APPENDIX E

New Mexico State Implementation Plan

Regional Haze
Section 309(g)

New Mexico Environment Department
Air Quality Bureau
February 28, 2011
(revised March 31, 2011)

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CHAPTER 1: GENERAL PLAN PROVISIONS

Section 169A of the Clean Air Act establishes a national goal for protecting visibility in Federally-protected scenic areas. These Class I areas include national parks and wilderness areas. Regional haze is a type of visibility impairment caused by air pollutants emitted by numerous sources across a broad region. On July 1, 1999, the Environmental Protection Agency (EPA) issued regional haze rules to comply with requirements of the Clean Air Act. Under 40 CFR 51.308, the rule requires the State of New Mexico to develop State Implementation Plans (SIPs) which include visibility progress goals for each of the nine Class I areas in New Mexico, as well as emission reduction strategies and other measures to meet these goals. Under 40 CFR 51.309, the rule also provides an optional approach to New Mexico and eight other western states to incorporate emission reduction strategies issued by the Grand Canyon Visibility Transport Commission (GCVTC) designed primarily to improve visibility in 16 Class I areas on the Colorado Plateau, including San Pedro Parks Wilderness Area in New Mexico.

On December 31, 2003, the State of New Mexico submitted a visibility SIP to meet the requirements of 40 CFR 51.309 (309 SIP). The 2003 309 SIP and subsequent revisions to the 309 SIP address the first phase of requirements, with an emphasis on stationary source SO_2 emission reductions and a focus on improving visibility on the Colorado Plateau. In the 2003 submittal, New Mexico committed to addressing the next phase of visibility requirements and additional visibility improvement in New Mexico's remaining eight Class I areas by means of a State Implementation Plan meeting the requirements in 309(g).

Since the 2003 submittal of the 309 SIP, EPA has revised both 40 CFR 51.308 and 309 in response to numerous judicial challenges. As a result of revisions to the Federal rules, the State of New Mexico is submitting revisions to the December 31, 2003, 309 SIP under separate cover, in conjunction with this 309(g) SIP submittal.

This 309(g) SIP submission serves as a supplement to the 309 SIP submittal. Pursuant to the requirements of 51.309(g), the State of New Mexico submits this Plan with a demonstration of expected visibility conditions for the most impaired and least impaired days at the additional mandatory Class I areas; provisions for establishing reasonable progress goals for New Mexico's seven Class I areas complying with 51.308(d)(1)-(4); long-term strategies that build upon emission reduction strategies developed in the first 309 SIP submittal; and provisions to address long-term strategies and Best Available Retrofit Technology (BART) requirements for stationary source Particulate Matter (PM) and Nitrogen Oxide (NOx) emissions pursuant to 51.308(e).

The State of New Mexico commits to participate in a Regional Planning Process with Alaska, Arizona, California, Colorado, Idaho, Montana, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming, and commits to continue participation through future SIPs. The Regional Planning Process describes the process, goals, objectives, management and decision making structure, deadlines for completing significant technical analyses and developing emission management strategies and a regulation implementing the recommendations of the regional group.

Pursuant to the Tribal Authority Rule, any Tribe whose lands are within the boundaries of the State of New Mexico have the option to develop a regional haze TIP for their lands to assure reasonable progress in the nine Class I areas in New Mexico. As such, no provisions of this Implementation Plan shall be construed as being applicable to Indian Country.

CHAPTER 2: NEW MEXICO REGIONAL HAZE SIP DEVELOPMENT PROCESS

The Regional Haze Rule contains requirements for state, federal, and tribal consultation. The New Mexico Regional Haze State Implementation Plan (SIP) was developed through a process of consultation with other States, Tribes, the Environmental Protection Agency (EPA), state and federal natural resource agencies, other stakeholders, and the public. This chapter contains a description of the requirements from the Regional Haze Rule. For additional details regarding individual consultation, see Chapter 11 (Long-Term Strategy).

2.1 Federal Land Manager Consultation

40 CFR Section 51.308(i) of the Regional Haze Rule requires coordination between states and the Federal Land Managers (FLMs). New Mexico has provided agency contacts to the FLMs as required under 51.308(i)(1). During the development of this Plan, the FLMs were consulted in accordance with the provisions of 51.308(i)(2).

Numerous opportunities were provided by the Western Regional Air Partnership for FLMs to participate fully in the development of technical documents developed by the WRAP and included in this Plan. This included the ability to review and comment on these analyses, reports, and policies. A summary of WRAP-sponsored meetings and conference calls is provided on the WRAP website at: http://www.wrapair.org/cal/calendar.php.

The State of New Mexico has provided an opportunity for consultation, in person and at least 60 days prior to holding any public hearing on the SIP. As required by 40 CFR Section 51.308(i)(3), the FLM comments and State responses, as well as email exchanges from the FLM community to NMED explaining their review preferences of the SIP, will be submitted to EPA along with this Plan.

40 CFR Sections 51.308(f)-(h) establish requirements and timeframes for states to submit periodic SIP revisions and reports that evaluate progress toward the reasonable progress goal for each Class I area. As required by 40 CFR Section 51.308(i)(4), New Mexico will continue to coordinate and consult with the FLMs during the development of these future progress reports and Plan revisions, as well as during the implementation of programs having the potential to contribute to visibility impairment in mandatory Class I areas. The progress and Plan reviews are to occur at five-year intervals, with a progress report between each required Plan revision. This consultation process shall provide on-going and timely opportunities to address the status of the control programs identified in this SIP, the development of future assessments of sources and impacts, and the development of additional control programs. The consultation will include the status of the following specific implementation items:

1. Implementation of emissions strategies identified in the SIP as contributing to achieving improvement in the worst-day visibility.

2. Summary of major new permits issued.

3. Status of State actions to meet commitments for completing any future assessments or rulemakings on sources identified as likely contributors to visibility impairment, but not directly addressed in the most recent SIP revision.

4. Any changes to the monitoring strategy or monitoring stations status that may affect tracking of reasonable progress.

5. Work underway for preparing the 5-year review and/or 10-year revision.

6. Items for FLMs to consider or provide support for in preparation for any visibility protection SIP revisions (based on a 5-year review or the 10-year revision schedule under EPA's RHR).

7. Summary of topics discussion (meetings, emails, other records) covered in ongoing communications between the State and FLMs regarding implementation of the visibility program.

The consultation will be coordinated with the designated visibility protection program coordinators for the National Park Service, U.S. Fish and Wildlife Service, Bureau of Land Management, and the U.S. Forest Service. At a minimum, the State of New Mexico will meet with the Federal Land Managers on an annual basis through the Western Regional Air Partnership or an alternative Regional Planning Organization.

2.2 State Consultation

Pursuant to 40 CFR Section 51.308(d)(iv), the State of New Mexico consulted with other states through a regional planning organization, the Western Regional Air Partnership (WRAP), in developing reasonable progress goals. The WRAP is a collaborative effort of tribal governments, State governments and various Federal agencies to implement the Grand Canyon Visibility Transport Commission's recommendations and to develop the technical and policy tools needed by western states and tribes to comply with the U.S. EPA's regional haze regulations. WRAP activities are conducted by a network of committees and forums composed of WRAP members and stakeholders who represent a wide range of viewpoints. The WRAP recognizes that residents have the most to gain from improved visibility and that many solutions are best implemented at the local, state, tribal or regional level with public participation. The following western states agreed to work together to address regional haze: Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming. The goals, objectives, management and decision making structure used by the WRAP during the development of data and policies incorporated into this plan are described in Work Plans and a Strategic Plan provided in Chapter 5, Technical Information and Data.

This consultation effort began with all states in the WRAP region contributing information to a Technical Support System (TSS) which allows all states to better understand the causes of haze and the levels of contribution from all sources to each Class I area. This project involved many hours of consultation between states on regional emission inventories, monitoring and modeling to determine the causes of visibility impairment in each mandatory Class I Federal area in the regional planning area. WRAP forums involved in the technical consultation between states were as follows:

Air Pollution Prevention Forum
Dust Emissions Forum
Economic Analysis Forum
Emissions Forum
Fire Emissions Joint Forum
Mobile Sources Forum
Sources In and Near Class I Areas Forum
Stationary Sources Joint Forum
Technical Analysis Forum

The next step in state consultation in the development of reasonable progress goals was through the Implementation Work Group (IWG) of the WRAP. The State of New Mexico participated in the IWG which took the products of the technical consultation process discussed above and developed a process for establishing reasonable progress goals in the Western Class I areas. A description of that process and the determination of reasonable progress goals for each of the Class I areas in the State of New Mexico is described in Chapter 11. The following states agreed to work together through the IWG in the development of reasonable progress goals: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming.

Opportunities for consultation on development of reasonable progress goals provided through the WRAP Implementation Work Group have been documented in calls listed on the Implementation Work Group section of the WRAP website at: http://www.wrapair.org/forums/iwg/meetings.html.

Pursuant to 40 CFR Section 51.308(d)(iv), the State of New Mexico also gave opportunity for neighboring states to comment on the State of New Mexico's reasonable progress goals for each Class I area located within the state. Opportunity for comment from other states was offered through a public hearing on the 2003 Section 309 SIP, held in accordance with 40 CFR Section 51.102. The following states in the WRAP region were notified of the SIP public hearing: Alaska, Arizona, California, Colorado, Idaho, Montana, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Nevada, and Hawaii. The following states in the neighboring Central States Regional Planning Organization (CENRAP) were notified of the SIP public hearing: Iowa, Kansas, Minnesota, Missouri, Nebraska, Oklahoma, and Texas.

Pursuant to 40 CFR 51.308(d)(3)(i), the State of New Mexico has participated in regional planning and coordination with other states in developing emission management strategies if emissions from within the state contribute to visibility impairment in a mandatory Class I Federal area outside the state, or if emissions from another state, regional planning organization, country, tribal area, or offshore location contribute to visibility impairment in any Class I Federal area within the state. This participation was through the WRAP. A more detailed description of the goals, objectives, management, and decision-making structure of the WRAP has been included in Chapter 5. The following WRAP forums have provided consultation opportunities between states on emission management strategies:

Air Pollution Prevention Forum
Dust Emissions Forum
Economic Analysis Forum
Emissions Forum
Fire Emissions Joint Forum
Mobile Sources Forum
Sources In and Near Class I Areas Forum
Stationary Sources Joint Forum
Technical Analysis Forum

Opportunities for consultation on emission strategies provided through the WRAP have been documented in calls and meetings on the WRAP website at: http://www.wrapair.org/cal/calendar.php.

A description of the selected emission management strategies for the State of New Mexico is described in Chapter 12 of this Plan. The State of New Mexico views the development of coordinated emission management strategies to be a long-term commitment, and therefore, the State of New Mexico agrees to continue to participate in the WRAP or an alternative Regional Planning Organization in developing coordinated emission management strategies for SIP revisions in 2013 and 2018.

Through the WRAP consultation process the State of New Mexico has reviewed and analyzed the contributions from other states that reasonably may cause or contribute to visibility impairment in New Mexico's Class I areas. New Mexico acknowledges that the long-term strategies adopted by Colorado, Arizona, Colorado, and Texas in their SIPs and approved by EPA will include emission reductions from a variety of sources that will reduce visibility impairment in New Mexico’s Class I areas.

