for the most recent three consecutive calendar years of quality-assured, certified air quality data from suitable FEM/FRM/ARM monitoring sites in the EPA's Air Quality System (AQS). For this designations analysis, the EPA used data for the 2011-2013 period (i.e., the 2013 design value), which are the most recent years with fully-certified air quality data. A monitor's DV is the metric or statistic that indicates whether that monitor attains a specified air quality standard. The 2012 annual $PM_{2.5}$ NAAQS is met at a monitoring site when the 3-year average annual mean concentration is 12.0 micrograms per cubic meter ($\mu g/m^3$) or less (e.g., 12.1 $\mu g/m^3$ or greater is a violation). A DV is only valid if minimum data completeness criteria are met or when other regulatory data processing provisions are satisfied (See 40 CFR part 50 Appendix N). Table 2a identifies the current design value(s) (i.e., the 2013 DV) and the most recent two design values based on all monitoring sites in the area of analysis for the West Silver Valley, Idaho nonattainment area.[16] Where a county has more than one monitoring location, the county design value is indicated in red type. Table 2b identifies all of the additional monitors relied upon in this TSD, especially with regard to understanding the remote and rural background

<u>Consideration of Exceptional Event Claims</u> – As the EPA will be taking action on exceptional events in the same Federal Register Final $PM_{2.5}$ Annual Standard Area Designations, this TSD provides technical information for both the Pinehurst and Salmon exceptional event submission. The DVs for the Salmon unclassifiable/attainment area designation and West Silver Valley nonattainment area designation reflect the EPA's concurrence on multiple exceptional event claims that affect the data used to calculate the DVs. In the state of Idaho's area designations recommendation letter of December 6, 2013, Idaho recommended

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[13] In most, but not all, cases, the violating design value monitoring site is located in an urban area. Where the violating monitor is not located in an urban area, the "urban increment" represents the difference between local and other nearby emission sources in the vicinity of the violating monitoring location and more regional sources.
[14] Hand, et al. Spatial and Seasonal Patterns and Temporal Variability of Haze and its Constituents in the United States: Report V, June 2011. Chapter 7 – Urban Excess in $PM_{2.5}$ Speciated Aerosol Concentrations, *http://vista.cira.colostate.edu/improve/Publications/Reports/2011/PDF/Chapter7.pdf*
[15] US EPA, Office of Air Quality Planning and Standards, December 2004. (2004) Area Designations for 1997 Fine Particle ($PM_{2.5}$) Standards, Technical Support Document for State and Tribal Air Quality Fine Particle ($PM_{2.5}$) Designations, Chapter 3, Urban Excess Methodology. Available at *www.epa.gov/pmdesignations/1997standards/documents/final/TSD/Ch3.pdf*
[16] In certain circumstances, one or more monitoring locations within a monitoring network may not meet the network technical requirements set forth in 40 CFR 58.11(e), which states, "State and local governments must assess data from Class III $PM_{2.5}$ FEM and ARM monitors operated within their network using the performance criteria described in table C-4 to subpart C of part 53 of this chapter, for cases where the data are identified as not of sufficient comparability to a collocated FRM, and the monitoring agency requests that the FEM or ARM data should not be used in comparison to the NAAQS. These assessments are required in the monitoring agency's annual monitoring network plan described in §58.10(b) for cases where the FEM or ARM is identified as not of sufficient comparability to a collocated FRM…."

unclassifiable/attainment area designations for the cities of Salmon (Lemhi County) and Pinehurst (Shoshone County). Data recorded at these monitors initially showed 2010-2012 design values for the monitors in these cities in violation of the 2012 annual $PM_{2.5}$ NAAQS. However, Idaho contended that several days of flagged data should be excluded as exceptional events.

On December 6, 2013, Idaho submitted an exceptional event demonstration supporting wildfire-based exceptional events claims for approximately 43 days at the Salmon monitor, and four days at the Pinehurst monitor. Idaho's submission included an appendix of additional days that Idaho believed could qualify as exceptional events, but for which the state did not prepare or submit a technical demonstration. This submission was based on Idaho's belief concerning the number of exceptional event claims necessary to result in a 2010-2012 DV that met the standard. However, these designations are based on 2011-2013 DVs, which incorporate the most recent valid data. Accordingly, on January 30, 2014, the EPA informed Idaho that in order to achieve a compliant 2011-2013 DV for the Salmon monitor Idaho would need to submit documentation supporting an additional six exceptional events claims for that monitor. On April 25, 2014, Idaho submitted an addendum to its December 6, 2014 submission, with technical demonstrations supporting wildfire-based exceptional events for an additional 20 days at the Salmon monitor.

On July 8, 2014, the EPA informed Idaho that it concurred on a number of days that Idaho claimed as exceptional events for the Salmon monitor, as well as all four days claimed as exceptional events for the Pinehurst monitor.[17] The EPA concurred in a sufficient number of exceptional events claims to bring the 2011–2013 DV at the Salmon monitor to the standard. For Pinehurst, however, as indicated below in Table 2a, the exceptional events claims were insufficient to bring the 2011-2013 DV into compliance with the standard. Furthermore, the number and magnitude of the remaining days flagged as potential exceptional events for the Pinehurst monitor would not have been sufficient to bring that monitor into compliance with the standard, even if Idaho had submitted additional technical demonstrations.

Table 2a. Air Quality Data collected in Area of Analysis (all DV levels in μg/m^3)

City, County, State	Monitor Site ID	State Rec NA?	09-11 DV	10-12 DV	11-13 DV
St Maries, Benewah, Idaho	160090010	No	9	8.9	9.9
Spokane, Spokane, Washington	530630021	No	7.2	7.4	8.0
Pinehurst, Shoshone, Idaho	160790017	No	12	12.0	12.8*
Libby, Lincoln, Montana	300530018	-	11.4	11.5	11.4
Hamilton, Ravalli, Montana	300810007	-	7.8	11.0	11.2
Sandpoint, Bonner, Idaho**	160170005/3	No	3.7	3.6	4.0
Clearwater, Idaho	No monitor	-	-	-	-
Coeur d Alene, Kootenai, Idaho**	160550003	No	4.3	3.9	4.1

[17] Copies of the concurrence letter and analysis may be found in the docket.

* The 2011–2013 DV for the Pinehurst monitor was derived from data that excluded the four exceptional event days discussed above. Had those exceptional events not been excluded, the 2011-2013 DV for this monitor would have been 12.9 µg/m^3.
** Non regulatory monitor

Table 2b. Air Quality Data Collected at Special Purpose, Non-Regulatory Monitors (all DV levels in µg/m^3)*

City, County, State	Monitor Site ID	State Rec NA?	09-11 DV	10-12 DV	11-13 DV
Plummer, Benewah, Idaho	160090011	No	Not determined	Not determined	Not determined
Moscow, Latah, Idaho	160570005	No	Not determined	Not determined	Not determined
Spokane, Spokane, Washington	530630047	No	Not determined	Not determined	7.5
Colville, Stevens, Washington	530650004	No	Not determined	Not determined	9.0
Welpinit, Stevens, Washington	530650002	No	Not determined	Not determined	5.6
Pullman, Whitman, Washington	530750003	No	Not determined	Not determined	5.8
Rosalia, Whitman, Washington	530750006	No	Not determined	Not determined	4.7
LaCrosse, Whitman, Washington	530750005	No	Not determined	Not determined	4.4
Thompson Falls, Sanders, Montana	No monitor	-	Not determined	Not determined	Not determined
Cabinet Mts, Sanders, Montana	IMPROVE	-	Not determined	Not determined	Not determined
Sula Pk, Ravalli, Montana	IMPROVE	-	Not determined	Not determined	Not determined

* Monitors in this chart provided data for analyses in this TSD, primarily understanding the remote and rural background.

The Figure 1a and 1b maps, shown previously, identify the West Silver Valley, Idaho nonattainment area and Pinehurst monitoring location with 2011-2013 violating DV. As indicated on the map, there is one violating monitoring location located in Pinehurst near the western border of Shoshone County, Idaho. It is located in the West Silver Valley and with the community of Kingston to the west and towns of Smelterville and Kellogg to the east. The West Silver Valley area historically has had elevated particulate matter levels; it is currently a PM_{10} nonattainment area (although attaining the standard). In 2009, EPA designated Shoshone County as unclassifiable/attainment for the 2006 24-hour $PM_{2.5}$ standard based on the design value for the 2006-2008 period which was below the standard. In prior years, the area experienced violations of that standard. Residential wood combustion in the cold, winter months is most responsible for elevated particulate matter in the area, while prescribed burning in the late autumn and in the spring also contribute substantially. Smoke from wildfires can affect the area in the summer. Smoke from crop residue burning is a negligible contributor to $PM_{2.5}$ in West Silver Valley.

Seasonal variation can highlight those conditions most associated with high average concentration levels of $PM_{2.5}$. Figure 2a and 2b show monthly mean $PM_{2.5}$ concentrations for the 2008-2011 4-year period and the 2011-2013 3-year period for the highest DV monitoring site within the area of analysis. The 2011-2013 data set is not being used to establish the regional background as it is influenced by wildfire events. However, by comparing Figure 2a based on the 2008-2011 data and Figure 2b using 2011-2013 data with elevated wildfire values which EPA has concurred are exceptional events removed, it demonstrates that Figure 2a and the 2008-2011 dataset is representative of years not affected by exceptional events and can be used as background for purposes of these analyses. This graphical representation is particularly relevant when assessing air quality data for an annual standard, such as the 2012 annual $PM_{2.5}$ NAAQS, because, as previously stated, the annual mean is calculated as the mean of quarterly means and a high month or quarter can drive the mean for an entire year, which, in turn, can drive an elevated 3-year DV.

Figure 2a. West Silver Valley $PM_{2.5}$ Monthly Means for 2008-2011, including Urban Increment

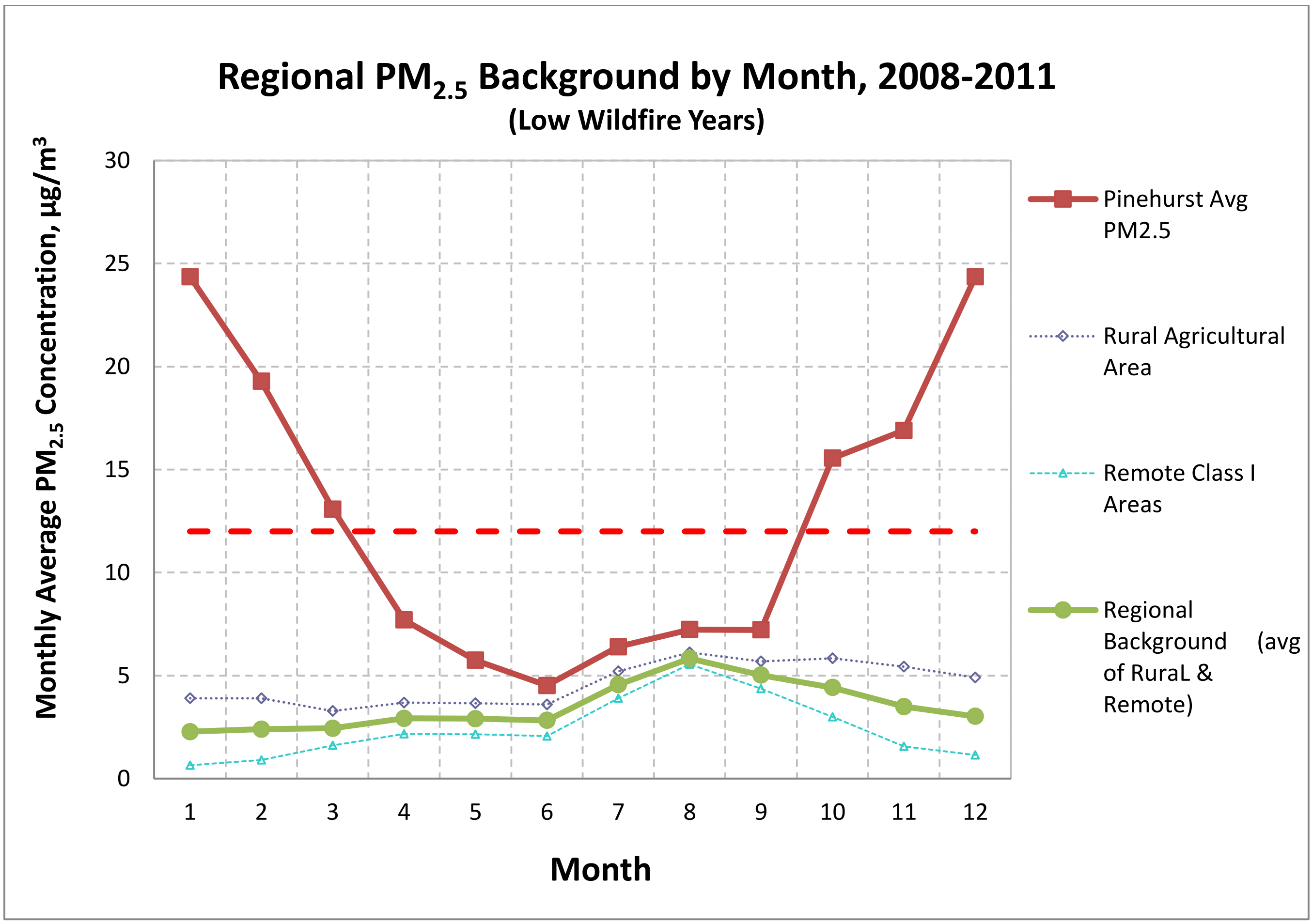
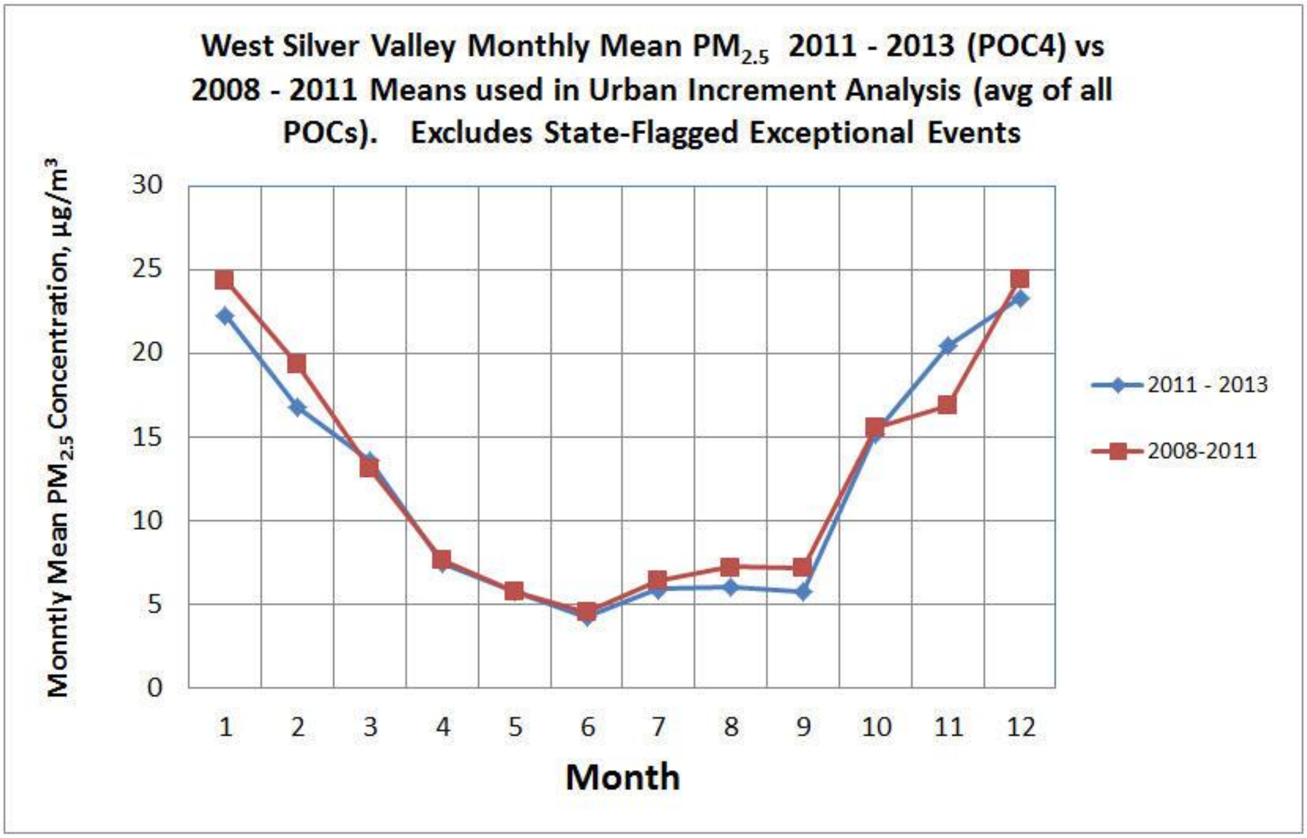