2.3 Reasonable Progress Summary

Pursuant to 40 CFR 51.308(h)(2), the State of New Mexico has determined this first State Implementation Plan is adequate to ensure reasonable progress for the first planning period of the regional haze long-term planning effort which extends out to the year 2064. While emissions from sources outside of the State of New Mexico have resulted in a slower rate of improvement in visibility than the rate that would be needed to attain natural conditions by 2064, most of these emissions are beyond the control of any state in the regional planning area of the WRAP. [~~Two Class I areas in New Mexico show degradation: Gila Wilderness for both the 20 percent best and worst days, and~~] The modeling for Carlsbad Caverns National Park shows degradation for the 20 percent [~~worst~~] best days. The emission sources include: emissions from outside the WRAP domain; emissions from Mexico; emissions from wildfires and windblown dust; and emissions from CENRAP and the Eastern U.S. In addition, future area source emissions based on strong population growth are unlikely to occur at rates predicted when the modeling for this SIP was performed. A report prepared for WRAP by Eastern Research Group (ERG) used the EPA model EGAS to estimate growth in area sources. This model over predicts area source growth by using a simple multiplier and does not take into account additional regulatory requirements, both federal and state, in the analysis. In contrast to modeled predictions, Figure 6-1**Error! Reference source not found.** shows that actual visibility measurements from 2005 through 2009 show improvement in the best days at Carlsbad Caverns National Park.

A more detailed description and quantification of these uncontrolled emissions is included in the Source Apportionment and Regional Haze Modeling chapter of this SIP. Additional strategies to address emissions beyond the control of any state in the WRAP under the jurisdiction of EPA are discussed in the Long-Term Strategy chapter of this SIP.

2.4 Tribal Consultation

Although tribal consultation is not required under the Regional Haze Rule, NMED views this as an important part of the consultation process, and actively pursued this during the development of the Regional Haze Plan.

2.5 Public and Stakeholder Outreach

New Mexico participated in numerous stakeholder meetings during the WRAP process and continues to meet with stakeholders. Additional stakeholder meetings will be held during the public comment period of this SIP proposal.

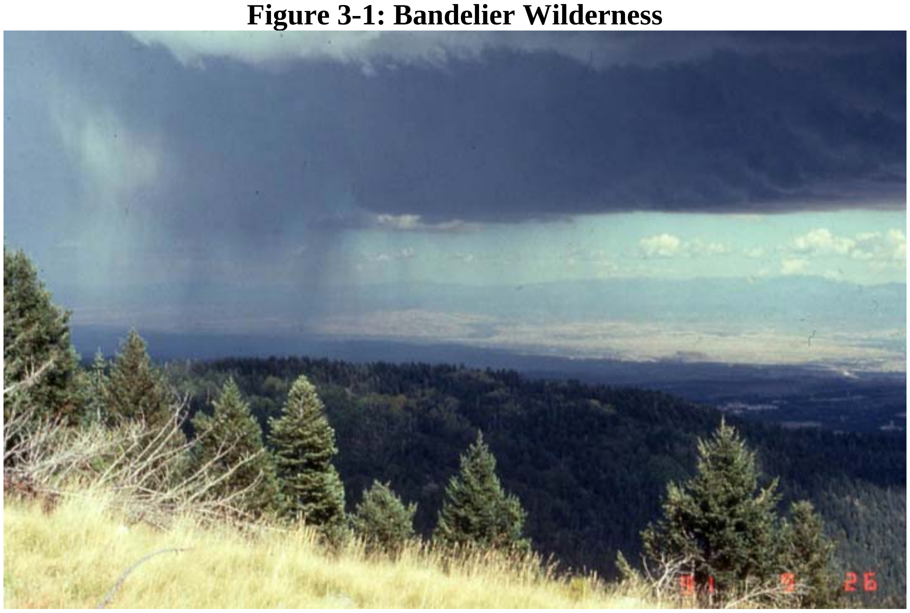
CHAPTER 3: NEW MEXICO CLASS I AREAS

This chapter provides an overview of eight of New Mexico's nine Class I areas included in this document. San Pedro Parks Wilderness Area is discussed further in the Section 309 SIP submittal.

3.1 Bandelier Wilderness Area

Bandelier Wilderness Area encompasses approximately 90 percent of the Bandelier National Monument. Bandelier National Monument sits at the southern end of the Pajarito Plateau. The plateau was formed by two eruptions 1.6 and 1.4 million years ago. Bandelier ranges from 5,340 ft at the Rio Grande to the south and 10,199 ft at the summit of Cerro Grande to the north, almost a mile of elevation change in just under 12 miles. This elevation gradient creates a unique diversity of habitats specific to Northern New Mexico. The diversity of habitats and quick access to water supported a relatively large population of Ancestral Pueblo people. Currently, piñon-juniper woodlands dominate in the southern parts of the park transitioning through ponderosa pine savannahs and forests finally reaching mixed conifer forests at the highest elevation. Scattered throughout the park are desert grasslands, montane meadows, and riparian areas in the canyon bottoms. Bandelier is home to a wide variety of wildlife. The backcountry trails at Bandelier climb in and out of deep canyons and cross large flat mesas, showcasing the entire spectrum of volcanic geology.

Figure 3-1: Bandelier Wilderness



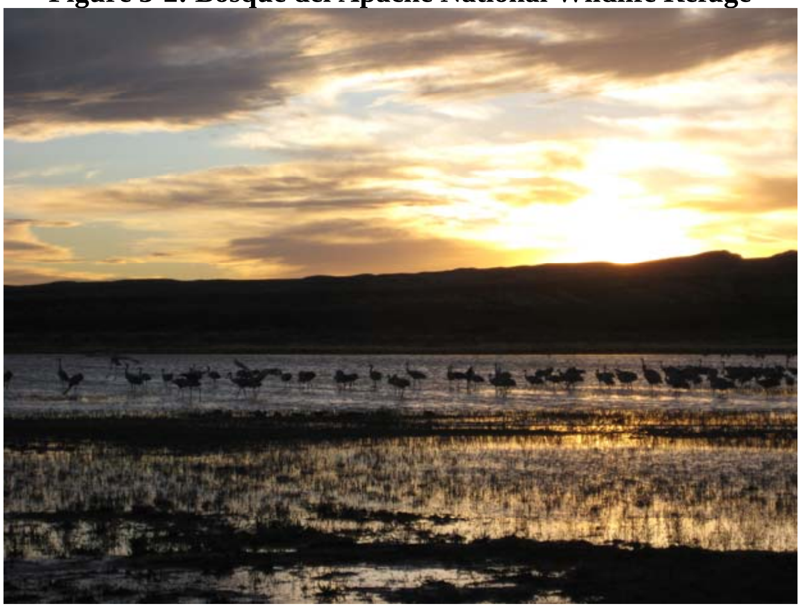
Photograph courtesy of wilderness.net, no photographer identified

3.2 Bosque del Apache National Wildlife Refuge

The Bosque del Apache National Wildlife Refuge (NWR) is located along the Rio Grande near Socorro, New Mexico. The Refuge is located at the northern edge of the Chihuahuan desert, and straddles the Rio Grande. The heart of the Refuge is about 12,900 acres of moist bottomlands – 3,800 acres are active floodplain of the Rio Grande and 9,100 acres are areas where water is diverted to create extensive wetlands, farmlands, and riparian forests. The rest of Bosque del Apache NWR is made up of arid foothills and mesas, which rise to the Chupadera Mountains on the west and the San Pascual Mountains on the east. Most of these desert lands are preserved as wilderness areas.

Managed by the U.S. Fish and Wildlife Service, Bosque del Apache NWR is an important link in the more than 500 refuges in North America. The goal of refuge management is to provide habitat and protection for migratory birds and endangered species and provide the public with a high quality wildlife and educational experience

Figure 3-2: Bosque del Apache National Wildlife Refuge



Photograph by Rita Bates

3.3 Carlsbad Caverns National Park

Carlsbad Caverns National Park is located in the Guadalupe Mountains, a mountain range that runs from west Texas into southeastern New Mexico. Elevations within the park rise from 3,595 feet in the lowlands to 6,520 feet atop the escarpment. Though there are scattered woodlands in the higher elevations, the park is primarily a variety of grassland and desert shrubland habitats.

The park supports a diverse ecosystem, including habitat for many plants and animals that are at the geographic limits of their ranges. For example, the ponderosa pine reaches its extreme eastern limit here and several species of reptiles are at the edges of their distributions.

The most famous of all the geologic features in the park are the caves. Carlsbad Caverns National Park contains more than 110 limestone caves, the most famous of which is Carlsbad Cavern. Carlsbad Cavern receives more than 300,000 visitors each year and offers a rare glimpse of the underground worlds preserved under the desert above.

Figure 3-3: Carlsbad Caverns National Park

Photograph courtesy of wilderness.net, photograph by Renee West

3.4 Gila Wilderness

Many different types of terrain are found in the Gila Wilderness. The northeastern and far eastern sections of the wilderness tend to consist of high mesas and rolling hills, ranging in elevation from approximately 5,000 to 8,000 feet and cut by the deep canyons of the Gila River. The vegetation there consists primarily of mixed junipers and piñon pines, grasses, and at the higher elevations and on northern slopes, ponderosa pines. Vast stands of ponderosas cover the central part of the wilderness in this area.

The river canyons offer spectacular cliffs, with mixed hardwoods and ponderosa pine growing along the riparian bottoms. The far western and southwestern sections of the Gila Wilderness consist of high mountains, particularly the Mogollon Range, with the highest elevation reaching 10,895 feet. Steep side canyons are common, and vegetation includes Douglas fir, ponderosa pine, aspens and a variety of ferns. The area includes the drainage basins of both Mogollon Creek and Turkey Creek.

Figure 3-4: Gila Wilderness

Photograph courtesy of wilderness.net, photograph by Steve Boutcher

3.5 Pecos Wilderness

The Pecos Wilderness extends through two Ranger Districts in the Santa Fe National Forest and into the Carson National Forest to the north. Within the boundaries of this expansive area are several landmarks including Truchas Peak which tops of at 13,103 feet, and the southern stretch of the Rocky Mountains. The terrain varies from open meadows in the Pecos River Valley to the steep canyons of the Sangre de Cristo mountain range. Wildlife ranges from deer and elk to big horn sheep, turkeys and grouse. It is not uncommon to run into cattle in the wilderness either, as some ranchers are permitted to graze their cattle in areas of the wilderness. There are 15 lakes, and eight major streams to sustain both plant and animal habitat, including the native Rio Grande Cutthroat Trout.

Figure 3-5: Pecos Wilderness

Photograph by Rita Bates

3.6 Salt Creek Wilderness

Salt Creek Wilderness Area is part of the Bitter Lake National Wildlife Refuge (NWR). Salt Creek Wilderness Area consists of river bottomlands, grasslands, sand dunes, and mixed shrub communities. Salt Creek Wilderness is made up of the watershed of Salt Creek which empties into the Pecos River in southeastern New Mexico. The refuge, Bitter Lake, is located near Roswell, NM, immediately west of the Pecos River. Virtually no waterfowl or waterbirds use the wilderness area of Salt Creek because it is devoid of wetlands other than the river and a dozen sinkholes. Two or three of the sinkholes contain rare fish – Pecos gambusia, which is endangered and the Pecos pupfish, a species of concern. Part of the reason Salt Creek was established as wilderness was to protect the scenic red bluffs on the north side of Salt Creek.

Figure 3-6: Salt Creek Wilderness

Photograph courtesy of wilderness.net, photograph by Jeff Howland

3.7 Wheeler Peak Wilderness

Lying along the top of the Sangre De Cristo mountain range, Wheeler Peak Wilderness is characterized by high rugged terrain. Elevations range from a low of 7,650 feet to a high of 13,161 feet at Wheeler Peak, the highest point in the State of New Mexico. Marmots, pikas, elk, mule deer, and golden eagles are found in the Wheeler Peak Wilderness. Above Taos Ski Valley, the Rio Hondo has a natural population of cutthroat trout as does Sawmill Creek. From the cottonwoods along the Rio Hondo to the Bristlecone pines guarding the peaks, Wheeler Peak Wilderness has almost all of the trees native to Northern New Mexico. Englemann spruce and sub-alpine fir are the predominant tree species. Because Wheeler Peak is so high, it is one of the only places in the State to see a true alpine "mat" as opposed to grasses that grow in other high alpine locales. The "mat" produces beautiful brilliantly colored flowers. The average annual precipitation is 34-40 inches, with about half the total from summer rains and half from winter snows. Average annual temperatures range between 80 degrees in the summer to 20 degrees below zero in the winter.

Figure 3-7: Wheeler Peak Wilderness

Photograph courtesy of wilderness.net, photograph by Steve Boutcher

3.8 White Mountain Wilderness

The White Mountain Wilderness lies entirely within the Smokey Bear Ranger District of the Lincoln National Forest. The Wilderness is 12.5 miles long and ranges from 4 to 12 miles wide. The Wilderness consists mainly of a long, northerly running ridge and its branches. The west side of the ridge is steep and extremely rugged with many extensive rock outcroppings, while the eastern side is more gentle with broader, forested canyons and a few tiny streams. Elevations range from a low of 6,400 feet at Three River Campground on the west side to a high of 11,580 feet near Lookout Mountain on the south. From Three Rivers to the crest there are four different life zones: piñon-juniper, ponderosa pine, mixed conifer, and sub-alpine forest. Abrupt changes in elevation, escarpments, rock outcrops, and avalanche chutes make for striking contrast and scenery. Interspersed along the crest are several meadows as well as some grass-oak savannahs, which are the result of fires.

The weather too, is directly related to elevation. Springtime is usually dry and windy throughout the wilderness. July and August are the rainy months with frequent afternoon showers. In summer, while the desert is sweltering, the high country will likely be cool. Autumn is a beautiful time of year with oaks, maples, and aspens adding splashes of color to the hillsides. The days are usually cool and sunny with little wind. Winter in the wilderness brings a time of quiet beauty. Snowfall usually begins during the mid to latter part of November and can continue on through June. During the winter months, the higher elevations may be under six or more feet of snow while it is comfortably warm at the 6,000 feet level.

Figure 3-8: White Mountain Wilderness

Photograph courtesy of wilderness.net, photograph by Deidre St. Louis

CHAPTER 4: REGIONAL HAZE MONITORING NETWORK

4.1 Overview of IMPROVE Network

The Interagency Monitoring of Protected Visual Environments (IMPROVE) program is a cooperative measurement effort governed by a steering committee composed of representatives from Federal and regional-state organizations. The IMPROVE monitoring program was established in 1985 to aid the creation of Federal and State Implementation Plans for the protection of visibility in Class I areas (156 national parks and wilderness areas) as stipulated in the 1977 amendments to the Clean Air Act.

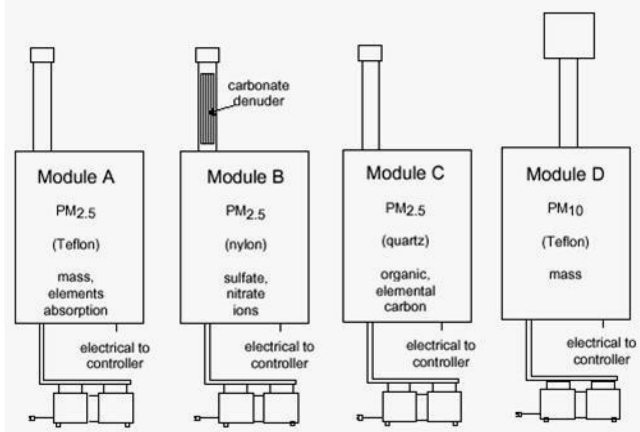
The objectives of IMPROVE are: (1) to establish current visibility and aerosol conditions in mandatory Class I areas; (2) to identify chemical species and emission sources responsible for existing man-made visibility impairment; (3) to document long-term trends for assessing progress towards the national visibility goal; (4) and with the enactment of the Regional Haze Rule, to provide regional haze monitoring representing all visibility-protected Federal Class I areas where practical. IMPROVE has also been a key participant in visibility-related research, including the advancement of monitoring instrumentation, analysis techniques, visibility modeling, policy formulation and source attribution field studies.

Figure 4-1 shows a typical IMPROVE site, and Figure 4-2 shows the four separate modules used for sampling the different pollutant species.

Figure 4-1: IMPROVE Monitor at Bosque del Apache National Wildlife Refuge

Picture from: IMPROVE website,
http://vista.cira.colostate.edu/improve/Web/Sitebrowser/Sitebrowser.aspx?SiteID=32

Figure 4-2: Four Modules Used for Regional Haze Sampling



The IMPROVE monitoring network consists of aerosol and optical samplers. The network began operating in 1988 with 20 monitoring sites in Class I areas. By 1999 the network expanded to 30 monitoring sites in Class I areas and 40 sites using IMPROVE site and sampling protocols operated by Federal and State agencies. With the enactment of the Regional Haze Rules the IMPROVE network has been expanded by 80 new sites.

Formula for Reconstructed Light Extinction

The IMPROVE program has developed methods for estimating light extinction from speciated aerosol and relative humidity data. The three most common metrics used to describe visibility impairment are:

- Extinction (bext) - Extinction is a measure of the fraction of light lost per unit length along a sight path due to scattering and absorption by gases and particles, expressed in inverse Megameters (Mm-1). This metric is useful for representing the contribution of each aerosol species to visibility impairment and can be practically thought of as the units of light lost in a million meter distance.

- Visual Range (VR) - Visual range is the greatest distance a large black object can be seen on the horizon, expressed in kilometers (km) or miles (mi).

- Deciview (dv) - This is the metric used for tracking regional haze in the Regional Haze Rule. The deciview index was designed to be linear with respect to human perception of visibility. A one deciview change is approximately equivalent to a 10% change in extinction, whether visibility is good or poor. A one deciview change in visibility is generally considered to be the minimum change the average person can detect with the naked eye.

The IMPROVE network estimates light extinction based upon the measured mass of various contributing aerosol species. EPA's 2003 guidance for calculating light extinction is based on the original protocol defined by the IMPROVE program in 1988. (For further information, see http://vista.cira.colostate.edu/improve/Publications/GuidanceDocs/guidancedocs.htm.) In December 2005, the IMPROVE Steering Committee voted to adopt a revised algorithm for use by IMPROVE as an alternative to the original approach.

The revised algorithm for estimating light extinction is calculated as recommended for use by the IMPROVE steering committee using the following equations:

b*ext* ≈ 2.2 x fs(RH) x [Small Amm. Sulfate] + 4.8 x fL(RH) x [Large Amm. Sulfate]
+ 2.4 x fs(RH) x [Small Amm. Nitrate] + 5.1 x fL(RH) x [Large Amm. Nitrate]

+ 2.8 x [Small POM] + 6.1 x [Large POM]
+ 10 x [EC]
+ 1 x [Soil]
+ 1.7 x fss(RH) x [Sea Salt]
+ 0.6 x [CM]
+ 0.33 x [NO2(ppb)]
+ Rayleigh Scattering (Site Specific)

The revised algorithm splits ammonium sulfate, ammonium nitrate, and POM concentrations into small and large size fractions as follows:

$$\text{For } [\text{Total}] < 20\mu\text{g/m}^3 \begin{cases} [\text{Large}] = \dfrac{[\text{Total}]}{20} \times [\text{Total}] \\ [\text{Small}] = [\text{Total}] - [\text{Large}] \end{cases}$$

$$\text{For } [\text{Total}] \geq 20\mu\text{g/m}^3, [\text{Large}] = [\text{Total}]$$

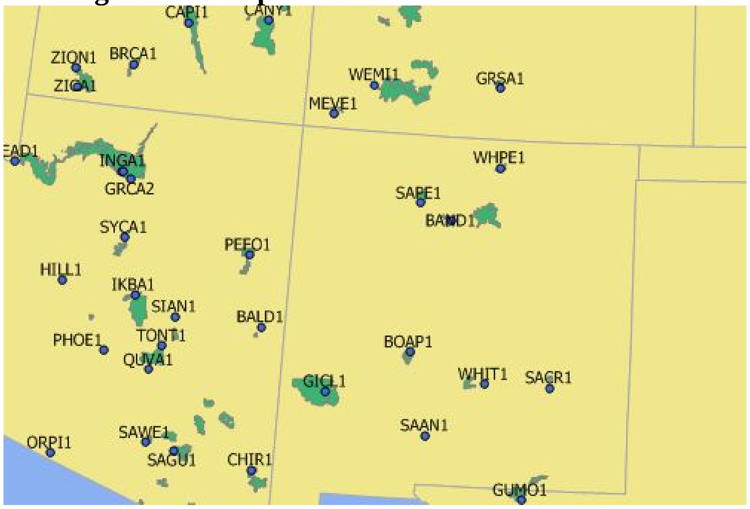
4.2 New Mexico IMPROVE Monitoring Network

In New Mexico, there are seven IMPROVE monitors listed in Table 4-1, that collect data for regional haze monitoring. There are nine Class I areas in New Mexico. The IMPROVE monitor for Carlsbad Caverns is located in Texas at Guadalupe Mountains National Park. The IMPROVE monitor for the Wheeler Peak Wilderness Area is used to represent visibility conditions at the nearby Pecos Wilderness. Although it is desirable to have one monitor for each Class I area, in most cases one monitor is "representative" of haze conditions in nearby Class I areas. Figure 4-3 shows the locations of the IMPROVE monitors in New Mexico.

Table 4-1: IMPROVE Monitors in New Mexico

Site Name	Site Code	Class I Area	Sponsor	Elevation MSL (ft)	Start Date
Bandelier NM	BAND1	Bandelier Wilderness	NPS	6,523	3/2/1988
Bosque del Apache	BOAP1	Bosque del Apache NWR	FWS	4,560	4/5/2000
Gila Wilderness	GICL1	Gila Wilderness	USFS	5,825	4/15/1994
Guadalupe Mountains National Park (TX)	GUMO1	Carlsbad Caverns NP	NPS	5,338	3/2/1988
Salt Creek	SACR1	Salt Creek Wilderness	FWS	3,518	4/6/2000
Wheeler Peak	WHPE1	Wheeler Peak Wilderness, Pecos Wilderness	USFS	11,043	8/15/2000
White Mountain	WHIT1	White Mountain Wilderness	USFS	6,770	1/15/2002

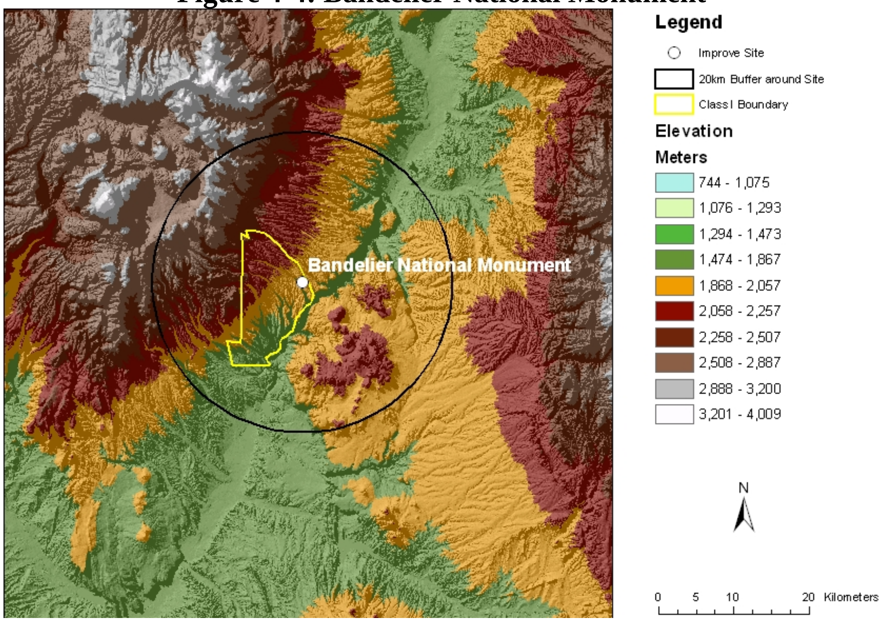
Figure 4-3: Map of New Mexico IMPROVE Sites



4.2.1 Bandelier Wilderness

The IMPROVE monitoring site representing the Bandelier Wilderness is BAND1, located near a fire tower on a ridge crest just outside of the eastern Wilderness boundary at an elevation of 6,517 feet. The BAND1 IMPROVE site is in an exposed location at an elevation near the middle of the range of Wilderness elevations and about 1,000 feet above the Rio Grande at the bottom of the canyon. Highest Wilderness elevations are typically about 1,000 feet above the monitoring site. BAND1 should be very representative of Wilderness locations, although lower Wilderness canyon bottom elevations, that comprise a very small part of the Wilderness area, may at times be within a lower surface inversion.