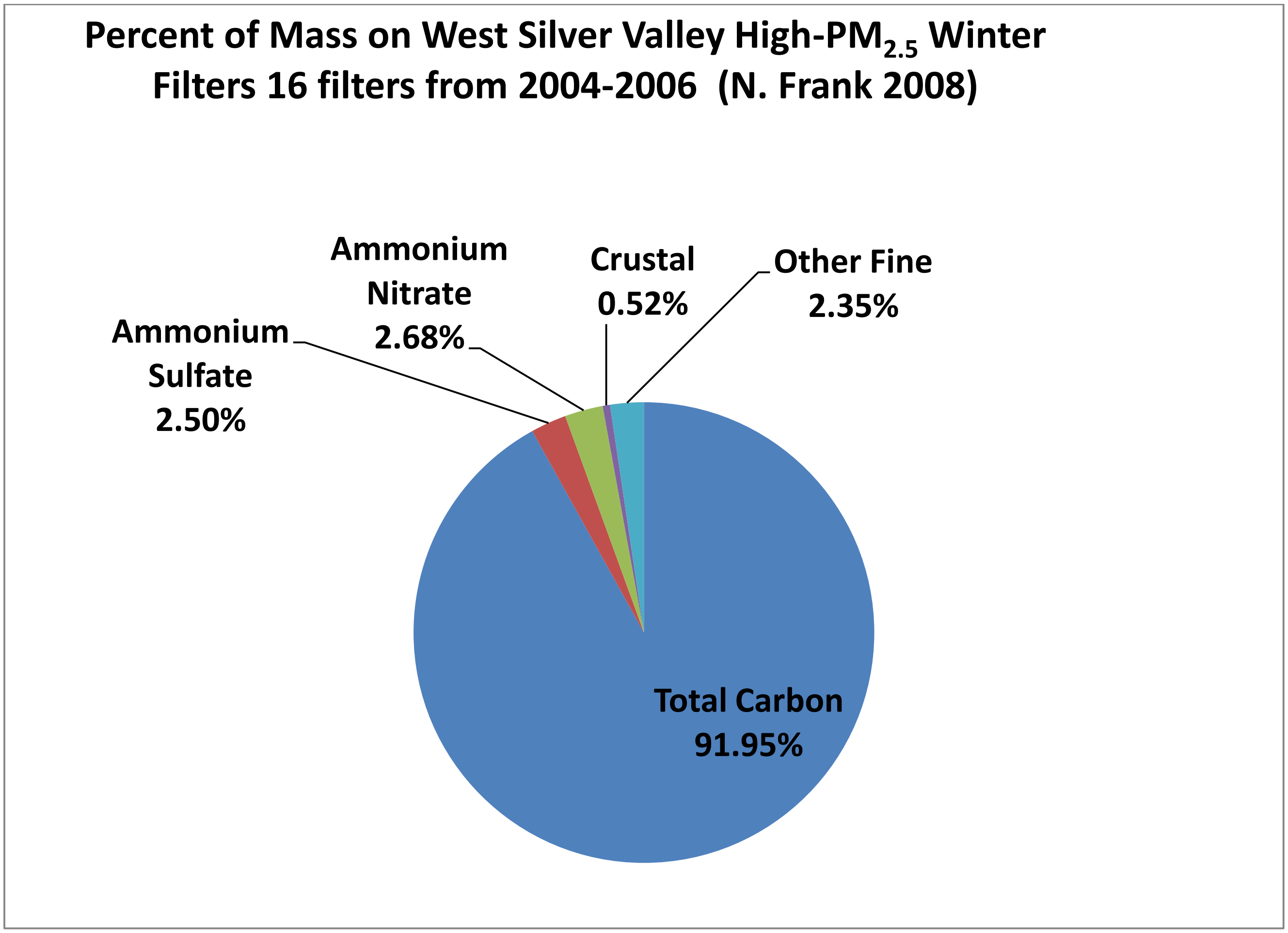
Figure 2b. West Silver Valley $PM_{2.5}$ Monthly Means for 2011-2013, excluding state flagged days affected by wildfire smoke for comparative non-regulatory purposes



$PM_{2.5}$ at the Pinehurst monitor is highest during wintertime months (October through March months 10-12, 1-3 in Figure 2a) due to residential wood combustion. In April, August and September (months 4, 8, 9), prescribed burning elevates $PM_{2.5}$ in West Silver Valley above the regional background. During the warmer months, $PM_{2.5}$ levels are lower overall and are similar to the regional background with a minor component from smoke generated by agricultural burning/crop residue burning and forestry burning (prescribed and wildfire). Note the high values in winter with a considerable urban increment and low values in summer with little to no urban increment from local emission sources. Figure 2a, along with subsequent speciation related analyses, clearly shows the importance of evaluating on a monthly basis as opposed to quarterly seasonal basis as otherwise it would not be possible to separate the impact from prescribed burning from that of residential wood combustion.

$PM_{2.5}$ Composition Measurements - To assess potential emissions contributions for each violating monitoring location, the EPA determined the various chemical species comprising total $PM_{2.5}$ to identify the chemical constituents over the analysis area, which can provide insight into the types of emission sources impacting the monitored concentration. Figure 3 illustrates the fraction of each $PM_{2.5}$ chemical constituent at the Pinehurst monitoring site based on a comparison to the aforementioned Neil Frank 2008 study.

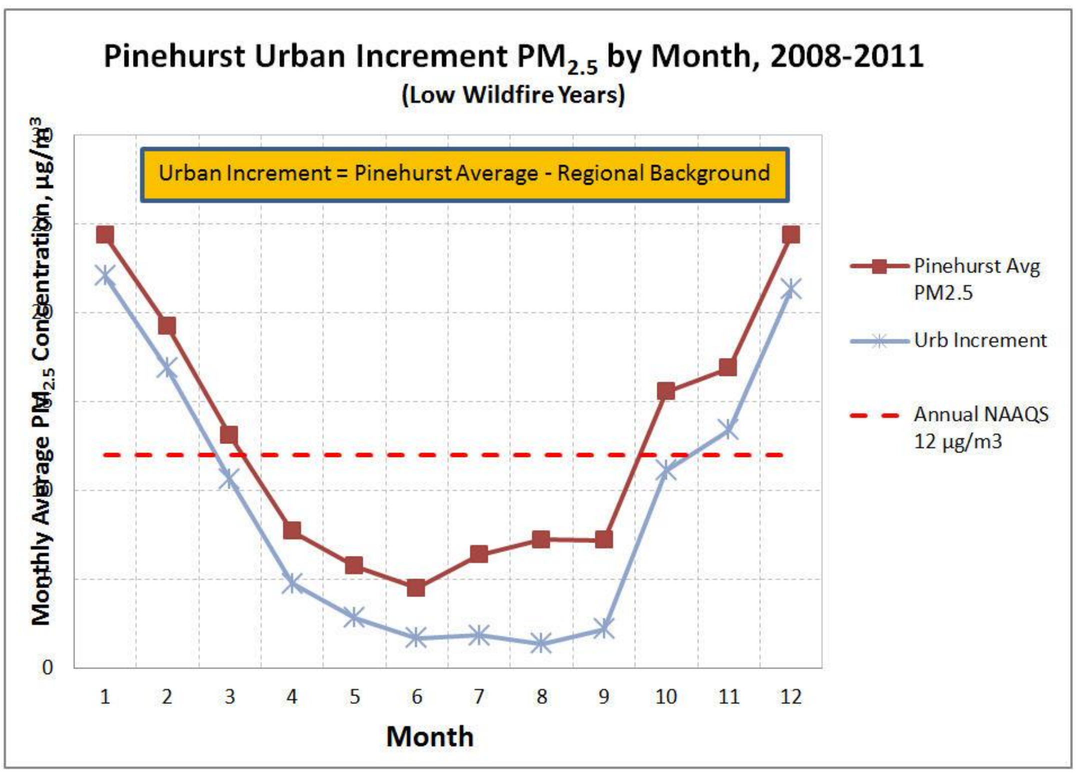
Figure 3. West Silver Valley, Idaho Wintertime $PM_{2.5}$ Constituents



As illustrated in Figure 3, the majority of the monitored $PM_{2.5}$ at the site during the winter are carbon based, 92%. During the winter the remaining 8% of $PM_{2.5}$ are shown to be 5.2% from ammonium sulfate and ammonium nitrate and the other 2.8% from crustal and other fine components. This speciation information aligns with the preliminary analyses of monthly data that projected the bulk of emissions coming during wood heating season and prescribed burning season. To analyze contributions for the summer and in the absence of summertime speciation data in the West Silver Valley, we analyzed $PM_{2.5}$ -speciated IMPROVE data from the nearby Sula Peak and Cabinet peak monitors. These monitors measure year-round and provide speciated data for the summer months when the urban increment is small. For the summer period of May through August 2008-2011 the monthly average background ammonium sulfate concentration was 0.6 µg/m^3 and ammonium nitrate was 0.1 µg/m^3. It is unlikely for the ammonium sulfate and ammonium nitrate concentrations at the Pinehurst monitor to be much higher than these values because these components are regional in nature and tend to have few sharp gradients. Considering that the combined ammonium sulfate and ammonium nitrate is well less than 1 µg/m^3 and wintertime carbon concentration is near 20 µg/m^3, we find that sources of organic and elemental carbon are the primary driver of nonattainment of the annual $PM_{2.5}$ standard in West Silver Valley.

The EPA assessed seasonal and annual average $PM_{2.5}$ constituents at monitoring sites within the area relative to monitoring sites outside of the analysis area to account for the difference between regional background concentrations of $PM_{2.5}$, and the local concentrations of $PM_{2.5}$, also known as the "urban increment." This analysis differentiates between the influences of emissions from sources in nearby areas and in more distant areas on the violating monitor. Estimating the urban increment in the area helps to illuminate the amount and type of particles at the violating monitor that are most likely to be the result of sources of emissions in nearby areas, as opposed to impacts of more distant or regional sources of emissions. Figure 4 includes a plot showing the monthly average Pinehurst monitored values and the Pinehurst monthly average urban increment defined as the Pinehurst monthly average minus the average of the rural and remote site monthly average. For purposes of this TSD, the average of the rural and remote background values was chosen for determining the urban increment so that it would include sources such as agricultural burning in the estimate of local $PM_{2.5}$. The urban increment is much higher in the winter than other seasons. The emission inventory presented below and the speciation data lend confidence that wintertime primary emissions of $PM_{2.5}$ are the main sources contributing to the monitor's highest $PM_{2.5}$ values throughout the year. With regard to crop residue burning, according to the Idaho Open Burning of Crop Residue State Implementation Plan (SIP) revision in April 2008, estimates of $PM_{2.5}$ contribution from crop residue burning (CRB) range from as low as 0.004 µg/m^3 seasonally to a slightly higher value of 0.17 µg/m^3 annually. For this analysis the more conservative 0.17µg/m^3 annual value was used.

Figure 4. West Silver Valley, Idaho Urban Increment Analysis



Factor 2: Emissions and emissions-related data

In this designations process, for each area with a violating monitoring site, the EPA evaluated the emissions data from nearby areas using emissions related data for the relevant counties to assess each county's potential contribution to $PM_{2.5}$ concentrations at the violating monitoring site or monitoring sites in the area under evaluation. Similar to the air quality analysis, these data were examined on a seasonal basis. The EPA examined emissions of identified sources or source categories of direct $PM_{2.5}$, the major components of direct $PM_{2.5}$ (organic mass, elemental carbon, crustal material (and/or individual trace metal compounds)), primary nitrate and primary sulfate, and precursor gaseous pollutants (i.e., SO_2, NO_X, total VOC, and NH_3). The EPA also considered the distance of those sources of emissions from the violating monitoring site. While direct $PM_{2.5}$ emissions and its major carbonaceous components are generally associated with sources near violating $PM_{2.5}$ monitoring sites, the gaseous precursors tend to have a more regional influence (although the EPA is mindful of the potential local NO_X and VOC emissions contributions to $PM_{2.5}$ from mobile and stationary sources) and transport from neighboring areas can contribute to higher $PM_{2.5}$ levels at the violating monitoring sites.

<u>Emissions Data</u>

For this factor, the EPA reviewed data from the 2011 National Emissions Inventory (NEI) version 1 (see *http://www.epa.gov/ttn/chief/net/2011inventory.html*). For each county in the area of analysis, the EPA examined the magnitude of county-level emissions reported in the NEI. These county-level emissions represent the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, nonroad mobile, on-road mobile, and fires. The EPA also looked at the geographic distribution of major point sources of the relevant pollutants.[18] Significant emissions levels from sources in a nearby area indicate the potential for the area to contribute to monitored violations.

To further analyze area emissions data, the EPA also developed a summary of direct $PM_{2.5}$, components of direct $PM_{2.5}$, and precursor pollutants, which is available at *http://www.epa.gov/pmdesignations/2012standards/docs/nei2011v1pointnei2008v3county.xlsx*.

In addition, the IDEQ supplied the EPA with an updated annual emission inventory for direct $PM_{2.5}$ and all precursors for Shoshone County and surrounding counties. They also gave an emissions inventory for the West Silver Valley nonattainment area, including direct $PM_{2.5}$ and all precursors, for specific months when $PM_{2.5}$ is high, namely the wintertime period and the late autumn, and for the area of the county including Pinehurst and its geographically-constrained airshed.