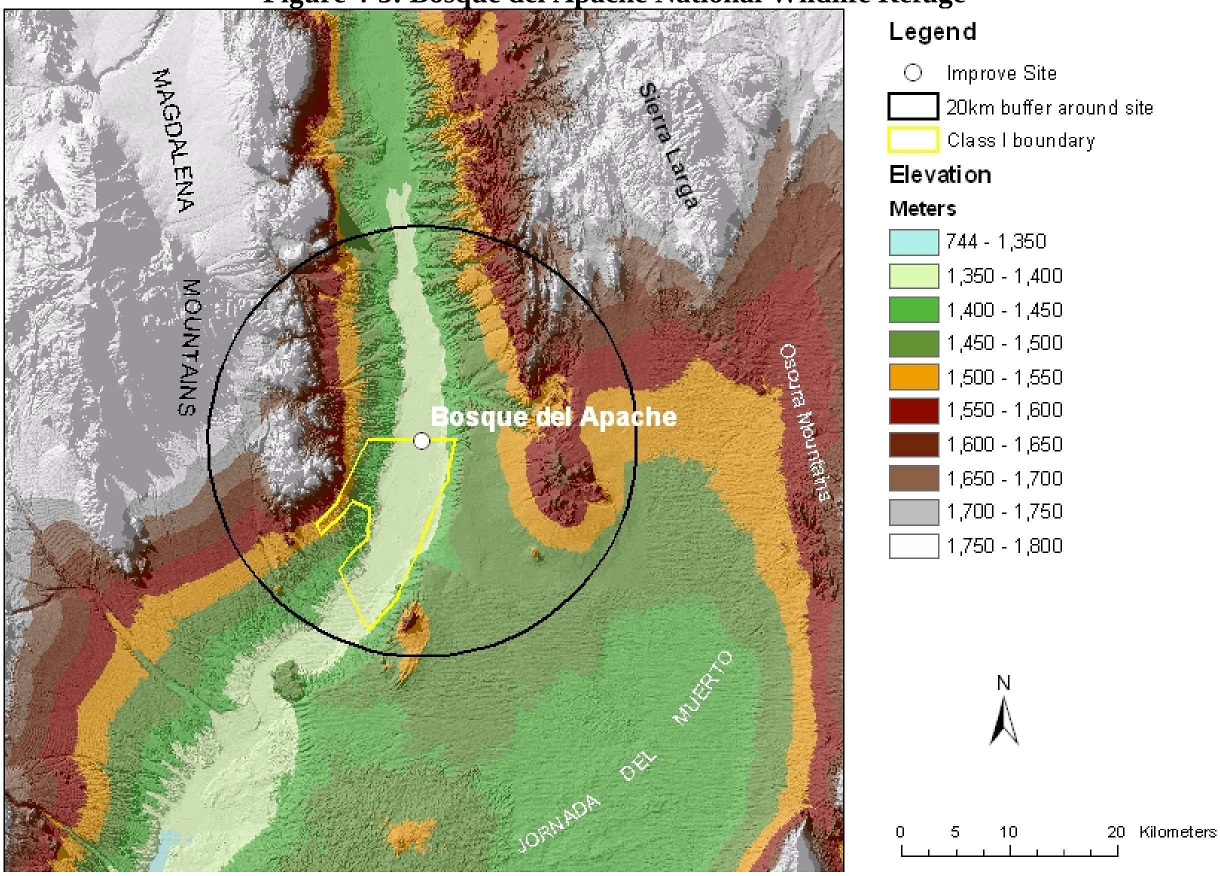
Figure 4-4: Bandelier National Monument



4.2.2 Bosque del Apache National Wildlife Refuge

The IMPROVE monitoring site representing the Bosque del Apache is BOAP1, at the northern boundary near the Rio Grande, at an elevation of 1,383 m (4,536 ft). Given the narrow range of elevations in the Bosque del Apache, the BOAP1 IMPROVE should be very representative of aerosol concentration and composition within the class I area.

Figure 4-5: Bosque del Apache National Wildlife Refuge



4.2.3 Carlsbad Caverns National Park

The IMPROVE monitoring site representing Carlsbad Caverns National Park is GUMO1 (Guadalupe Mountains), located about 25 km (15 mi) southwest in mountainous terrain near the crest of the Delaware Mountain Range at an elevation of 1,674 m (5,492 ft). It has good exposure to regional scale winds and may be influenced by wind blown dust from the dry lake (bare ground) in western Texas, as well as from the Mexican dry/barren region to the southwest. Near the monitoring site ground cover is desert vegetation (shrub land and grassland, etc.).

Aerosol data collected at the GUMO1 IMPROVE site should be very representative of aerosol characteristics within Carlsbad Caverns NP, especially at higher elevations.

Figure 4-6: Map of Carlsbad Caverns National Park

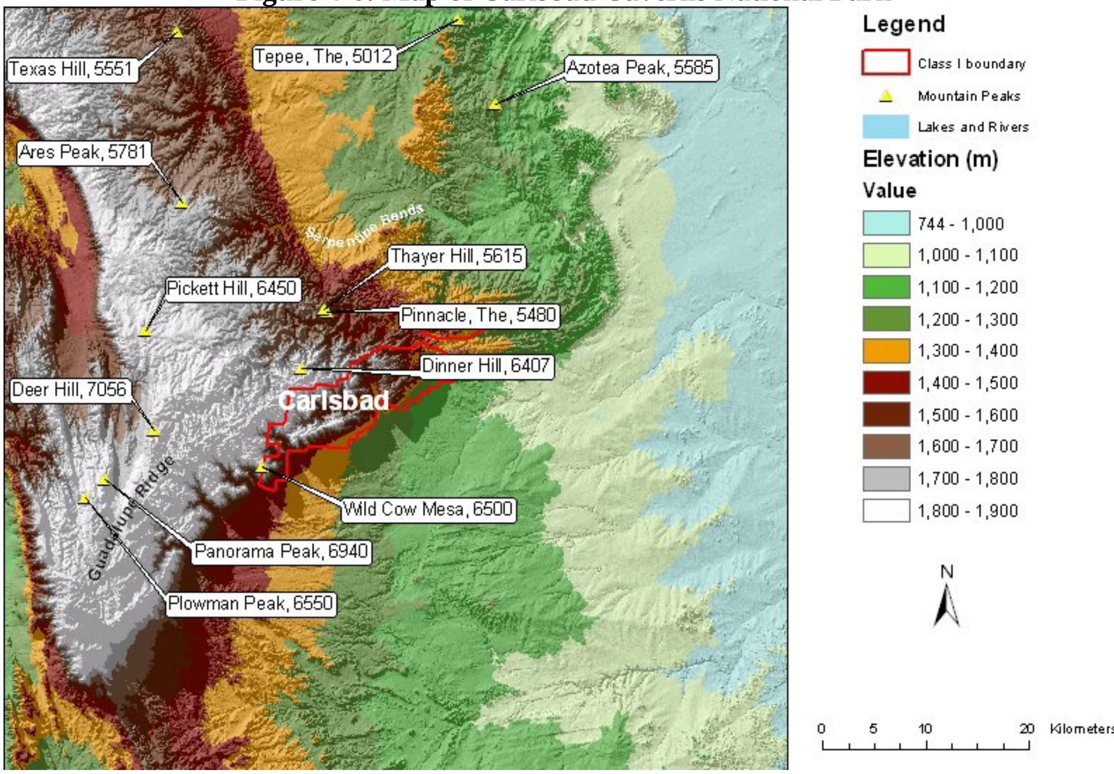
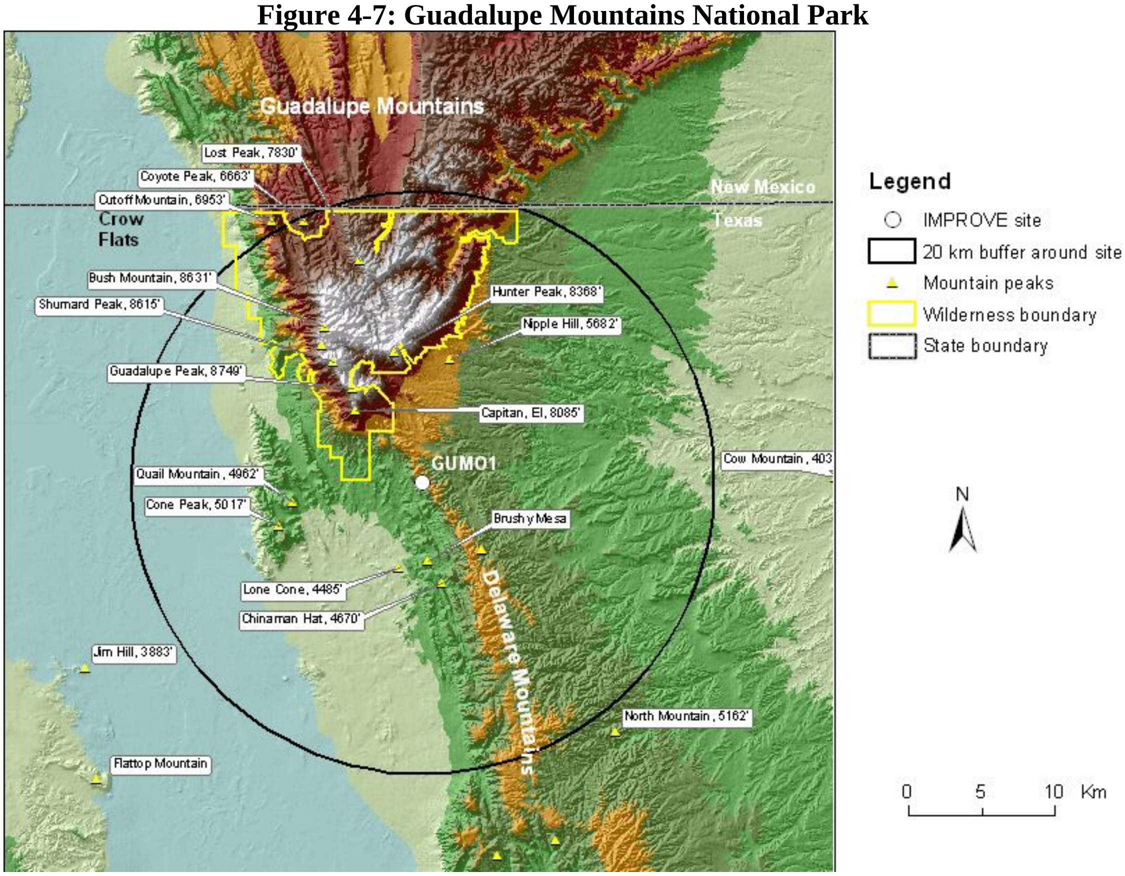


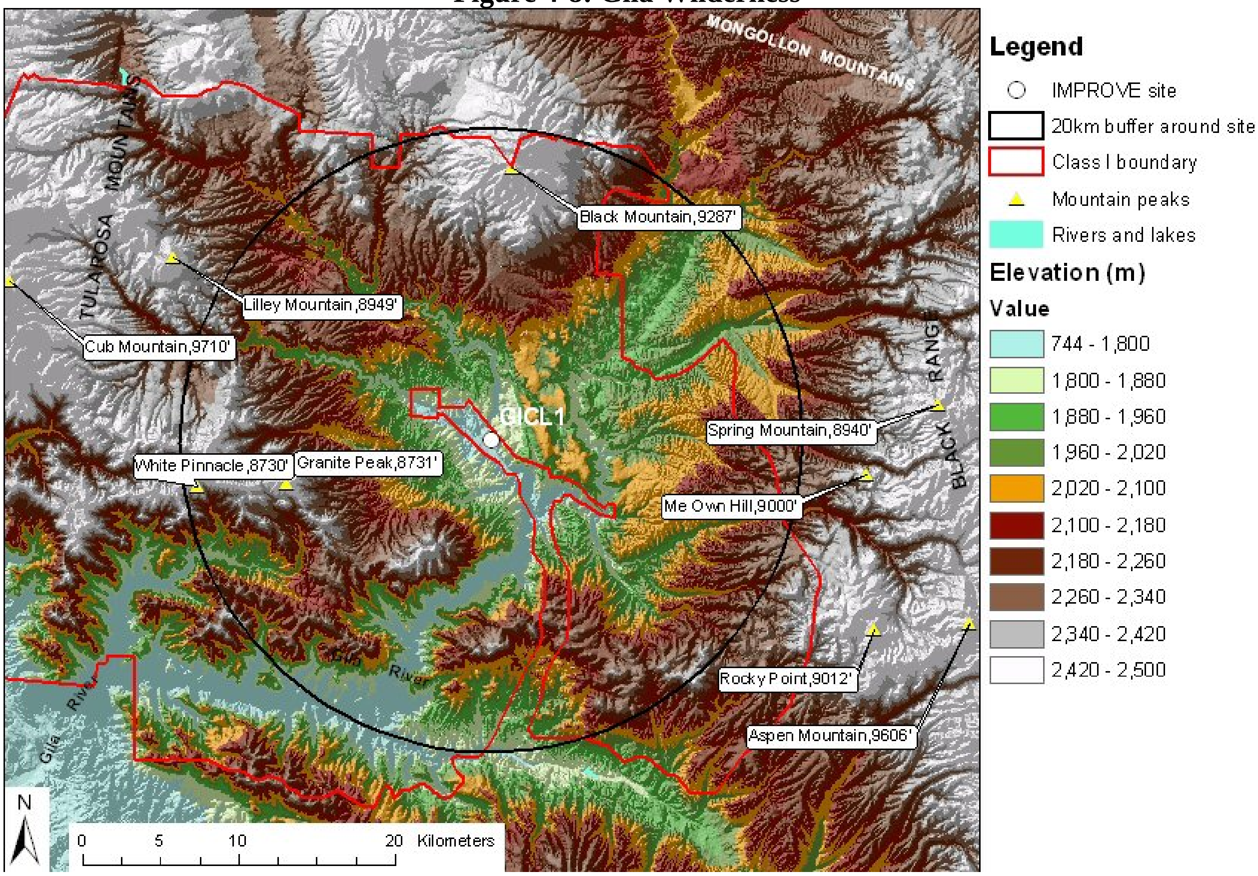
Figure 4-7: Guadalupe Mountains National Park



4.2.4 Gila Wilderness

The IMPROVE monitoring site representing the Gila Wilderness is GICL1, located on a bank just overlooking the Gila River in the east central part of the Wilderness, elevation 1,776 m (5,825 ft). The location of the Gila Wilderness IMPROVE site, GICL1, near the center of the Wilderness should make it representative of Wilderness locations when the atmosphere is well mixed. Its elevation is at the lower end of Wilderness elevations so that there may be times when it is isolated within shallow surface-based inversions that do not extend vertically to higher Wilderness elevations.

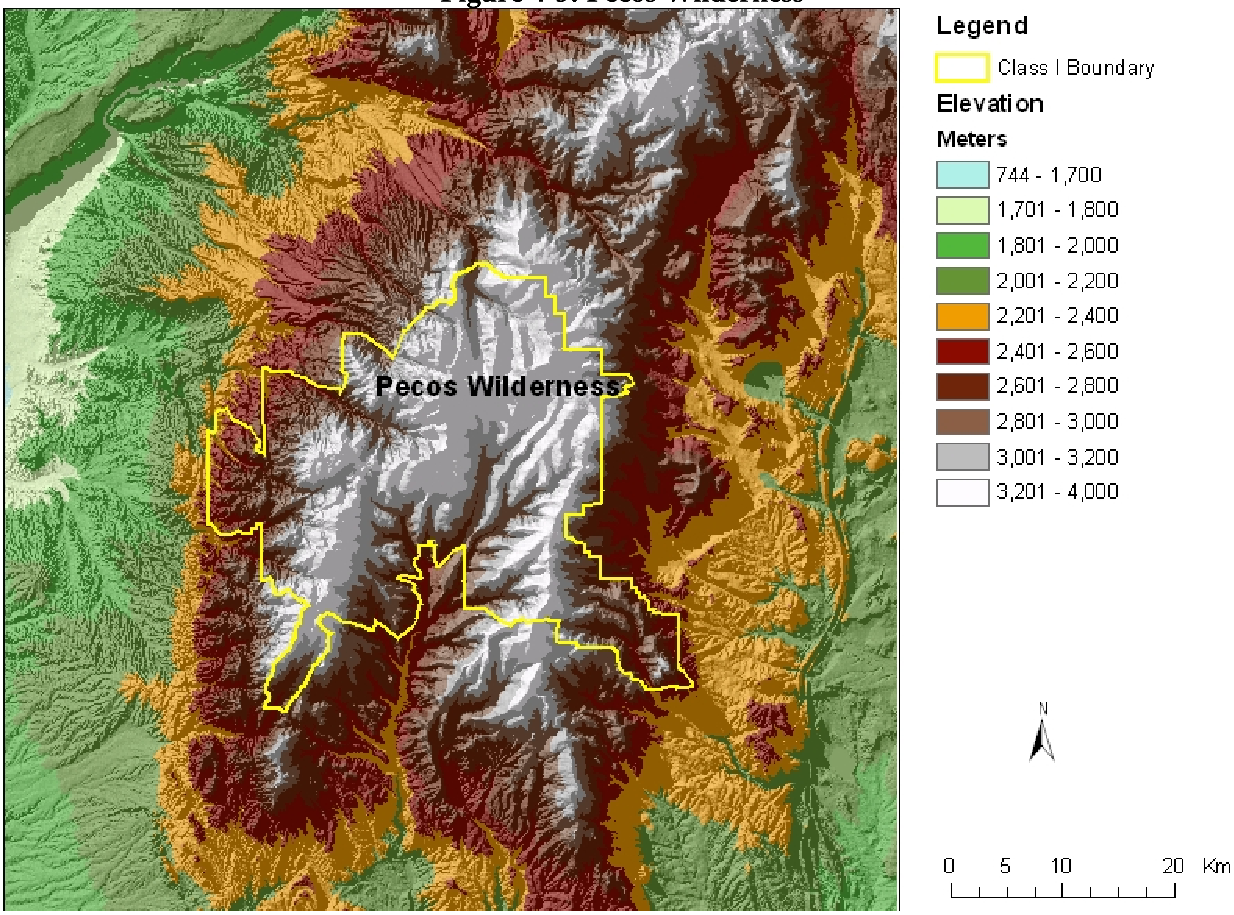
Figure 4-8: Gila Wilderness



4.2.5 Pecos Wilderness

The IMPROVE monitoring site representing the Pecos Wilderness is WHPE1 (Wheeler Peak), located about 60 km (~ 40 mi) to the north near the Wheeler Peak Wilderness at an elevation of 3,372 m (11,060 ft). The WHPE1 IMPROVE site is at a high elevation and should be very representative of Wilderness vistas at high elevations of the Sangre de Cristos, including the Pecos Wilderness. At this high elevation it may occasionally be above regional haze, and may also at times be isolated from lower valley bottom Wilderness locations contained within valley inversions.

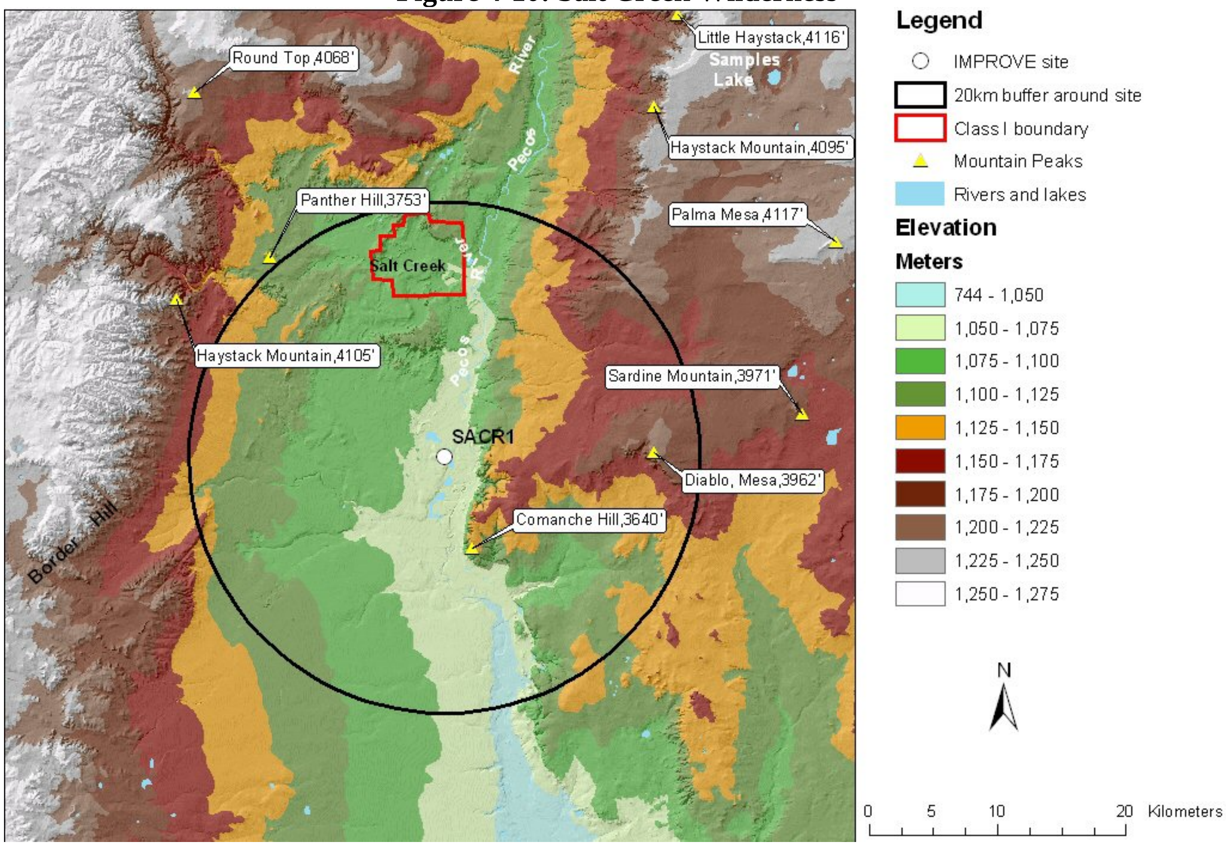
Figure 4-9: Pecos Wilderness



4.2.6 Salt Creek Wilderness

The IMPROVE monitoring site representing the Salt Creek Wilderness is SACR1, located about 10 km (6 mi) south of the Wilderness at an elevation of 1,077 m (3,533 ft). The SACR1 IMPROVE should be very representative of aerosol concentration and composition in the Salt Creek Wilderness since it is at the same elevation with no intervening terrain.