When considered with the speciation comparison analysis in Factor 1, evaluating the components of direct $PM_{2.5}$ and precursor gases can help identify specific sources or source types contributing to elevated concentrations at violating monitoring sites and thus assist in identifying appropriate area boundaries. In general, directly emitted particulate organic carbon (POC) and VOCs[19] contribute to $PM_{2.5}$ organic mass (OM); directly emitted EC contributes to $PM_{2.5}$ EC; NO_X, NH_3 and directly emitted nitrate contribute to $PM_{2.5}$ nitrate mass; SO_2, NH_3 and directly emitted sulfate contribute to $PM_{2.5}$ sulfate mass; and directly emitted crustal

[18] For purposes of this designations effort, "major" point sources are those whose sum of PM precursor emissions ($PM_{2.5}$ + NOx + SO_2 + VOC + NH_3) are greater than 500 tons per year based on NEI 2011v1.

[19] As previously mentioned, nearby VOCs are presumed to be a less important contributor to $PM_{2.5}$ OM than POC.

material contribute to $PM_{2.5}$ crustal matter.[20,21] The EPA believes that the quantities of those nearby emissions as potential contributors to the $PM_{2.5}$ violating monitors are somewhat proportional to the $PM_{2.5}$ chemical constituents in the estimated urban increment. Thus, directly emitted POC is more important per ton than SO_2, partially because POC emissions are already $PM_{2.5}$ whereas SO_2 must convert to $PM_{2.5}$ and not all of the emitted SO_2 undergoes this conversion.

Table 3a provides a county-level emissions summary (i.e., the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, nonroad mobile, on-road mobile, and fires) of directly emitted $PM_{2.5}$ and precursor species for the county with the violating monitoring site and nearby counties considered for inclusion in the West Silver Valley area. Table 3B summarizes the directly emitted components of $PM_{2.5}$ for the same counties in the area of analysis for the West Silver Valley area. Table 3b breaks down the direct $PM_{2.5}$ emissions value from Table 3a into its components.

Table 3a. County-Level Emissions of Directly Emitted $PM_{2.5}$ and Precursors (tons/year)

County, State	Total NH_3	Total NOx	Total Direct $PM_{2.5}$	Total SO_2	Total VOC	Total
Clearwater, ID	1,466	1,241	6,857	532	19,598	29,694
Kootenai, ID	543	6,668	2,240	220	8,902	18,573
Bonner, ID	471	3,702	2,271	212	7,265	13,921
Shoshone, ID	**525**	**1,329**	**2,707**	**212**	**8,181**	**12,954**
Benewah, ID	481	803	1,550	134	4,443	7,411
Latah, ID	817	1,596	1,412	81	2,837	6,743
Sanders, MT	402	1,464	1,217	107	3,375	6,565
Mineral, MT	118	1,426	483	62	1,614	3,703

Table 3b. County-Level Emissions for Components of Directly Emitted $PM_{2.5}$ (tons/year)[22]

County, State	POM	EC	PSO4	PNO3	Pcrustal	Residual	Total Direct
Clearwater, ID	5,674	730	33	62	89	269	6,857
Shoshone, ID	**2,239**	**300**	**14**	**25**	**30**	**100**	**2,707**
Bonner, ID	1,590	256	19	17	178	211	2,271
Kootenai, ID	1,262	252	30	10	336	351	2,240
Benewah, ID	1,175	162	10	13	91	99	1,550
Latah, ID	686	115	12	6	314	279	1,412
Sanders, MT	935	148	6	11	44	72	1,217

[20] *See*, Seinfeld J. H. and Pandis S. N. (2006) *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, 2nd edition, J. Wiley, New York. See also, Seinfeld J. H. and Pandis S. N. (1998) *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, 1st edition, J. Wiley, New York.
[21] USEPA Report (2004), The Particle Pollution Report: Current Understanding of Air Quality and Emissions through 2003, found at: *http://www.epa.gov/airtrends/aqtrnd04/pm.html*.
[22] Data are based on the 2011 and 2018 Emissions Modeling Platform Data Files and Summaries (*ftp://ftp.epa.gov/EmisInventory/2011v6/v1platform*) available at: *http://www.epa.gov/ttn/chief/emch/index.html#2011* (accessed 02/26/14).

County, State	POM	EC	PSO4	PNO3	Pcrustal	Residual	Total Direct
Mineral, MT	356	72	4	3	11	37	483

Reviewing the county level emission data in Table 3a, Shoshone County is average when compared to the surrounding counties in the area of analysis. Shoshone is roughly in the middle (43.6% of the highest) in terms of total $PM_{2.5}$ and precursor emissions. Table 3b provides more meaningful information with respect to the $PM_{2.5}$ issue in the West Silver Valley. The Table 3b values in the Shoshone County, where the West Silver Valley resides, clearly identify that emissions of organic carbon (POM and EC) are much higher than that of sulfates and nitrates. Overall, in all counties organic mass is by far the largest constituent of primary $PM_{2.5}$ emissions followed to a lesser extent elemental carbon and crustal matter. This is consistent with the speciation data in that both the county-level emissions and monitored $PM_{2.5}$ are dominated by organic carbon. It furthermore supports the conclusion that secondary ammonium sulfate and ammonium nitrate are not large contributors to the violating monitor.

Figure 5a-1. West Silver Valley, Idaho nonattainment Area Emissions Inventory, Annual $PM_{2.5}$

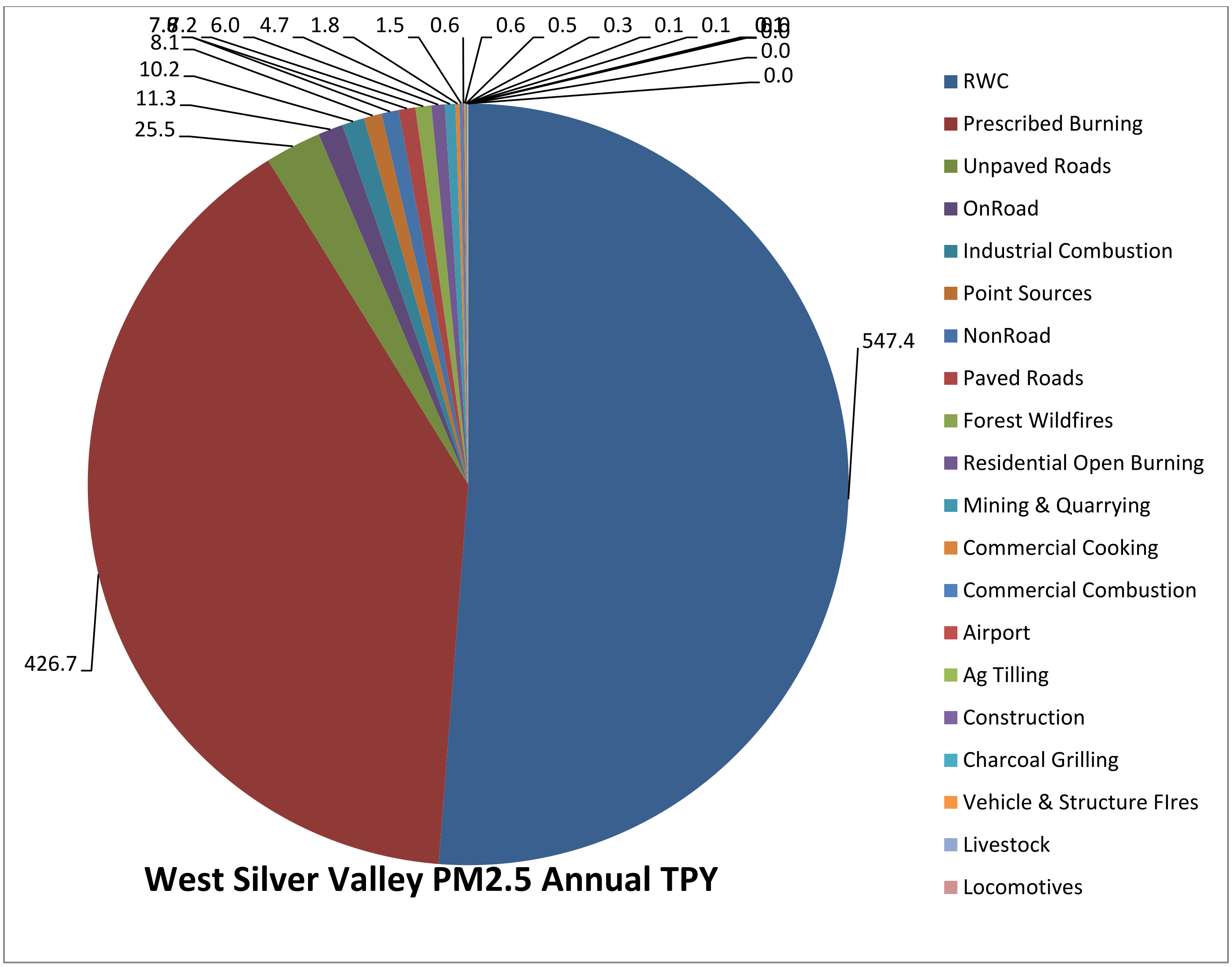


Figure 5a-2. West Silver Valley, Idaho nonattainment Area Emissions Inventory, Annual NO_x

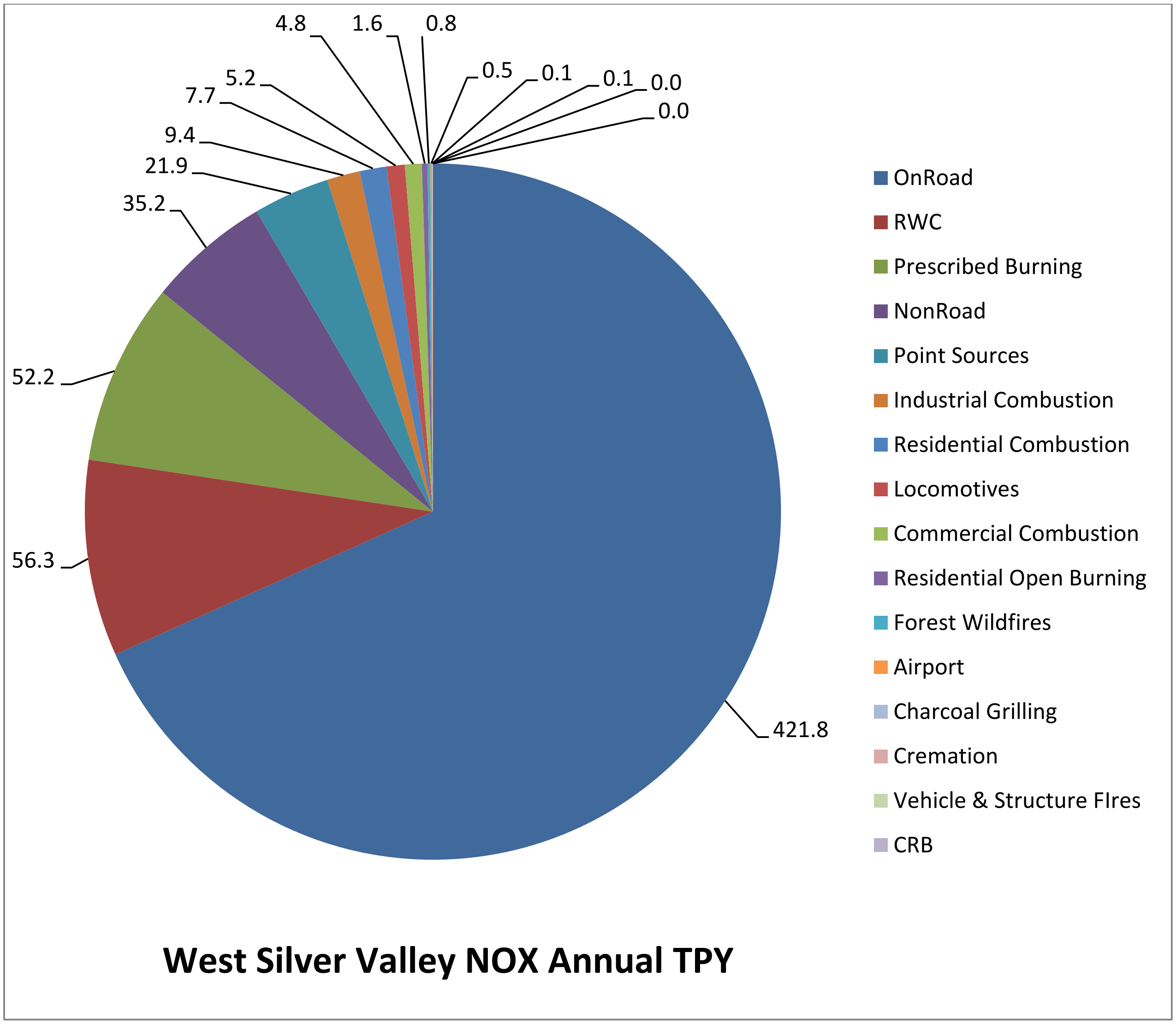


Figure 5a-3. West Silver Valley, Idaho nonattainment Area Emissions Inventory, Annual VOC

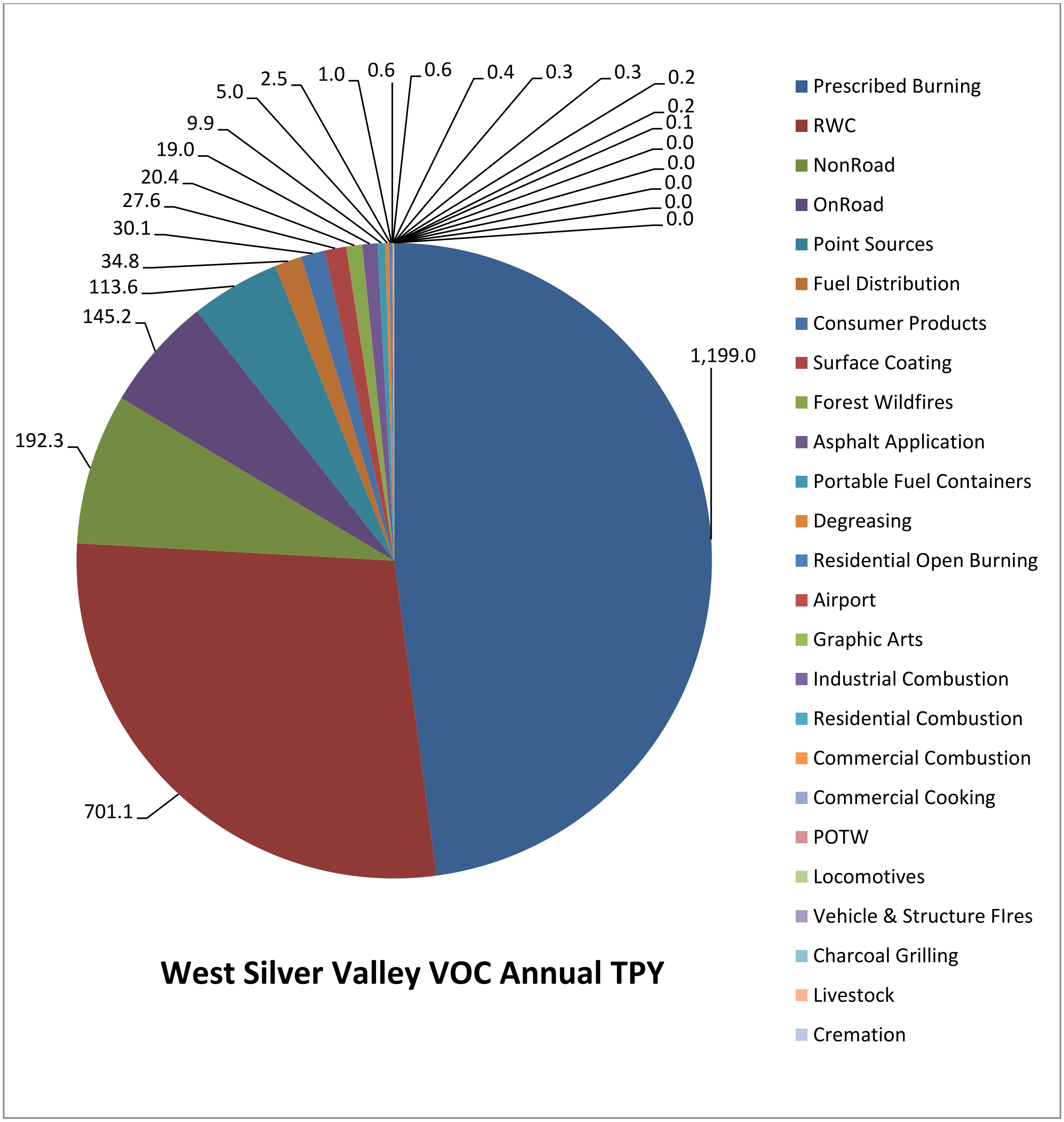


Figure 5a-4. West Silver Valley, Idaho nonattainment Area Emissions Inventory, Annual SO_2

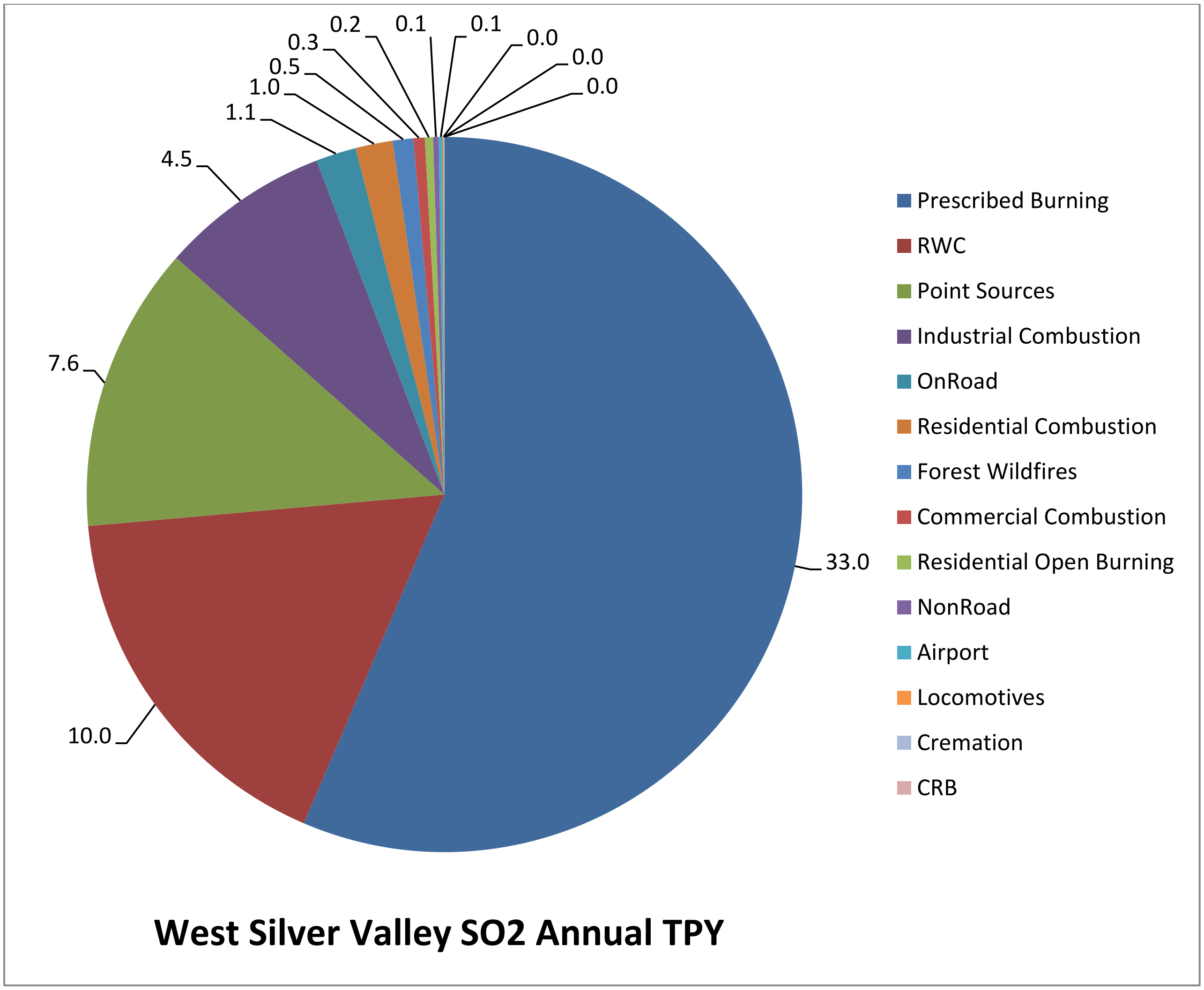


Figure 5a-5. West Silver Valley, Idaho nonattainment Area Emissions Inventory, Annual NH_3

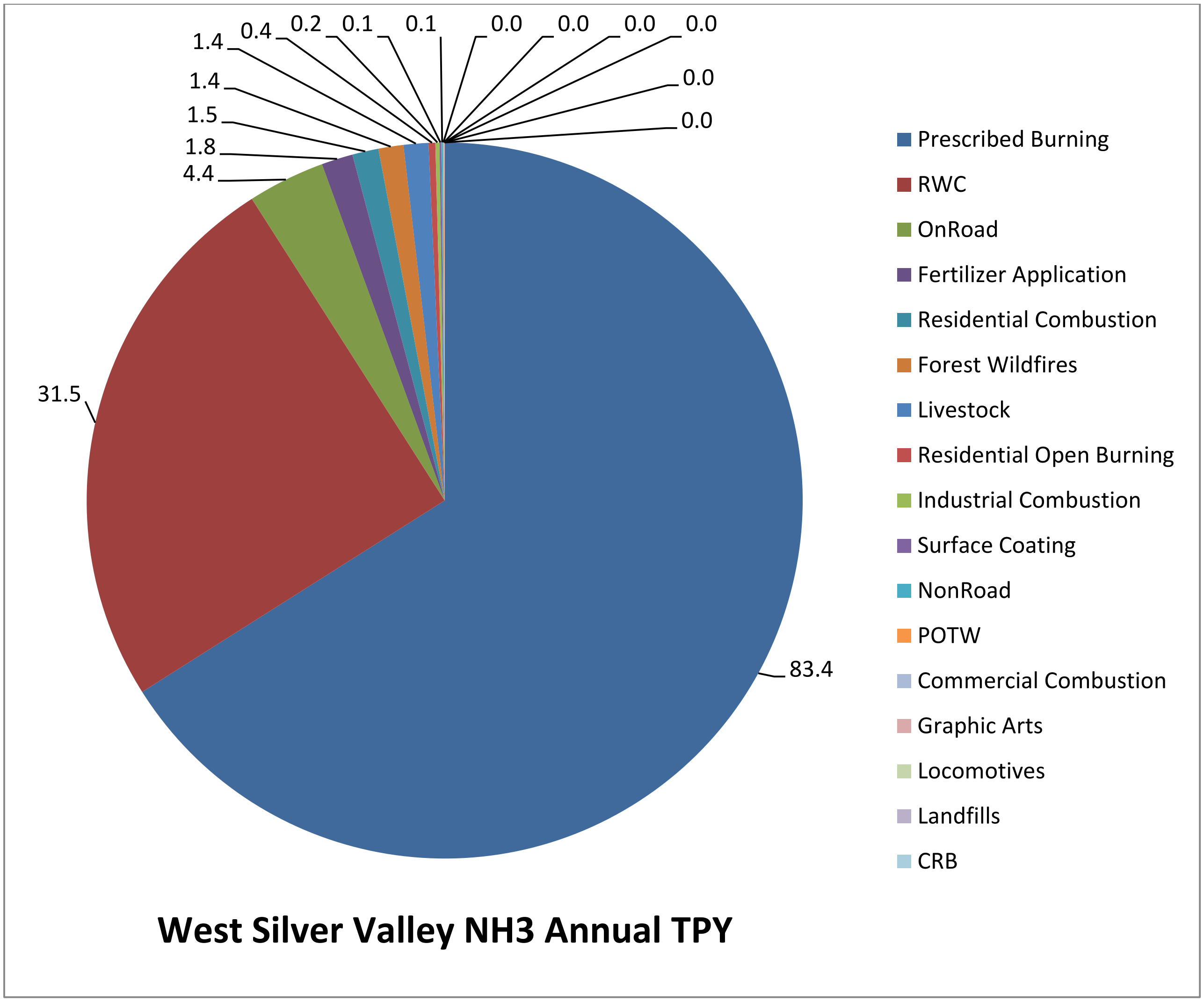


Figure 5b. West Silver Valley, Idaho nonattainment Area Emissions Inventory, Monthly, Wintertime (December)

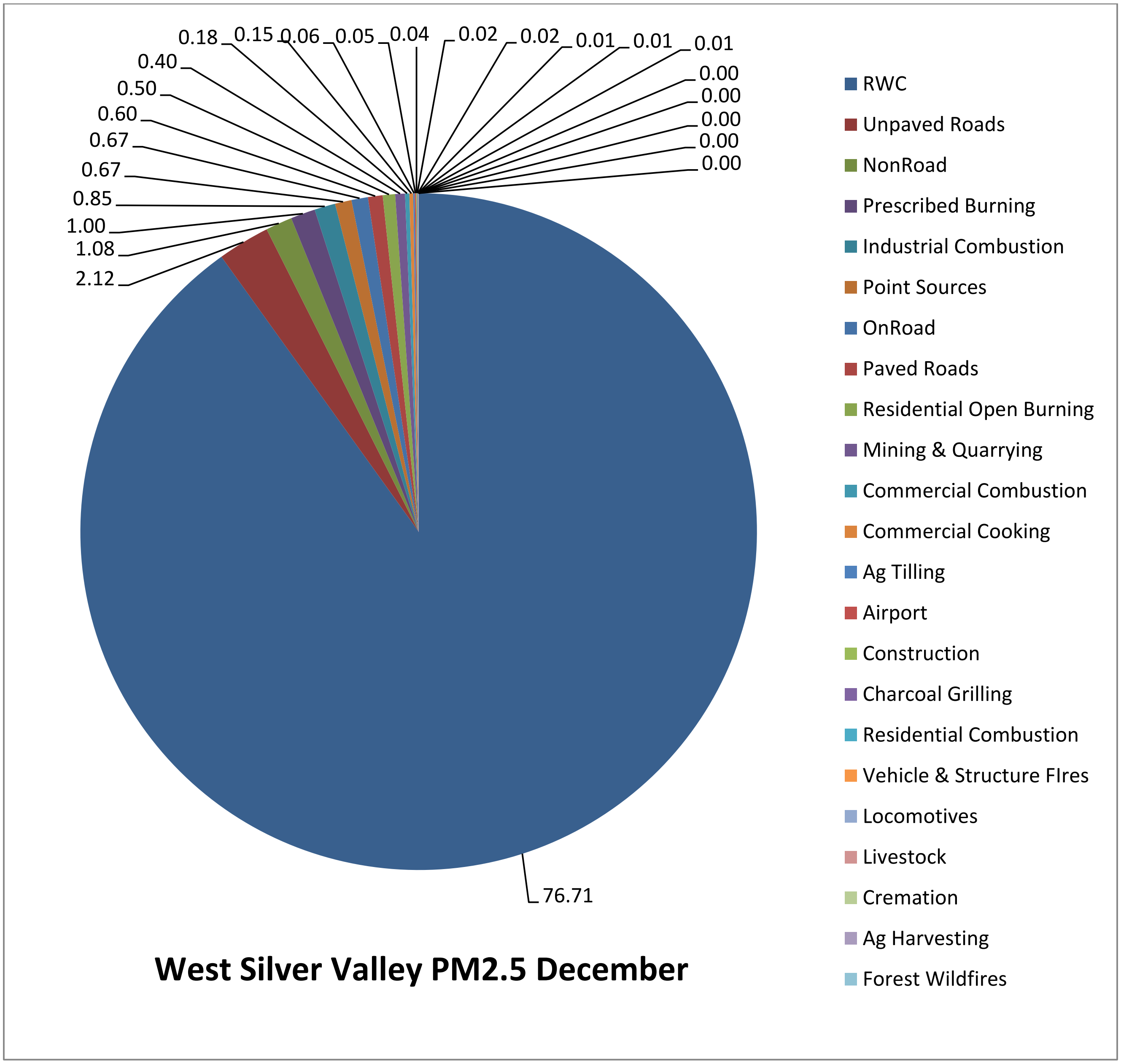
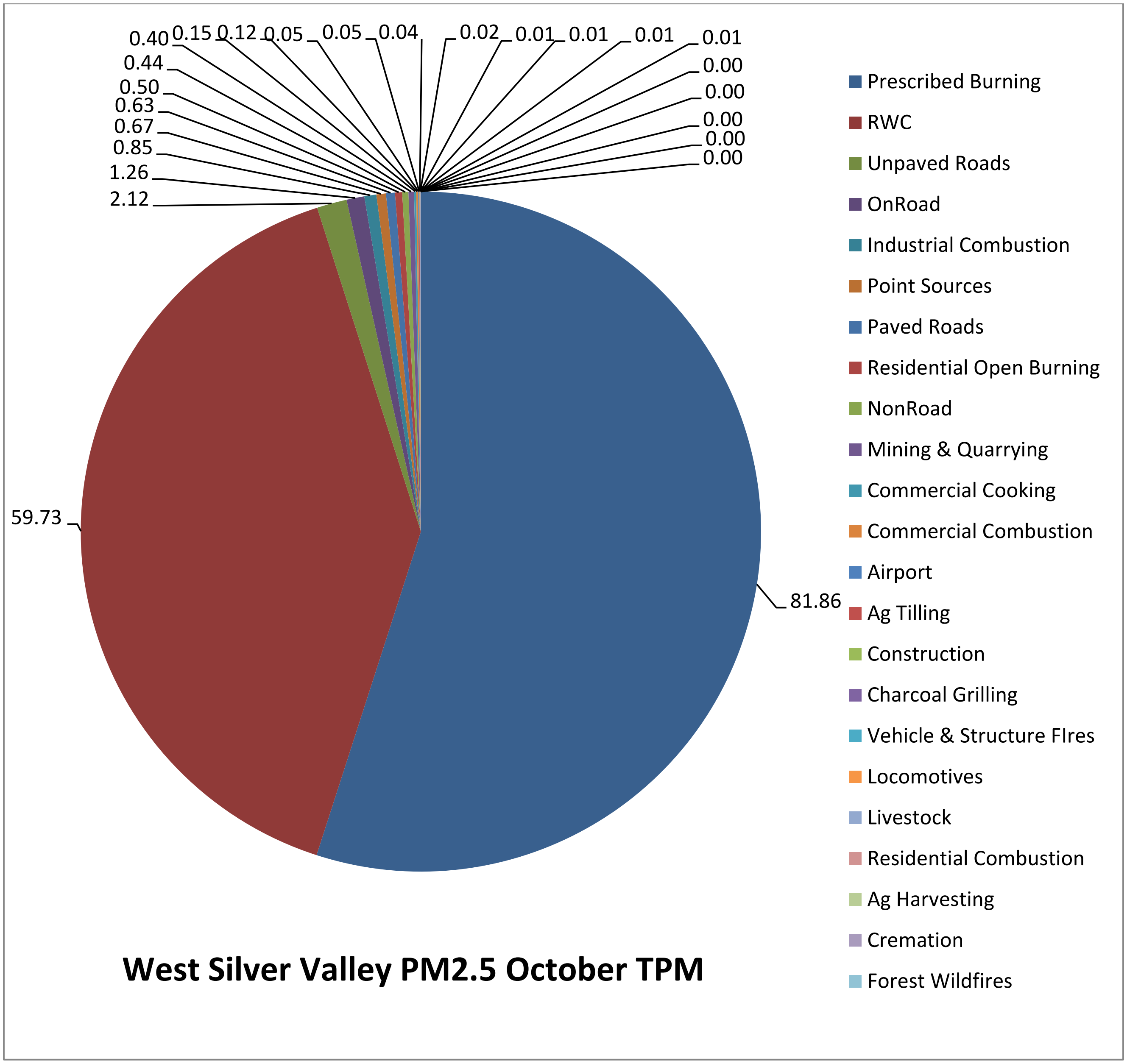