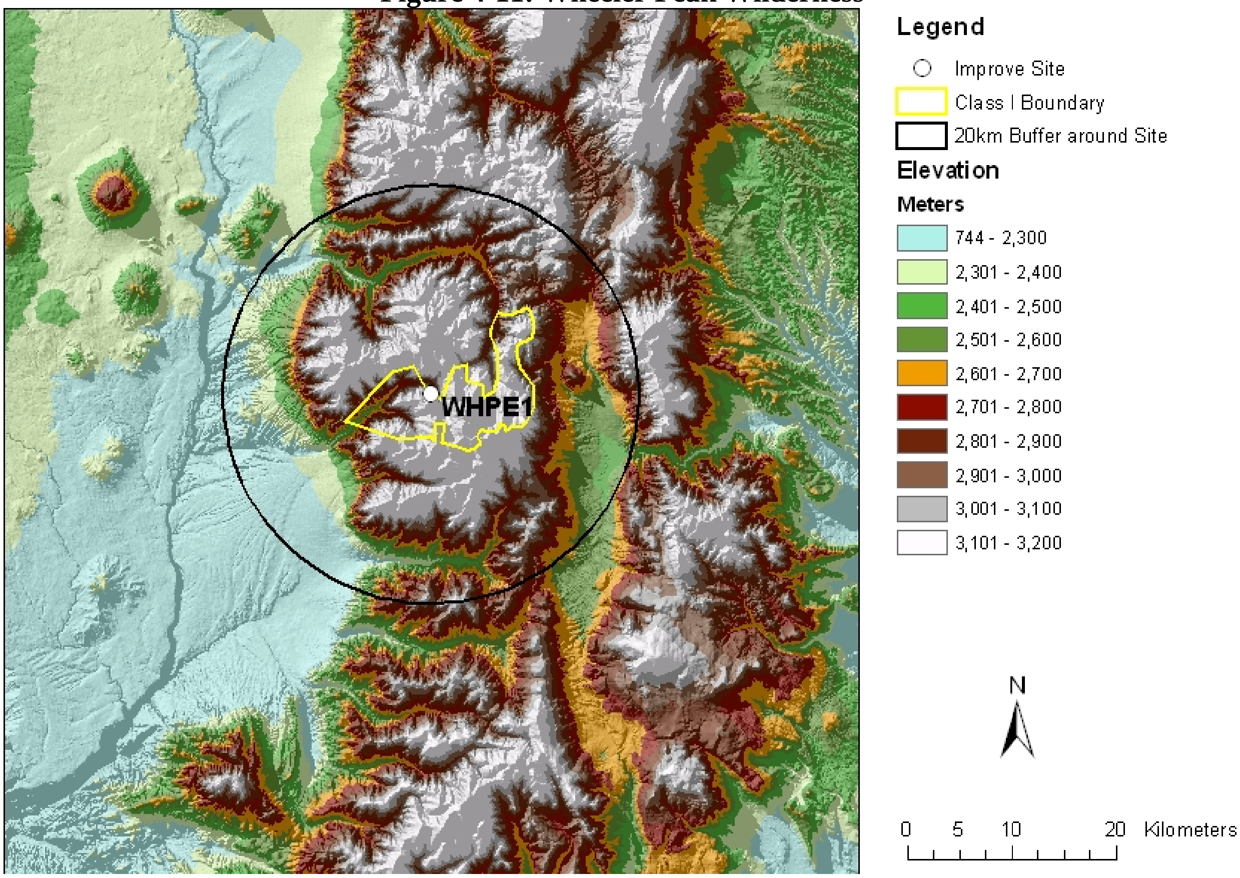
Figure 4-10: Salt Creek Wilderness



4.2.7 Wheeler Peak Wilderness

The IMPROVE monitoring site representing the Wheeler Peak Wilderness is WHPE1, located at a high point just outside the northern Wilderness boundary at an elevation of 3,372 m (11,060 ft). The WHPE1 IMPROVE site is at a high elevation and should be very representative of Wilderness vistas. At this high elevation it may occasionally be above regional haze, and may also at times be isolated from lower valley bottom Wilderness locations contained within valley inversions.

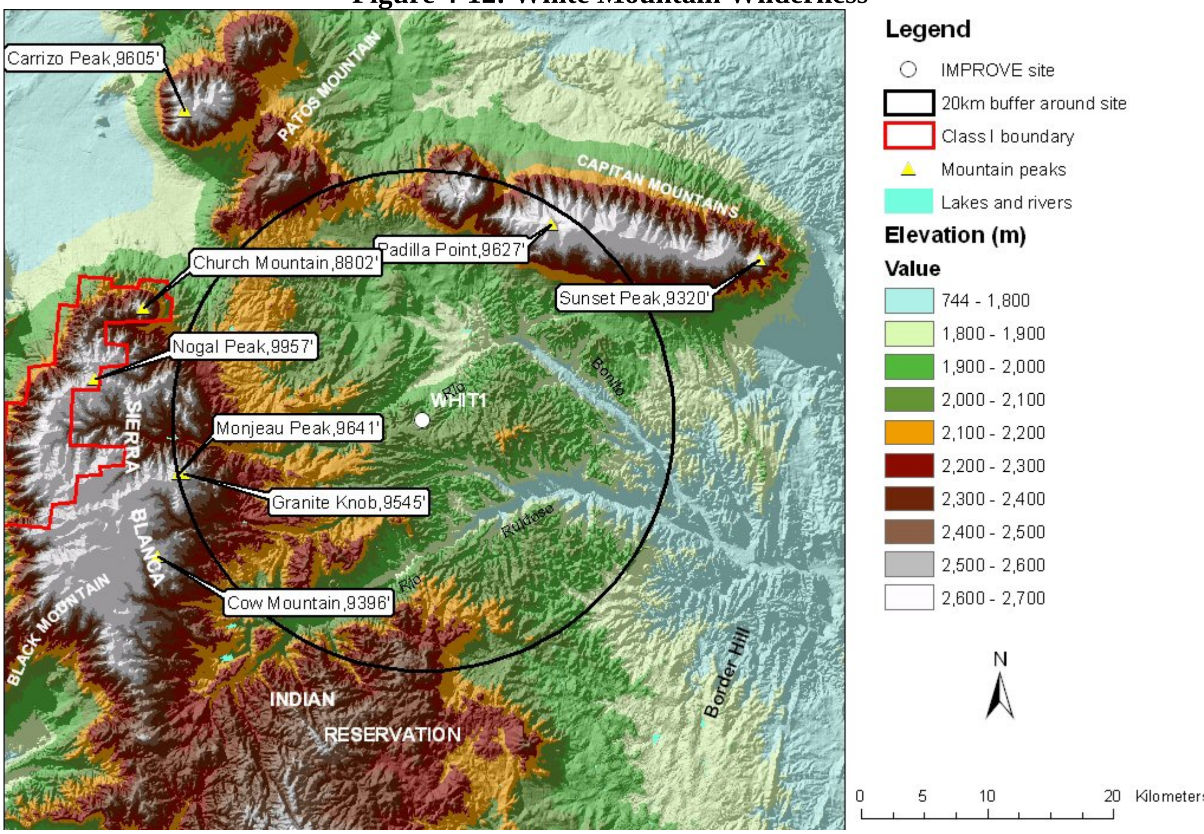
Figure 4-11: Wheeler Peak Wilderness



4.2.8 White Mountain Wilderness

The IMPROVE monitoring site representing the White Mountain Wilderness is WHIT1, located on a low ridge between Rio Bonito and Little Creek, near the Sierra Blanca regional airport about 15 km east of the Wilderness at an elevation of 2,050 m (6,724 ft). The WHIT1 IMPROVE site is on a well-exposed low ridge at an elevation near lower Wilderness elevations. It should be representative of Wilderness locations, especially during downslope flow conditions that bring Wilderness air towards the monitor via the Rio Bonito and Little Creek drainages.

Figure 4-12: White Mountain Wilderness



4.3 New Mexico Regional Haze Monitoring Commitments

The State of New Mexico will rely upon a Regional Planning Organization's provision of adequate technical support to meet its commitment to conduct the analyses necessary to meet the requirements of 51.308(d)(4).

The State of New Mexico will depend on the Inter-Agency Monitoring of PROtected Visual Environments (IMPROVE) monitoring program to collect and report aerosol monitoring data for long-term reasonable progress tracking as specified in 40 CFR 51.308(d)(4) of the Regional Haze Rule (RHR). Because the RHR is a long-term tracking program with an implementation period nominally set for 60 years, NMED expects that the IMPROVE program will provide data based on the following goals:

1. Maintain a stable configuration of the individual monitors and sampling sites, and stability in network operations for the purpose of continuity in tracking reasonable progress trends;

2. Assure sufficient data capture at each site of all visibility-impairing species;
3. Comply with EPA quality control and assurance requirements; and
4. Prepare and disseminate periodic reports on IMPROVE program operations.

The State of New Mexico is relying on the IMPROVE program to meet these monitoring operation and data collection goals, with the fundamental assumption that network data collection operations will not change, or if changed, will remain directly comparable to those operated by the IMPROVE program during the 2000-2004 RHR baseline period. Technical analyses and reasonable progress goals in this Implementation Plan for Regional Haze are based on data from these sites. As such, the State will ask that the IMPROVE program identify potential issues affecting RHR implementation trends and/or notify the State before changes in the IMPROVE program affecting a RHR tracking site are made.

Further, the State of New Mexico notes that the human resources to operate these monitors are provided by Federal Land Management agencies. Beyond that in-kind contribution, resources for operation and sample analysis of a complete and representative monitoring network of these long-term reasonable progress tracking sites by the IMPROVE program are a collaborative responsibility of EPA, states, tribes, and FLMs and the IMPROVE program steering committee. The State of New Mexico will collaborate with the EPA, FLMs, other states, tribes, and the IMPROVE committee to assure adequate and representative data collection and reporting by the IMPROVE program.

CHAPTER 5: TECHNICAL INFORMATION AND DATA

This chapter describes the information relied upon in developing this plan. It describes the Western Regional Air Partnership (WRAP), committees and workgroups of the WRAP, and work products developed by WRAP that were used to develop this plan.

5.1 WRAP and Technical Support

The WRAP is a voluntary organization of western States, Tribes and federal agencies. It was formed in 1997 as the successor to the Grand Canyon Visibility Transport Commission (GCVTC). It is a regional planning organization that provides assistance to western States to aid in the preparation of regional haze plans. The WRAP also implements regional planning processes to improve visibility in all Western Class I areas by providing the technical and policy tools needed by States and Tribes to implement the federal regional haze rule.