Figure 5c. West Silver Valley, Idaho nonattainment Area Emissions Inventory, Monthly, Fall (October)



The West Silver Valley nonattainment area direct $PM_{2.5}$ emissions data in Figures 5a-1, 5b, and 5c breakout direct $PM_{2.5}$ by sources source category annually, in the wintertime (December), and in the autumn (October), respectively. Emissions in the autumn and winter are relevant because these seasons are when the urban increment is the highest. When reviewing the emissions inventory for the West Silver Valley nonattainment area within Shoshone County, the data shows in Figure 5a-1 that annually residential wood combustion (574.4 tpy) and prescribed burning (426.7 tpy) are the major sources categories of direct $PM_{2.5}$ with the next highest source category being only 25.5 tpy. For wintertime emissions, residential wood combustion is 76.7 tpm and the next highest sector is prescribed burning at only 2.12 tpm (December used as a representative month). For autumn emissions, residential wood combustion is 59.7 tpm and prescribed burning 35.6 tpm (October used as a representative month). This supports the conclusion that the residential wood combustion and prescribed burning source categories are the major sources of direct $PM_{2.5}$ and that residential wood combustion is increased during the wintertime and that prescribed burning peaks during the fall. As seen in the chemical speciation comparative study depicted in Figure 3, the primary constituents at the Pinehurst monitor are in the form of total carbon and Table 3b breaks down the emissions into organic carbon and elemental carbon. The information in Figures 5a, 5b, and 5c, and in Tables 3a and 3b is consistent with the measured $PM_{2.5}$ speciation in Figure 3. These emissions and subsequently identified constituents are characteristic of residential wood combustion that occurs during the wintertime months and prescribed burning during the early spring and early autumn months. As mentioned already, CRB was explicitly modeled by IDEQ as $0.17 \mu g/m^3$ annually.

With regard to precursor emissions in the West Silver Valley nonattainment area, the IDEQ also prepared annual emissions inventories for each $PM_{2.5}$ precursor (Figures 5a-2 through 5a-5). For NO_x, Figure 5a-2 identifies the top three source categories as being onroad, residential wood combustion, and prescribed burning. For VOCs, Figure 5a-3 identifies the top three source categories as being prescribed burning, residential wood combustion, and nonroad. For SO_2, Figure 5a-4 identifies the top three source categories as being prescribed burning, residential wood combustion, and point sources. For NH_3, Figure 5a-5 identifies the top source categories as being prescribed burning and residential wood combustion.

Point Sources

In addition to reviewing county-wide and nonattainment area emissions of $PM_{2.5}$ and $PM_{2.5}$ precursors, the EPA also reviewed emissions from point sources located in the area of analysis. The magnitude and location of these sources can help inform nonattainment boundaries. Table 5 provides facility-level emissions of direct $PM_{2.5}$, components of direct $PM_{2.5}$, and precursor pollutants (given in tons per year) from point sources located in the area of analysis for the West Silver Valley area. Table 5 also shows the distance from the facility to the Pinehurst monitor. The distance from the violating monitoring location is particularly important for directly emitted $PM_{2.5}$. The influence of directly emitted $PM_{2.5}$ on ambient $PM_{2.5}$ diminishes more than that of gaseous precursors as a function of distance.[23] Only six of the sources have total emissions of direct $PM_{2.5}$ and precursors greater than 50 tons per year. Only one facility emits more than 100 tons per year of any pollutant. As indicated in Figure 6, there are 11 point sources located in the Area of Analysis in Shoshone, Benewah, and Kootenai Counties. There are no major sources of $PM_{2.5}$ near the monitor. All point sources within 20 miles of the violating monitor have fewer than six tons per year of direct $PM_{2.5}$ emissions. The largest point sources for direct $PM_{2.5}$ emit roughly 100 tons per year but are 22 and 34 miles from the violating monitor and are separated from the violating monitor by hills and mountains.

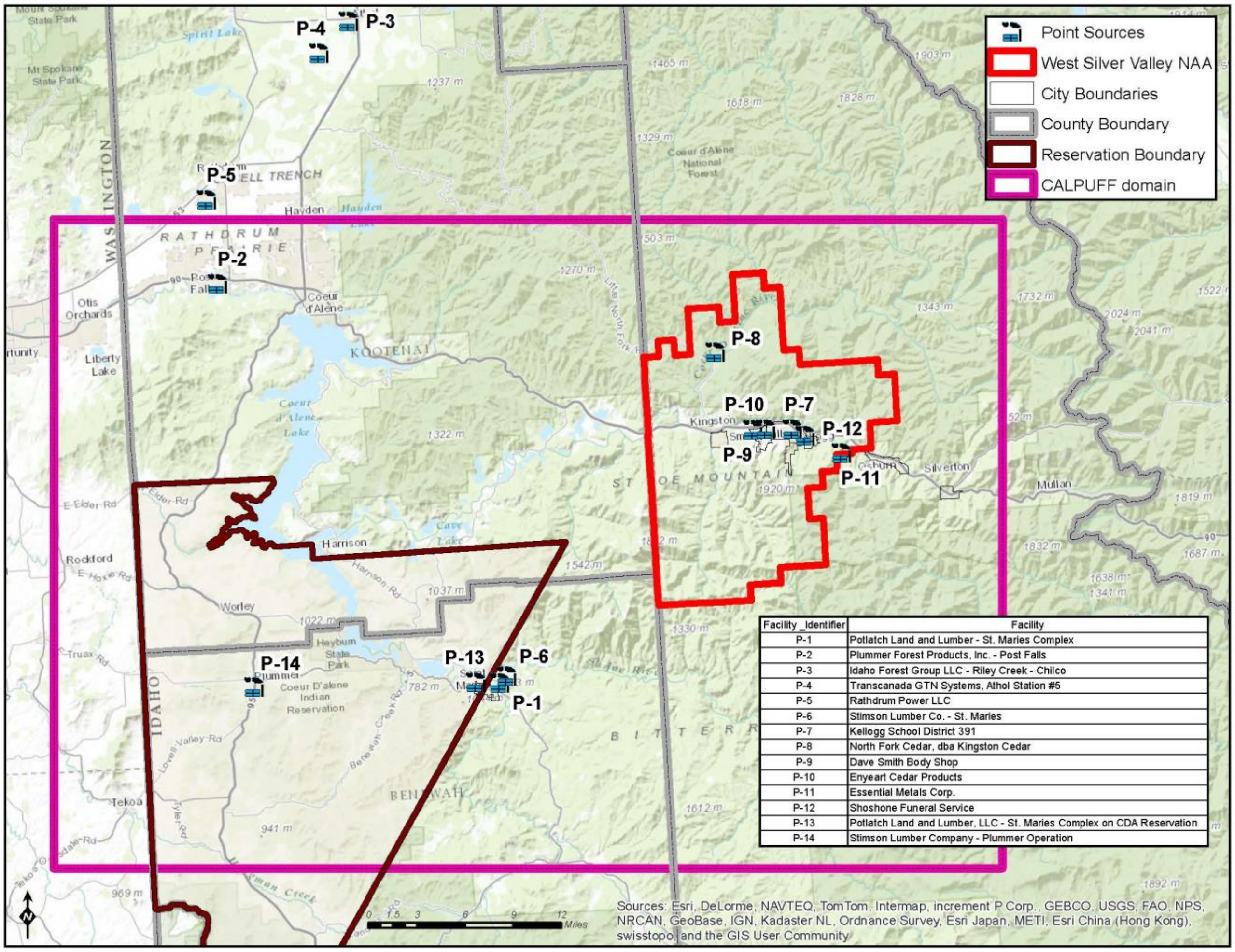
[23] Baker, K. R. and K. M. Foley. *A nonlinear regression model estimating single source concentrations of primary and secondarily formed $PM_{2.5}$*. Atmospheric Environment. 45 (2011) 3758-3767.

Table 5. NEI 2011 Point Source Emissions (tons/year)

County, State	Map Point		Distance monitor (miles)	NEI 2011 v1 Emissions - Tons/Year NH3	NOx	PM2.5	SO2	VOC	Total
Shoshone, ID	P-1	Potlatch Land & Lumber – St. Maries Complex	35.5	-	36	28	1	-	65
Kootenai, ID	P-2	Plummer Forest Products Inc. – Post Falls	54.3	-	80	19	2	-	101
Kootenai, ID	P-3	Idaho Forest Group LLC – Riley Creek-Chilco	57.8	-	65	20	7	--	92
Kootenai, ID	P-4	TransCanada GTN Systems, Athol Station #5	35.7	-	72	1	1	-	74
Kootenai, ID	P-5	Rathdrum Power LLC	58.5	-	99	66 (PM_{10})	11	-	176
Benewah, ID	P-6	Stimson Lumber Co St. Maries	32.9	-	-	3	-	-	3
Shoshone, ID	P-7	Kellogg School District 391	7.8	-	<1	<1 (PM_{10})	<1	-	1
Shoshone, ID	P-8	North Fork Cedar, dba Kingston Cedar	5.1	-	-	6 (PM_{10})	-	-	6
Shoshone, ID	P-9	Dave Smith Body Shop	3.8	-	4	<1 (PM_{10})	<1	-	4
Shoshone, ID	P-10	Enyeart Cedar Products	5.2	-	12	1 (PM_{10})	7	-	20
Shoshone, ID	P-11	Essential Metals Corp.	12.9	-	5	<1	-	-	5
Shoshone, ID	P-12	Shoshone Funeral Service	8.9	-	-	<1 (PM_{10})	-	-	<1
Benewah, ID	P-13	Potlatch Land & Lumber, LLC – St. Maries Complex on Coeur d'Alene Reservation*	22.0	-	96	97	13	68	274
Benewah, ID	P-14	Stimson Lumber Company – Plummer Operation*	33.7	-	99	101	12	41	253

Sources: IDEQ analysis. *Provided by IDEQ and CDA Tribe

Figure 6. Point Sources in the Area of Analysis for the West Silver Valley Area.



Using the information in Table 5 and Figure 6, the IDEQ provided supplemental information regarding the impact of point sources in the West Silver Valley. The IDEQ performed Calpuff modeling and developed a tool to determine the impact of sources in the modeled domain around the violating monitor. More detailed information on source contribution and modeling can be found in the docket for the Federal Register Notice for this nonattainment area.

Population density and degree of urbanization

In this part of the five factor analysis, the EPA evaluated the population and vehicle use characteristics and trends of the area as indicators of the probable location and magnitude of non-point source emissions that might contribute to the violations. Rapid population growth in a county on the urban perimeter signifies increasing integration with the core urban area, and indicates that it may be appropriate to include the county associated with area source and mobile source emissions as part of the nonattainment area. Table 6 shows the 2000 and 2010 population, population growth since 2000, and population density for each county in the area.

Table 6a. Population Growth and Population Density, County.

County, State	Population 2000	Population 2010	% Change from 2000	Land Area (Sq. Miles)	Population Density (per Sq. Mile)	%	Cumulative %
Kootenai, ID	108,685	138,920	27.8	1,245	112	53	53
Bonner, ID	36,835	40,940	11.1	1,738	24	16	69
Latah, ID	34,935	37,298	6.8	1,077	35	14	83
Shoshone, ID	**13,771**	**12,727**	**-7.6**	**2,634**	**5**	5	88
Sanders, MT	10,227	11,397	11.4	2,762	4	4	92
Benewah, ID	9,171	9,281	1.2	776	12	4	96
Clearwater, ID	8,930	8,633	-3.3	2,461	4	3	99
Mineral, MT	3,884	4,216	8.5	1,220	3	1	100
Total	**226,438**	**263,412**					

Source: U.S. Census Bureau population estimates for 2000 and 2010

Table 6b. Population Growth, Cities in the Silver Valley.

County, State	Population 2000	Population 2010	% Change from 2000
Cataldo	NA	NA	NA
Kingston	NA	NA	NA
Pinehurst	1,619	1,615	-0.24
Smelterville	627	626	-0.16
Kellogg	2,120	2,113	-0.33
Wardner	188	188	0
Osburn	1,555	1,549	-0.39
Wallace	784	782	-0.26

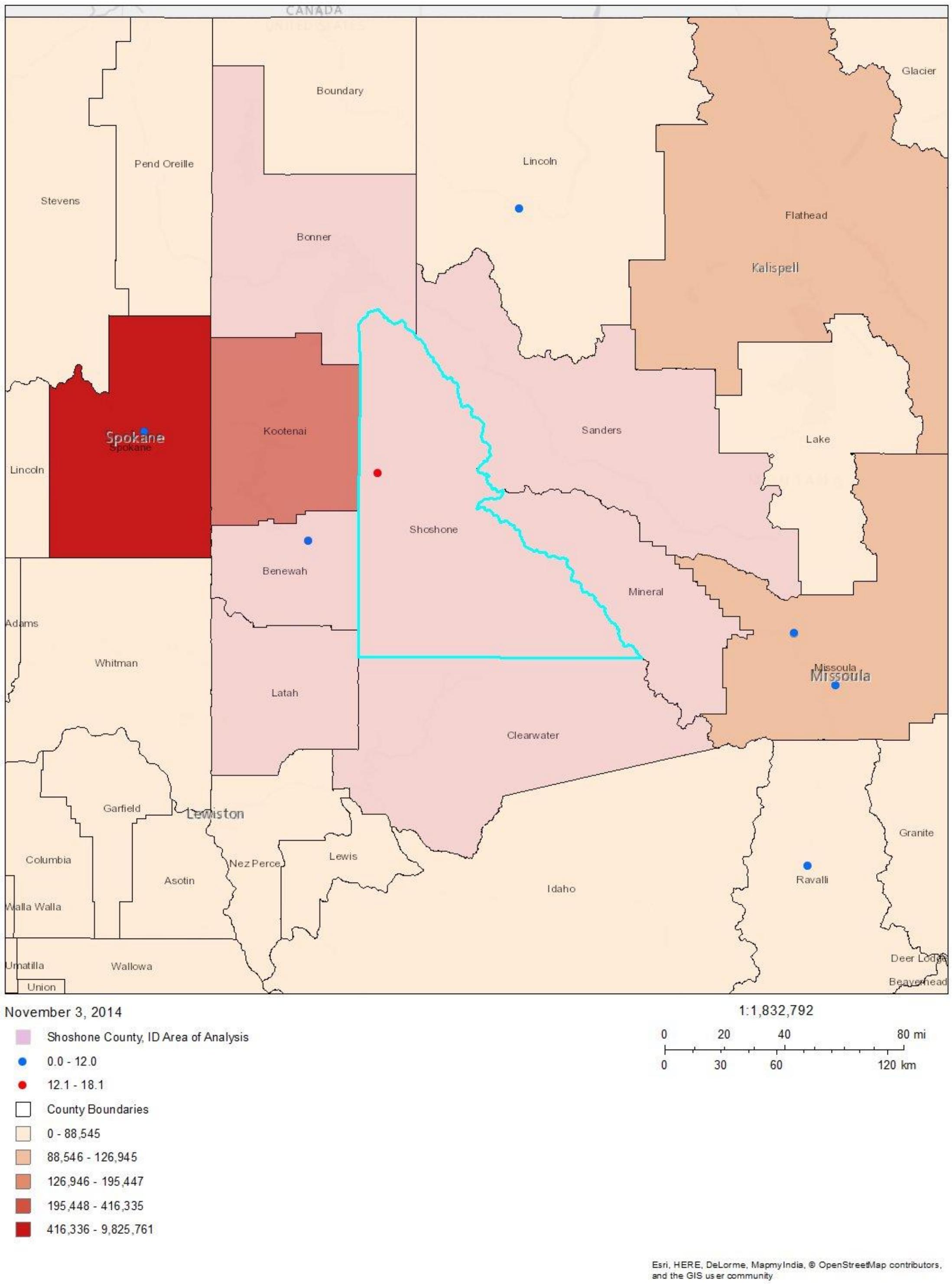
Source: http://factfinder2.census.gov/

Within Shoshone County, there are pocket communities along the I-90 corridor and the county is overall sparsely populated at only 5 people per square mile. Surrounding counties population densities range from 3 – 35 people per square mile and overall populations ranged from 4,216 to 40,940 for entire counties. The outlier of the group was Kootenai at a still sparse 112 people per square mile and 138,920 people in the county. The population in Shoshone County decreased 7.6% between 2000 and 2010. The only nearby CBSA/CSA was located in Kootenai County.

There are several small towns along the Interstate 90 (I-90) corridor that bisect Idaho's panhandle along the Silver Valley. According to census data, the towns within the West Silver Valley nonattainment area range in size: from the largest, Kellogg with 2,113 residents, to the second-largest, Pinehurst with 1,615, and the smallest, Smelterville with 626. Just outside the nonattainment area the towns of Osburn, Wallace, and Wardner are very sparsely populated at 1,549, 782, and 188 respectively. The counties in the area of analysis have very low populations and very low density.

As mentioned already, Pinehurst is located in a partially obstructed topographic bowl within the Silver Valley. The Silver Valley is also the location of the Bunker Hill Superfund site which is a large mining site that has been undergoing remediation since the 1980s. The mining site currently has only minor emissions associated with movement of product from the underground mining sites. The majority of the emissions as shown by the West Silver Valley specific emissions inventory and supporting speciation analysis is generated from residential wood combustion in close proximity to the violating monitor. With low employment rates and no major economic base, the use of woodstoves for inexpensive heating is common. Secondarily, emissions from prescribed burning generated in and around the Silver Valley are also expected to contribute to the exceedances at the violating monitor as shown by the discussion of Factor 4. With a very small and very sparse population, it is not projected that population changes will drive any major change in emissions in the West Silver Valley.

Figure 7. 2010 County-Level Population in the Area of Analysis for the West Silver Valley Area.



Traffic and Vehicle Miles Travelled

High vehicle miles travelled (VMT) and/or a high number of commuters associated with a county is generally an indicator that the county is an integral part of an urban area. Mobile source emissions of NO_x, VOC, and direct $PM_{2.5}$ may contribute to ambient particulate matter that contributes to monitored violations of the NAAQS in the area. In combination with the population/population density data and the location of main transportation arteries, an assessment of VMT helps identify the probable location of nonpoint source emissions that may contribute to violations in the area. Table 7 shows 2011 VMT while Figure 8 overlays 2011 county-level VMT with a map of the transportation arteries.

Compared to the surrounding counties, Shoshone County has only 7% of the total region-wide VMT based on the 2011 data. The majority of those miles are from cross state traffic in the I-90 corridor. Given the limited amount of VMT in Shoshone County, traffic and commuting patterns were not key factors in this area designation. The VMT information was sourced from the Federal Highway Administration

Table 7. 2011 VMT for the West Silver Valley Area.

County, State	Total 2011 VMT	Percent	Cumulative %
Kootenai, ID	1,448,700,416	47	47
Bonner, ID	511,021,336	16	63
Latah, ID	342,088,444	11	74
Mineral, MT	235,209,168	8	82
Shoshone, ID	**215,796,356**	**7**	**89**
Benewah, ID	122,030,599	4	93
Sanders, MT	116,083,370	4	97
Clearwater, ID	87,808,049	3	100
Total	**3,078,737,738**	**100**	

http://www.census.gov/hhes/commuting/data/commuting.html

Figure 8. Overlay of 2011 County-level VMT with Transportation Arteries

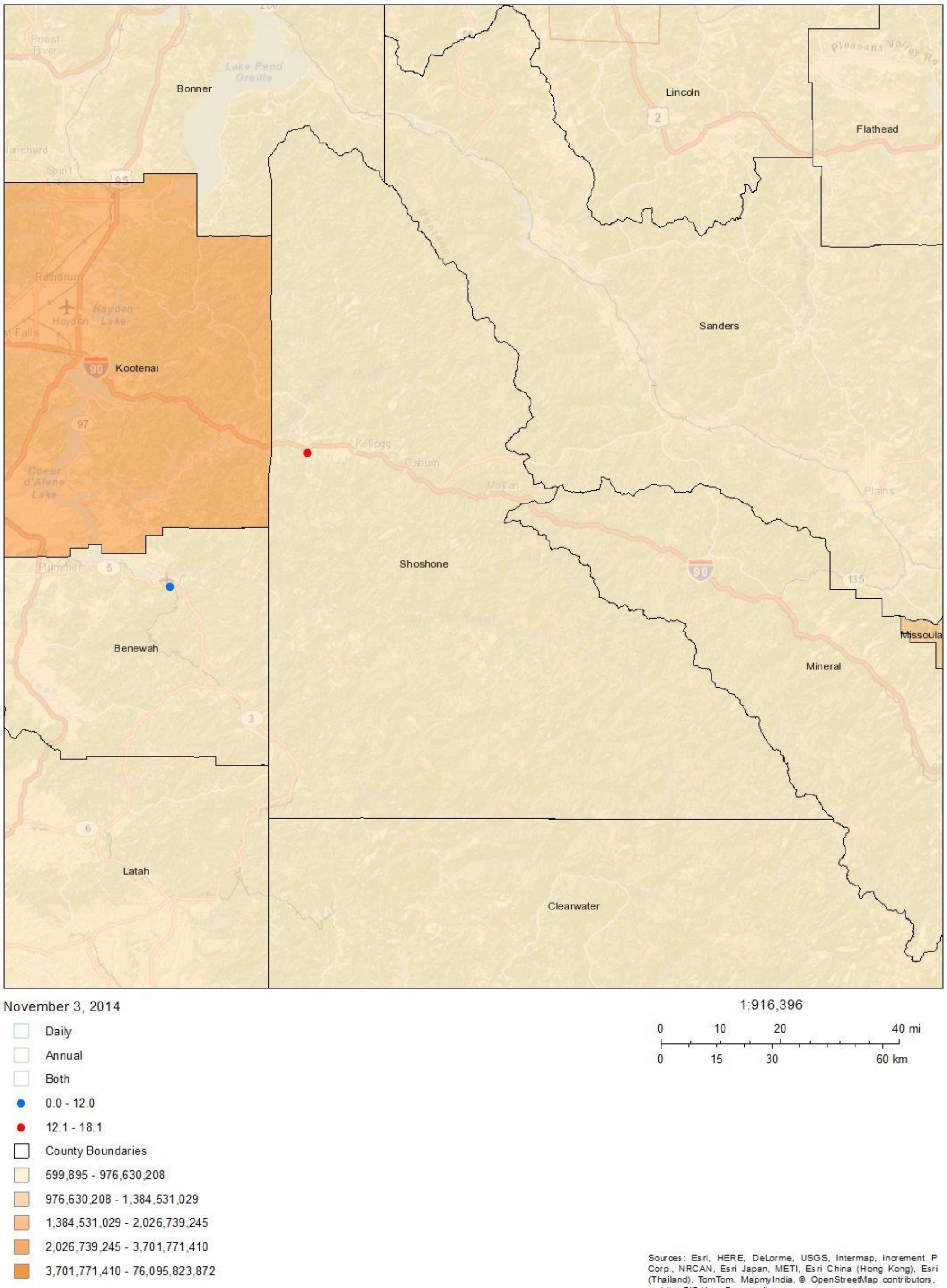


Figure 9. Source Category Contribution for West Silver Valley Area

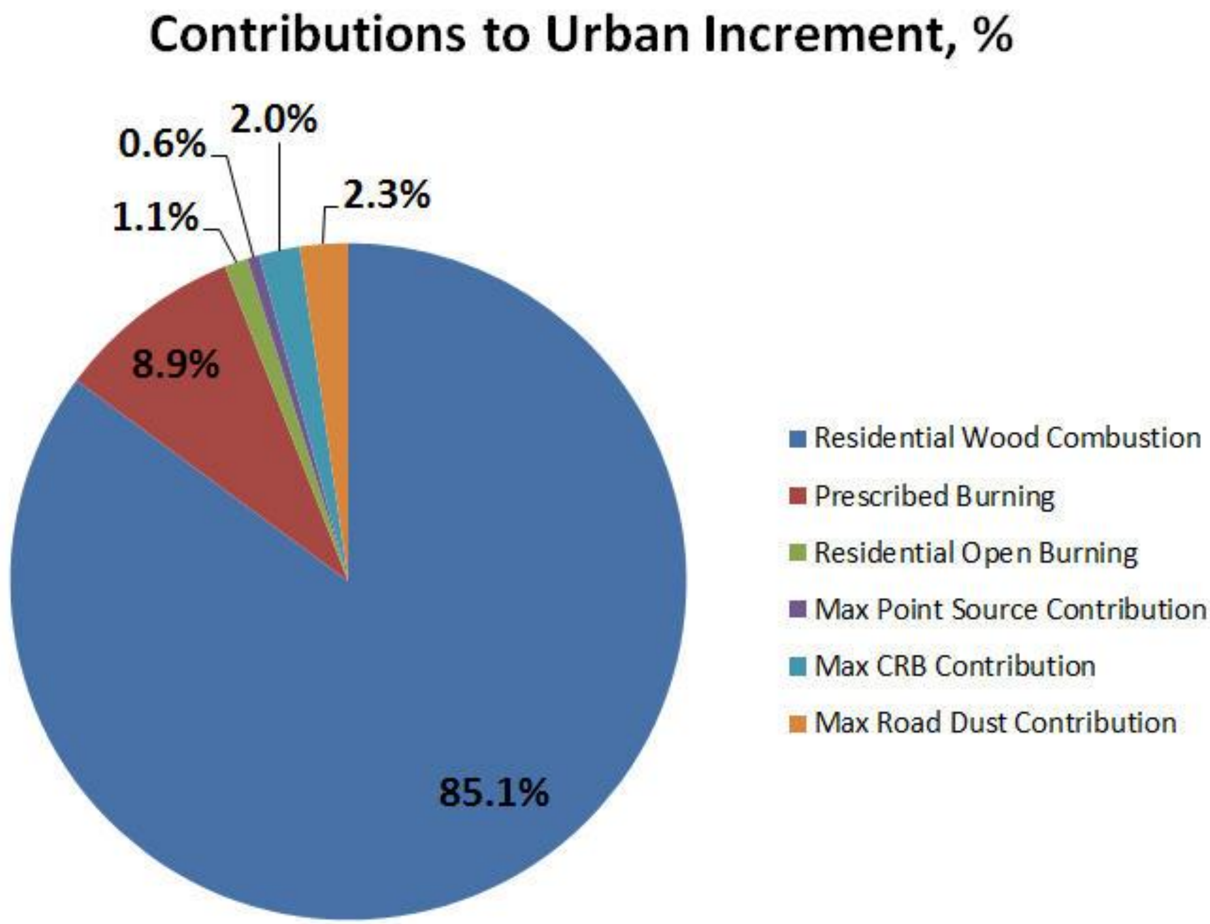


Figure 9 summarizes the analysis of relevant county-level emission source categories and the contribution to the urban increment in the area. As already shown in this section and the prior sections of this TSD, residential wood combustion is the major contributor to the urban increment at 85.1% and prescribed burning at 8.9%. The remaining sources categories were all below 2.5% contribution: road dust – 2.3%, CRB contribution - 2.0%, residential open burning – 1.1%, point source 0.6%. The analysis in this section and the modeling discussion in the next section, Factor 3: Meteorology, supports the conclusion that residential wood combustion and prescribed burning are the primary contributors to violations at the Pinehurst monitor. The analysis in this section also provided support that point sources and CRB were not major sources of contribution to violations at the monitor. Review of population and VMTs also showed them to be not significant in terms of impact on the area designation process given that they were both small values.