The States that have been involved with WRAP include: Alaska, Arizona, California, Colorado, Idaho, Montana, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming. Tribal board members included Campo Band of Kumeyaay Indians, Confederated Salish and Kootenai Tribes, Cortina Indian Rancheria, Hopi Tribe, Hualapai Nation of the Grand Canyon, Native Village of Shungnak, Nez Perce Tribe, Northern Cheyenne Tribe, Pueblo of Acoma, Pueblo of San Felipe, and Shoshone-Bannock Tribes of Fort Hall. Representatives of other tribes participate on WRAP forums and committees. Participation is encouraged throughout the Western states and tribes. Federal participants are the Department of the Interior (National Park Service and Fish & Wildlife Service,) the Department of Agriculture (Forest Service), and the Environmental Protection Agency (EPA).

5.1.1 WRAP Committees and Workgroups

The following is a description of WRAP Committees and Workgroups that were operational during the development of the tools and information used in this SIP:

<u>Initiatives Oversight Committee</u>
The Initiatives Oversight Committee (IOC) is responsible for establishing and overseeing the work of forums that develop policies and programs to improve and protect our air quality. IOC forums are:

The Air Pollution Prevention Forum
The Air Pollution Prevention Forum is tasked with developing energy conservation initiatives and programs to expand the use of renewable energy sources, and encourage use of energy sources that minimize air pollution.

The Economic Analysis Forum
This Forum assisted with studies to evaluate the economic effects of air quality programs developed by the WRAP to diminish haze throughout the West.

The Forum on Emissions In/Near Class I Areas
This Forum looked at pollution sources in and near federally mandated Class I areas to determine their impact on visibility in those areas, and at mitigation and outreach options.

The Mobile Sources Forum
This Forum addressed the impact of motor vehicles and other mobile sources of pollution. For example, the Forum developed a plan presented to the WRAP that suggested a revision of U.S. Environmental Protection Agency rules regarding the production of low-sulfur fuel by small refineries. The Forum also recommended reforms for off-road emissions and diesel fuel.

<u>Technical Oversight Committee</u>
The Technical Oversight Committee's (TOC's) tasks are to identify and manage technical issues and to establish and oversee the work of forums and work groups that are developing and analyzing, scientific information related to air quality planning in the West. TOC forums and work groups include:

The Air Quality Modeling Forum
This Forum identifies, evaluates the performance of, and applies mathematical air quality models, which can be used to quantify the benefits of various air quality programs for reducing haze in the western United States.

The Ambient Monitoring and Reporting Forum
This Forum oversees the collection, use, and reporting of ambient air quality and meteorological monitoring data as needed to further the WRAP's overall goals.

The Emissions Forum
This Forum is developing the first comprehensive inventory of haze-causing air emissions in the West, including a comprehensive emissions tracking and forecasting system. The forum also monitors trends in actual emissions and forecasts emissions reductions anticipated from current regulations and alternative control strategies.

Attribution of Haze Work Group
This Work Group is preparing guidance for States and tribes regarding both the types of pollution emitters and the regions in which pollutants contribute to visibility impairment in national parks and other Class I areas. Three state and three tribal representatives form the work group along with all members of the Technical Oversight Committee and one representative each from the Initiatives Oversight Committee, the technical and joint forums and the Tribal Data Development Work Group.

The Tribal Data Development Work Group
This Work Group is identifying gaps in air quality data for tribal lands and working with tribes to collect that data. While some tribes have adequate staff and equipment for such an undertaking, many lack the manpower and technical resources to accomplish the work on their own. This Work Group is providing help by both enhancing the tribes' ability to collect the necessary data and establishing an organized way to standardize and catalogue the information for subsequent analysis.

<u>WRAP Working Committees and Forums</u>
Implementation Work Group
The purpose of this work group is to bring together State and tribal staff involved in the development of regional haze plans, to meet the requirements of the Regional Haze Rule. This work group discusses the major strategies associated with State and tribal regional haze plans, issues associated with plan development and rule interpretation, and coordination and consultation between states, tribes, EPA, and the FLMs on these topics. State representatives on this work group are the primary regional haze plan writers.

Joint Technical and Policy Forums
Joint Forums address both technical issues and policy. Both the TOC and the IOC have oversight.

The Dust Emissions Joint Forum
This Dust Emissions Joint Forum (DEJF) seeks to improve the methods for estimating dust emissions and their inputs into air quality models. The Forum also is examining the extent of dust impacts and strategies to reduce dust emissions.

The Fire Emissions Joint Forum (FEJF)
The Grand Canyon Commission confirmed that forest fires contribute significantly to visibility problems and that the use of prescribed fire is expected to increase as a forest management tool. The FEJF is developing measures to reduce the effects of emissions from prescribed fires and is examining emissions from all kinds of fire, whether ignited naturally or by humans. The Forum is considering public health and nuisance effects as well as visibility impacts. It will develop a tracking system for fire emissions and management techniques to minimize emissions. This Forum is working to coordinate with and gain the full cooperation of federal, tribal, State, and local agencies as well as private landowners, forest managers, and the agriculture community.

The Stationary Sources Joint Forum
The Stationary Sources Joint Forum (SSJF), formerly the Market Trading Forum, developed the details of an emissions trading program to achieve cost-effective reductions from industrial sources of sulfur dioxide. The Forum first set emission milestones for sulfur dioxide between now and 2018 and then designed a trading program to be triggered if these emission targets are exceeded. The Forum is now examining other industrial source emissions, such as oxides of nitrogen and particulate matter, and is assisting WRAP members in compliance with the stationary source provisions of the regional haze rule.

5.1.2 WRAP Technical Support System

The primary purpose of the WRAP TSS is to provide key summary analytical results and methods documentation for the required technical elements of the Regional Haze Rule, to support the preparation, completion, evaluation, and implementation of the Regional Haze Implementation Plans to improve visibility in Class I areas. The TSS provides technical results prepared using a regional approach, to include summaries and analysis of the comprehensive datasets used to identify the sources and regions contributing to regional haze in the WRAP region.

The secondary purpose of the TSS is to be the one-stop-shop for access, visualization, analysis, and retrieval of the technical data and regional analytical results prepared by WRAP Forums and Workgroups in support of regional haze planning in the West. The TSS specifically summarizes results and consolidates information about air quality monitoring, meteorological and receptor modeling data analyses, emissions inventories and models, and gridded air quality/visibility regional modeling simulations. These copious and diverse data are integrated for application to air quality planning purposes by prioritizing and refining key information and results into explanatory tools. The WRAP TSS can be found at http://vista.cira.colostate.edu/tss/.

CHAPTER 6: NEW MEXICO CLASS ONE AREA BASELINE, NATURAL CONDITIONS, AND UNIFORM RATE OF PROGRESS

6.1 Baseline and Current Visibility Conditions

EPA requires the calculation of baseline conditions [40 CFR 51.308(d)(2)(i) and (ii)]. The baseline condition for each New Mexico Class I area is defined as the five year average (annual values for 2000-2004) of IMPROVE monitoring data (expressed in deciviews) for the most impaired (20% worst) days and the least impaired (20% best) days. For this regional haze SIP submittal, the baseline conditions are the reference point against which visibility improvement is tracked. For subsequent regional haze SIP updates (in the year 2018 and every 10 years thereafter), baseline conditions are used to calculate progress from the beginning of the regional haze program.

Current conditions for the best and worst days are calculated from a multiyear average, based on the most recent five-year of monitored data available [40 CFR 51.308(f)(1)]. This value will be revised at the time of each periodic SIP revision and will be used to illustrate the following: 1) the amount of progress made since the last SIP revision, and 2) the amount of progress made from the baseline period of the program.

New Mexico has established baseline visibility for the best and worst visibility days for each Class I area using on-site data from the IMPROVE monitoring sites. A five-year average (2000-2004) was calculated for each value (both best and worst). The calculations were made in accordance with 40 CFR 51.308(d)(2) and EPA's *Guidance for Tracking Progress Under the Regional Haze Rule* (EPA-454/B-03-004, September 2003). The IMPROVE II algorithm as described in Section 4.1 has been utilized for the calculation of Uniform Rate of Progress (URP) glide slopes for all Class I areas. Table 6-1 shows the baseline conditions for each IMPROVE monitor site in New Mexico.

Table 6-1: Baseline Conditions for 20% Worst Days

Mandatory Federal Class I Area	IMPROVE Monitor	Baseline Conditions for 20% Worst Visibility Days (dv)
Bandelier Wilderness	BAND1	12.22
Bosque del Apache NWR	BOAP1	13.8
Carlsbad Caverns NP	GUMO1	17.19
Gila Wilderness	GICL1	13.11
Pecos Wilderness, Wheeler Peak Wilderness	WHPE1	10.41
Salt Creek Wilderness	SACR1	18.03
White Mountain Wilderness	WHIT1	13.7

Table 6-2: Baseline Conditions for 20% Best Days

Mandatory Federal Class I Area	IMPROVE Monitor	Baseline Conditions for 20% Best Visibility Days (dv)
Bandelier Wilderness	BAND1	4.95
Bosque del Apache NWR	BOAP1	6.28
Carlsbad Caverns NP	GUMO1	5.95
Gila Wilderness	GICL1	3.31
Pecos Wilderness, Wheeler Peak Wilderness	WHPE1	1.22
Salt Creek Wilderness	SACR1	7.84
White Mountain Wilderness	WHIT1	3.55

6.3 Monitoring Data

Visibility impairing pollutants both reflect and absorb light in the atmosphere, thereby affecting the clarity of objects viewed at a distance by the human eye. Each haze pollutant has a different light extinction capability. In addition, relative humidity changes the effective light extinction of both nitrates and sulfates. Since haze pollutants can be present in varying amounts at different locations throughout the year, aerosol measurements of each visibility impairing pollutant are made every three days at the IMPROVE monitors located in or near each Class I area.

In addition to extinction, the Regional Haze Rule requires another metric for analyzing visibility impairment, known as the "Haze Index", which is based on the smallest unit of uniform visibility changes that can be perceived by the human eye. The unit of measure of the deciview (dv).

The haze pollutants reported by the IMPROVE monitoring program are sulfates, nitrates, organic carbon, elemental carbon, fine soil, and coarse mass. Summary data in Chapter 12 are provided for the worst and best days for baseline conditions from the eight IMPROVE monitors for the six haze pollutants.

6.4 Natural Visibility Conditions

The natural condition for each Class I area represents the visibility goal expressed in deciviews for the 20% worst visibility days and the 20% best visibility days that would exist if there were no naturally or anthropogenic impairment. The 20% worst days natural conditions correspond to the visibility goals for each Class I area to be reached by 2064 [40 CFR 51.308(d)(iii)].

Table 6-3 provides the 2064 natural conditions goal in deciviews for each New Mexico Class I area. The natural conditions estimates were calculated consistent with EPA's *Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule* (EPA-454/B-03-005, September 2003). The natural conditions goal can be adjusted as new visibility information becomes available.

Table 6-3: 2064 Natural Conditions Goal for 20% Worst Days

Mandatory Federal Class I Area	IMPROVE Monitor	2064 Natural Conditions for 20% Worst Visibility Days (dv)
Bandelier Wilderness	BAND1	6.26
Bosque del Apache NWR	BOAP1	6.73
Carlsbad Caverns NP	GUMO1	6.65
Gila Wilderness	GICL1	6.66
Pecos Wilderness, Wheeler Peak Wilderness	WHPE1	6.08
Salt Creek Wilderness	SACR1	6.81
White Mountain Wilderness	WHIT1	6.8

6.5 Uniform Progress

For the 20% worst days, uniform progress for each Class I area is the calculation of a URP goal per year to achieve natural conditions in 60 years [40 CFR 51.308(d)(1)(i)(B)]. In this SIP submittal, the first benchmark is the 2018 deciview level based on the uniform rate of progress (URP) applied to the first fourteen years of the program. This is also shown in Table 6-3 in the column titled "2018 URP Goal".