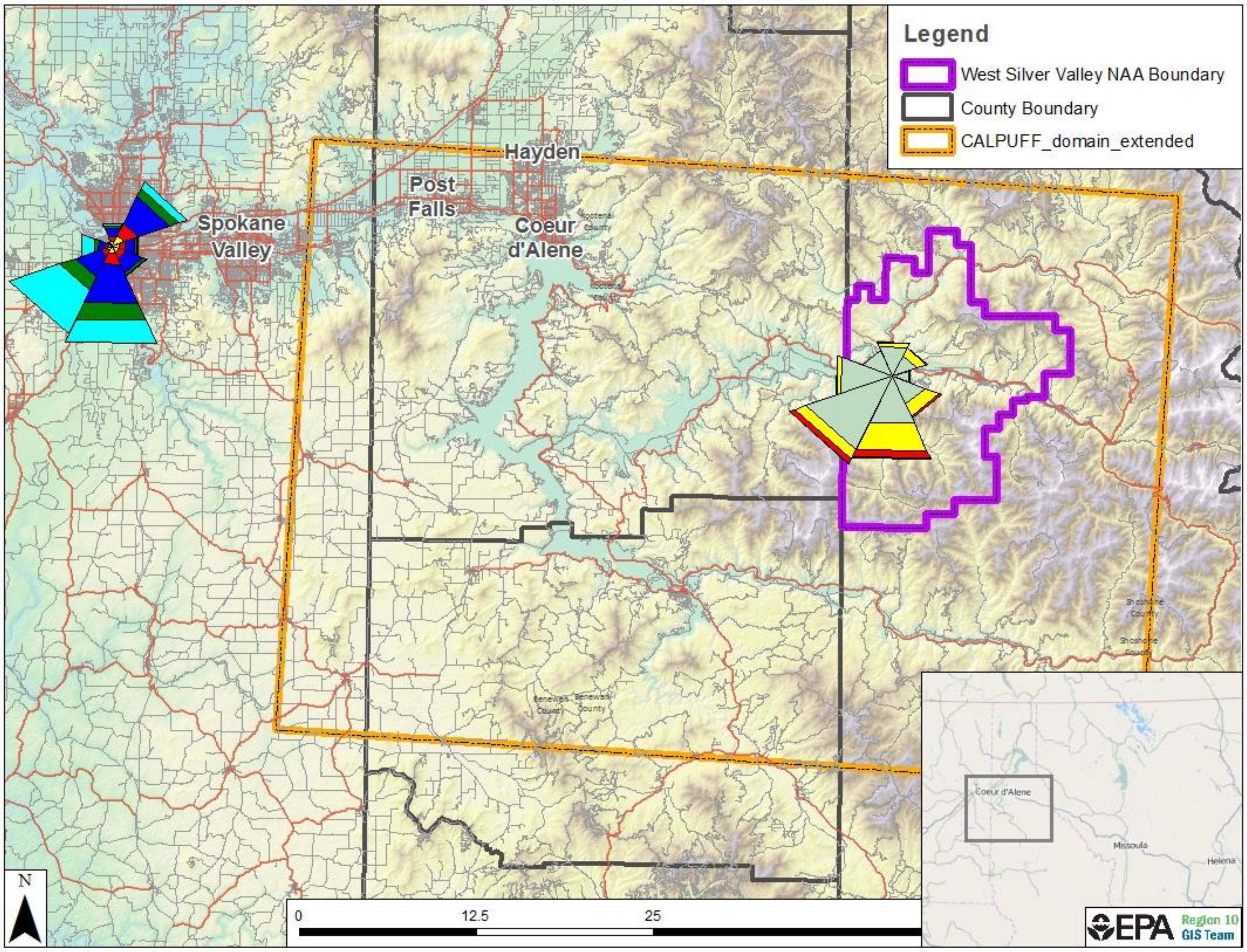
Factor 3: Meteorology

The EPA evaluated available meteorological data to determine how meteorological conditions, including, but not limited to, weather, transport patterns, and stagnation conditions, could affect the fate and transport of directly emitted particulate matter and precursor emissions from sources in the area of analysis. The EPA used three primary tools for this assessment: wind roses, woodsmoke box modeling provided by the IDEQ, and HYSPLIT back trajectories provided by the IDEQ. In addition, the IDEQ added supplemental reverse Calpuff modeling. When considered in combination with area $PM_{2.5}$ composition and county-level and facility emissions source location information, the meteorological assessment tools helped identify the area that contributes to violations at the Pinehurst monitor.

Wind roses are graphic illustrations of the frequency of wind direction and wind speed. Wind direction can indicate the direction from which contributing emissions are transported; wind speed can indicate the force of the wind and thus the distance from which those emissions are transported. The IDEQ constructed wind roses from hourly observations of wind direction and wind speed using 2009-2012 data from National Weather Service locations archived at the National Climate Data Center.[24] When developing these wind roses, the IDEQ also used wind observations collected at meteorological sampling stations collocated at air quality monitoring sites, where these data were available. Figure 10a shows wind roses from data relevant in the West Silver Valley area.

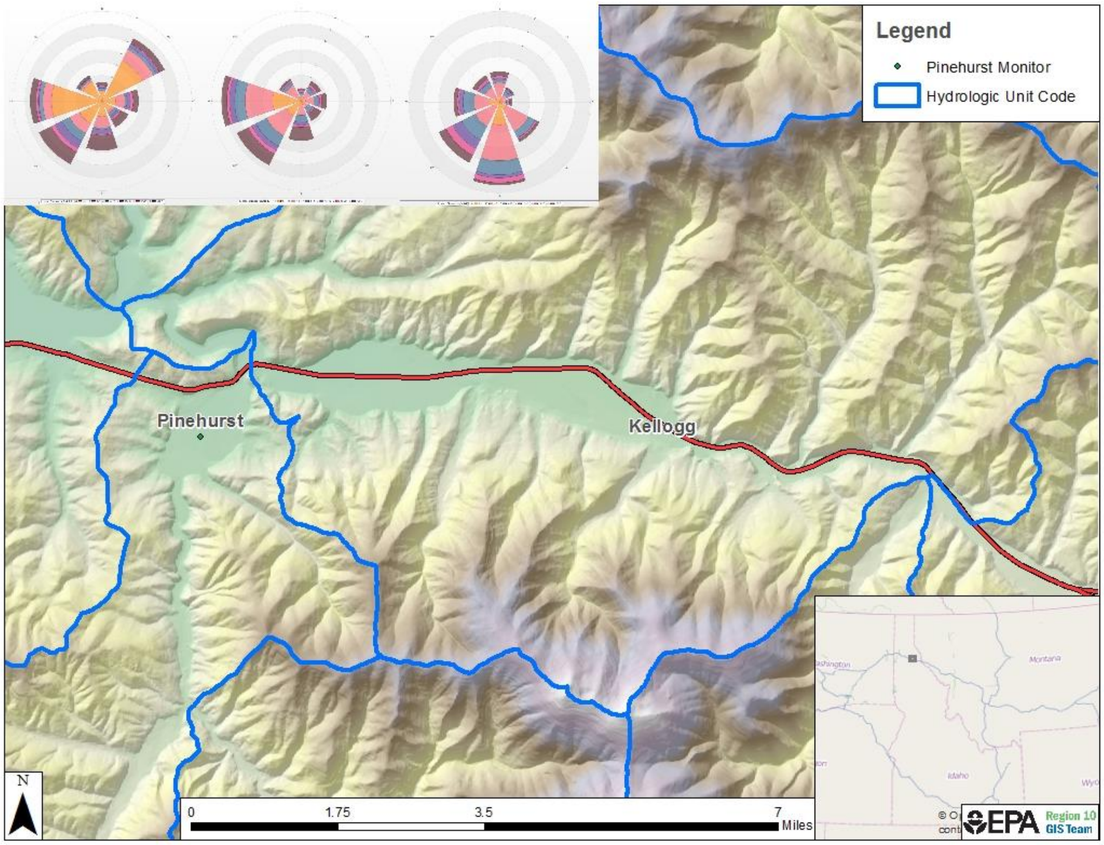
[24] *ftp.ncdc.noaa.gov/pub/data/noaa* or *http://gis.ncdc.noaa.gov/map/viewer/#app=cdo&cfg=cdo&theme=hourly&layers=1&node=gis* Quality assurance of the National Weather Service data is described here: *http://www1.ncdc.noaa.gov/pub/data/inventories/ish-qc.pdf*

Figure 10a. Wind Roses in the Area of Analysis for West Silver Valley Area.



Steering winds in this region of Northern Idaho are westerlies, which often translates into south westerlies near the surface. Topography plays a role in channeling winds along valleys in particular meteorological situations. In West Silver Valley the predominant wind directions are southwesterly and westerly, but during pollution episodes the wind can also be southerly or northeasterly. During calm, wintertime weather conditions, cold surface temperatures, low wind speeds, and constrained vertical mixing develop in concert with each other. The deep, narrow mountain valley magnifies this effect relative to other nearby areas. The combination of these meteorological effects and the mountainous terrain confine the geographical area that could contribute emissions to the pollution episode in West Silver Valley. It is hypothesized that the particular terrain features around Pinehurst limit mixing in Pinehurst even more so than the rest of the West Silver Valley. In Figure 10b, the wintertime pollution rose supports the conceptual model for elevated $PM_{2.5}$ in the West Silver Valley. Light westerly winds are often associated with high $PM_{2.5}$ in West Silver Valley because the monitor is located on the east side of town. The light westerly winds collect wintertime residential wood combustion $PM_{2.5}$ and carry it to the monitor to the east where it is constrained within the east side of the topographic bowl. At night cold air drainage winds follow the stream valleys from the higher terrain around West Silver Valley and into the river valley. These winds could bring smoke from smoldering prescribed burns from higher elevation into West Silver Valley. Stronger down-valley northeast winds clear the valley of pollution, while at other times weak northeast winds advect pollution to the monitor. As such, the nonattainment area boundary follows the local hydrologic units in order to capture the emissions in the valley as well as that on the surrounding mountains that could drain at night into West Silver Valley.

Figure 10b. Pollution Roses, 2011-2013 at the Pinehurst monitor in the West Silver Valley during the wintertime



In addition to wind roses, the IDEQ provided a wintertime woodsmoke model and HYSPLIT back trajectories for the autumn prescribed burning season. The IDEQ modeled woodsmoke in the towns of Pinehurst and Kellogg with a box model derived from the dimensions of the Silver Valley and climatological mixing heights during wintertime stagnation events. The simple model was able to account for greater than 90% of the wintertime urban increment. It corroborates our conceptual model of low wintertime wind speeds and low mixing heights trapping locally-emitted woodsmoke in the winter with little contribution from sources outside the immediate Silver Valley. The autumn HYSPLIT trajectories show how the mountainous terrain channels smoke from prescribed burning. The St. Joe Mountains acts as a topographic barrier between the burning in the south and the Pinehurst monitor. Smoke that breaches the topographical barriers around the Silver Valley would occur on days with very good mixing and thus not concentrate smoke in Pinehurst. However, smoke from prescribed burning in the nearby hills around Pinehurst can reach the valley floor during particular weather conditions. Under calm weather conditions, it is common for cold air to drain out of the hills and into the valleys during the evenings and nighttime hours. If a fire is still producing smoke into the evening, the smoke would drain to the valley floor and be trapped until at least the next morning. For the most important sources of

$PM_{2.5}$ in the urban increment, woodsmoke and prescribed burning, meteorology during the winter and autumn suggest a boundary constrained by topography.

As supplemental information, the IDEQ also generated Calpuff [25] dispersion modeling to further illustrate how topography and meteorology limit the geographical extent of contributions to the violating monitor. While the EPA does not generally endorse this Calpuff modeling effort, EPA Region 10 worked closely with IDEQ to understand how the results inform our understanding of source contributions. To understand elevated emissions at the monitor, the IDEQ ran Calpuff modeling to turn the spatially-allocated and temporally-allocated emission inventory into contributions of $PM_{2.5}$ at the violating monitor in West Silver Valley. The IDEQ ran a prescribed burning case for October 15th – November 15th, 2013 to represent the autumn prescribed burning season and a case for November 15th – December 15th, 2013 to represent the winter woodsmoke season. The results were apportioned to the urban increment in the appropriate months and analyzed for the annual average $PM_{2.5}$. The results show that the source categories within the nonattainment area most available for control strategies – residential wood combustion, prescribed burning, residential outdoor burning, point sources, and road dust – account for about 95% of the annual urban increment. The Calpuff results are supportive of the conclusion relevant to boundary conditions derived from other analysis tools in this document that the vast majority of contribution to the urban increment is in the West Silver Valley.

These analyses support EPA's conclusion that the boundary recommendation was appropriate and that no other nearby areas were contributing to the monitored violations. More detailed information on source contribution and modeling can be found in the docket for the Federal Register Notice for this nonattainment area.

Factor 4: Geography/topography

To evaluate the geography/topography factor, the EPA assessed physical features of the area of analysis that might define the airshed and thus affect the formation and distribution of $PM_{2.5}$ concentrations over the area. As mentioned, the West Silver Valley monitor is located within the city of Pinehurst which is located within the Silver Valley. Figures 11a and 11b depict West Silver Valley and the area immediately in its vicinity. The topography along with the wind rose, woodsmoke modeling, HYSPLIT trajectories, and supplemental Calpuff modeling all support that well over 90% of the emissions are generated in and around West Silver Valley. By far the highest $PM_{2.5}$ values occur in the winter (Figure 2a and 4a), and these are concentrated on cold stagnant days. Cold temperatures promote the burning of wood for heat. Winds are light and strongly stable cold air pools in the Silver Valley. It is for this reason that the various analysis tools show very little influence on the West Silver Valley monitor from emission sources outside the valley. Even compared to the town of Kellogg a few miles upriver, West Silver Valley has lighter winds during these stagnant periods.

While the nearby contribution of emissions is over 90%, the data support a small contribution of emissions from prescribed burning in the hills, mountains, and valleys that drain into West Silver Valley as a whole. Prescribed burning that occurs in the higher elevations outside of town would be transported into West Silver Valley if smoldering burns happen to coincide with meteorology conducive for cold air drainage winds. In order to capture this smaller source of contribution, the area boundary was drawn around the major topographic drainage features called hydrologic unit codes (HUCs), Figure 11c. Essentially, the HUCs are geographic based units that define watersheds and have been adapted for purposes of identifying a geographic boundary for the $PM_{2.5}$

[25] http://www.cleanairinfo.com/regionalstatelocalmodelingworkshop/documents/CALPUFF.pdf

generated around the Pinehurst monitor. The West Silver Valley area includes the full HUC that directly drains into West Silver Valley, along with the two HUCs to the north and south east that also drain into West Silver Valley and the Silver Valley. Finally, a portion of a 4th HUC to the West of Pinehurst is included as it drains into the West Silver Valley as well. The full HUC was not used on the western boundary for jurisdictional reasons to be discussed in the following section.

Topography strongly dictates what emissions get funneled into West Silver Valley. It is equally important in limiting regional transport from outside of the non-attainment area. The St. Joe Mountains to the south of West Silver Valley and the rocky terrain in between provide a physical barrier between emissions from numerous burning activities to the south of the mountain range. In order for emissions from these burns to reach West Silver Valley, they would need to be lofted above the mountain range and then find their way back to the surface on the north side. This is not an impossible event, but generally if the smoke is lifted that high up it will both get diluted in the process and will be carried by the transport winds in an eastward direction. Nighttime drainage winds on the south side of the St. Joe Mountains would go in an opposite direction from West Silver Valley. The HYSPLIT trajectories and supplemental Calpuff modeling confirms this conceptual result by modeling a minimal impact in West Silver Valley from burning activities south of the mountain range.

Metropolitan areas outside the valley, such as Coeur D'Alene and Spokane, are unlikely to contribute to the violating monitor. Design values in Coeur D'Alene and Spokane are well below the annual standard (see Table 2a) and so there is not much locally-generated pollution to transport to the West Silver Valley. During cold stagnant periods when $PM_{2.5}$ is the highest, the mountainous terrain strongly limit the ability of the already weak transport winds to bring pollution from the metropolitan areas into the valley. In the autumn prescribed burning is a larger source of $PM_{2.5}$ than the metropolitan areas, and at other times of the year the $PM_{2.5}$ in Pinehurst is very close to remote background levels.

Figure 11a Pinehurst monitor within West Silver Valley Topography

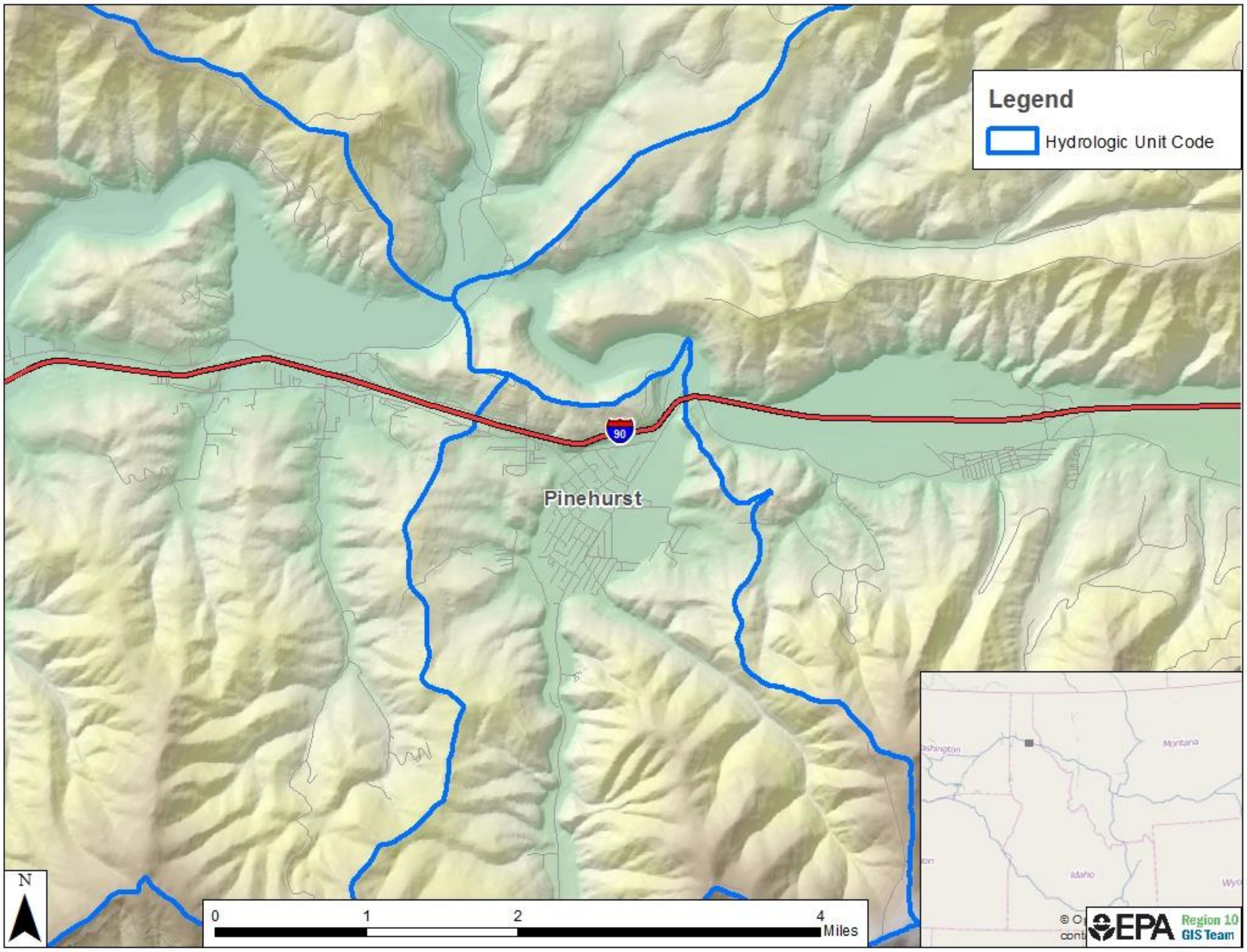


Figure 11b West Silver Valley Topography

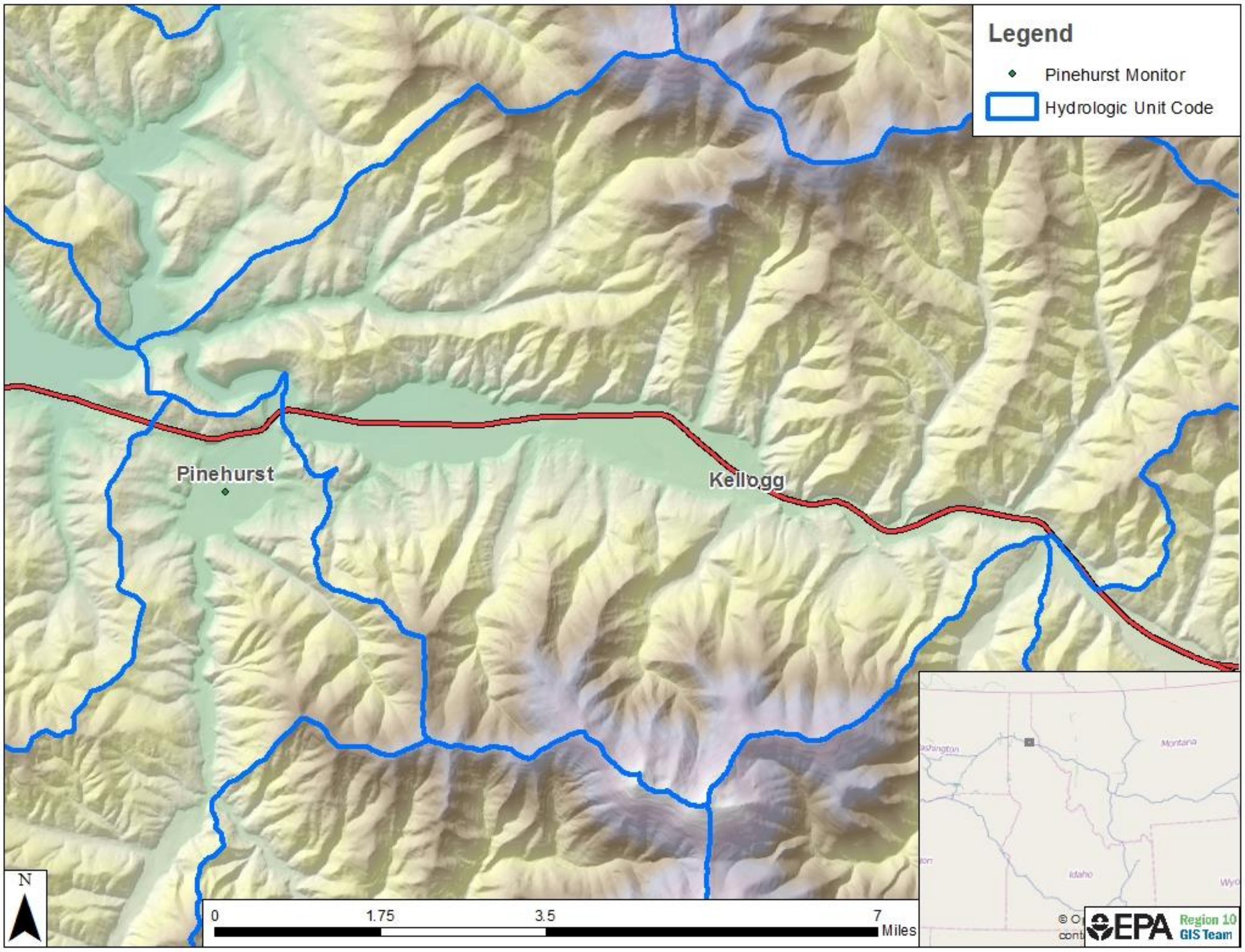
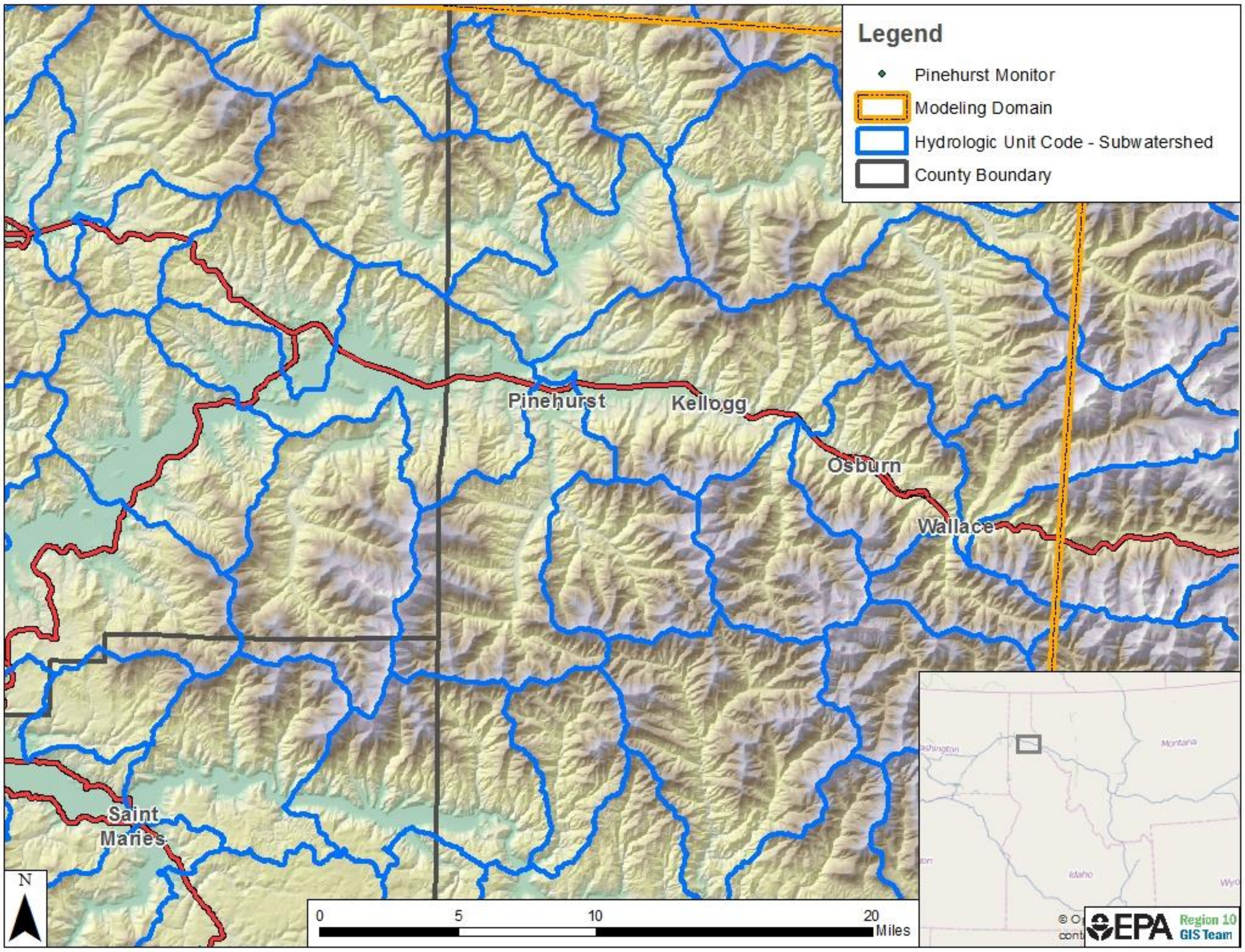


Figure 11c– Hydrologic Unit Code (HUC) boundaries in the West Silver Valley Area



Factor 5: Jurisdictional boundaries

In defining the boundaries of the West Silver Valley nonattainment area, the EPA considered existing jurisdictional boundaries, which can provide easily identifiable and recognized boundaries for purposes of implementing the NAAQS. Existing jurisdictional boundaries often signify the state and local governmental organization with the necessary legal authority for carrying out air quality planning and enforcement functions for the area. Examples of such jurisdictional boundaries include existing/prior nonattainment area boundaries for particulate matter, county lines, air district boundaries, township boundaries, areas covered by a metropolitan planning organization, state lines, and Reservation boundaries, if applicable. Where existing jurisdictional boundaries were not adequate or appropriate to describe the nonattainment area, EPA considered other clearly defined and permanent landmarks or geographic coordinates for purposes of identifying the boundaries of the designated areas.

For the majority of the boundary, the EPA relied on the geography based HUC features given that the majority of emissions were located close to the violating monitor in West Silver Valley and the minor contributions from prescribed burning were facilitated by topography draining emissions towards the monitor within the boundary and otherwise providing a barrier for emissions from outside the valley. The EPA is using the Shoshone County boundary as the jurisdictional boundary on the west side of the nonattainment area boundary.

Conclusion for the West Silver Valley Area

Based on the assessment of the five factors described above, both individually and in combination, the EPA is designating the following partial county as the West Silver Valley nonattainment area because it is violating the 2012 annual $PM_{2.5}$ NAAQS: Shoshone County, Idaho – partial. When reviewing the first factor of the five factor analysis, Air Quality Data, the air quality monitoring site in West Silver Valley, Shoshone County indicate violations of the 2012 annual $PM_{2.5}$ NAAQS based on the 2013 DVs. Air quality data from the surrounding area do not show a violation. Further review of Factor 1 – Air Quality Data, and Factor 2 Emissions related data, identified that the nature of the violations was seasonal and had to be evaluated on a monthly basis. This analysis showed that the bulk of the high $PM_{2.5}$ values were coming during the winter time and could be attributed to residential wood combustion, which historically has been a major source of elevated particulate matter in the area. The analysis also showed a much smaller but relevant contribution from prescribed burning in the shoulder months, April and October/November, of the heating season. A speciation analysis confirmed these assertions, and further evaluation of contributing sources from the area confirmed that emissions from major industrial sources and motor vehicles were not particularly contributing s to the problem, and more importantly, that close to 95% of the emissions were coming from within the West Silver Valley nonattainment area located within Shoshone County, ID. Once the major sources of emissions had been identified and modelled, Factor 3- Meteorology and Factor 4 – Geography/topography, were utilized to ensure that the majority of contributing emissions were captured with the nonattainment area boundary. The final refinement of the West Silver Valley nonattainment area boundary came with consideration of Factor 5 – Jurisdictional boundaries.