For the 20% worst days, the uniform rate of progress (URP) in deciviews per year (i.e., slope of the glide path) is determined by the following equation:

URP = [Baseline Condition – Natural Condition]/60 years

Multiplying the URP by the number of years in the first planning period calculates the uniform progress needed by 2018 in order to be on the glidepath towards achieving the 2064 natural conditions goal.

2018 UPG = [URP] x [14 years]

The first planning period spans 14 years, which includes the four years between the end of the baseline period and the SIP submittal plus the standard 10 year planning period for the subsequent SIP revisions.

More detailed information on the 20% worst visibility days along with the glide slope associated with each Class I area can be found in Chapter 9. The calculations are consistent with EPA's *Guidance for Setting Reasonable Progress Goals Under the Regional Haze Rule* (June 1, 2007).

For the 20% best visibility days at each Class I area, the State must ensure no degradation in visibility for the least impaired days over the same period. WRAP modeling predicts visibility degradation at Carlsbad Caverns National Park for the 20% best days. However, Figure 6-1 shows that visibility is actually improving on the best days from 2005 through 2009. The over-prediction for area sources is likely responsible for this modeled projection of worsening visibility on the best days.

Figure 6-1: Visibility in Deciviews, Best Days, Carlsbad Caverns National Park

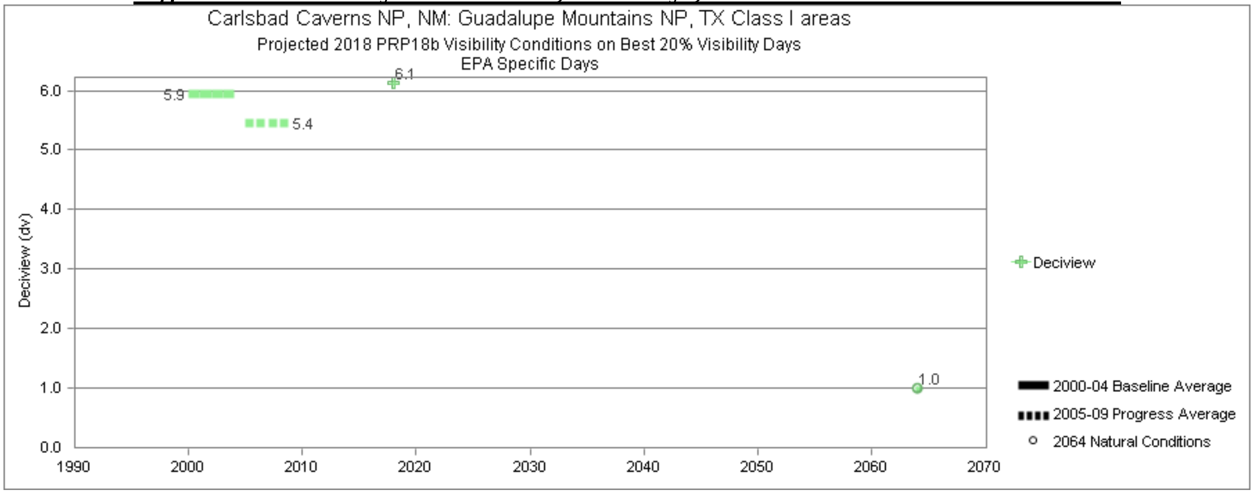


Table 6-4 shows the 2018 URP for the 20% worst days and the baseline that must not be exceeded over the years in order to maintain the best days. As with natural conditions, the URP can be adjusted as new visibility information becomes available.

Table 6-4: Summary of Best and Worst Visibility Days for New Mexico Class I Areas

	20% Worst Days Visibility			20% Best Days Visibility		
New Mexico Class I Area	**Worst Days Baseline (dv)**	**2018 URP Goal (dv)**	**2018 Projected Visibility (dv)**	**Best Days Baseline (dv)**	**2018 Projected Visibility (dv)**	**2018 Projection less than Baseline?**
Bandelier W	12.22	10.83	11.9	4.95	4.89	Y
Bosque del Apache NWR	18.03	15.41	17.33	7.84	7.43	Y
Carlsbad Caverns NP	17.19	14.73	16.93	5.95	6.14	N
Gila W	13.11	11.61	12.99 [~~15.17~~]	3.31	3.2 [~~3.45~~]	Y [~~N~~]
Pecos W, Wheeler Peak W	10.41	9.40	10.23	1.22	1.13	Y
Salt Creek W	18.03	15.41	17.33	7.84	7.43	Y
White Mountain W	13.7	12.09	13.27	3.55	3.42	Y

CHAPTER 7: VISIBILITY IMPAIRMENT AT NEW MEXICO CLASS I AREAS

This chapter provides a summary of visibility impairment at the Class I areas covered in this plan. Data was gathered from the IMPROVE monitoring sites for each Class I area. Each section includes a summary of the pollutants causing visibility impairment and a summary of the visibility improvement needed from baseline (2000-2004) to the 2018 URP goal, and to the 2064 natural condition goal.

The visibility impairing pollutants described in this section include: ammonium nitrate, ammonium sulfate, elemental carbon, organic mass carbon, coarse mass, fine soil, and sea salt. Table 7-1 lists the pollutants, their abbreviations, and associated colors. Figure 7-1 and Figure 7-2 show, for the worst days and best days respectively, the impairment at each of the Class I areas during the baseline period due toeach visibility impairing pollutant.

Table 7-1: IMPROVE Monitor Aerosol Composition

Color	Pollutant	IMPROVE Abbreviation
(red)	Ammonium Nitrate (NO3)	ammno3f_bext
(yellow)	Ammonium Sulfate (SO4)	ammso4f_bext
(black)	EC (Elemental Carbon)	ecf_bext
(green)	OMC (Organic Mass Carbon)	omcf_bext
(light gray)	CM (Coarse Mass)	cm_bext
(brown)	Soil (Fine Soil)	soilf_bext
(cyan)	Sea Salt	seasalt_bext

Figure 7-1: Reconstructed Aerosol Components for 20% Worst Days (2000-2004)

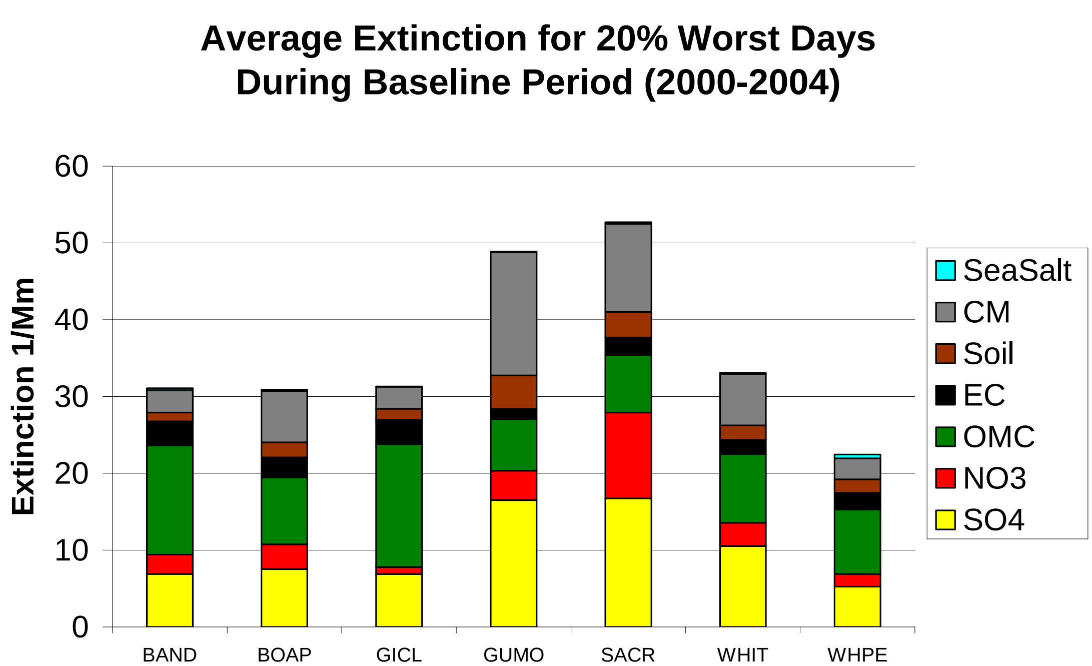
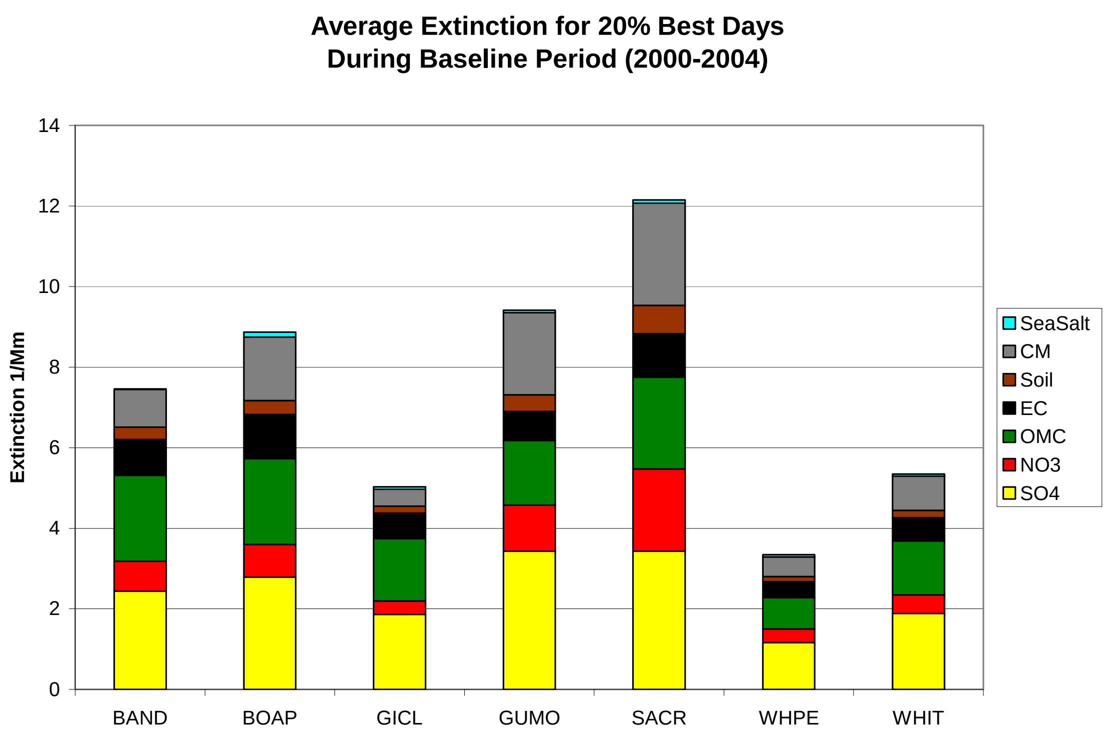


Figure 7-2: Reconstructed Aerosol Components for 20% Best Days (2000-2004)



7.1 Bandelier Wilderness

The pollutants affecting visibility on the worst days at Bandelier Wilderness (as represented by BAND1 IMPROVE monitor) are primarily sulfate, organic carbon, elemental carbon and coarse mass. Best days are dominated by sulfates, followed by organic carbon then coarse mass and elemental carbon. The average contributions are shown in Figure 7-3 for baseline conditions.

Figure 7-3: Average Species Contribution to 20% Best and Worst Days Baseline

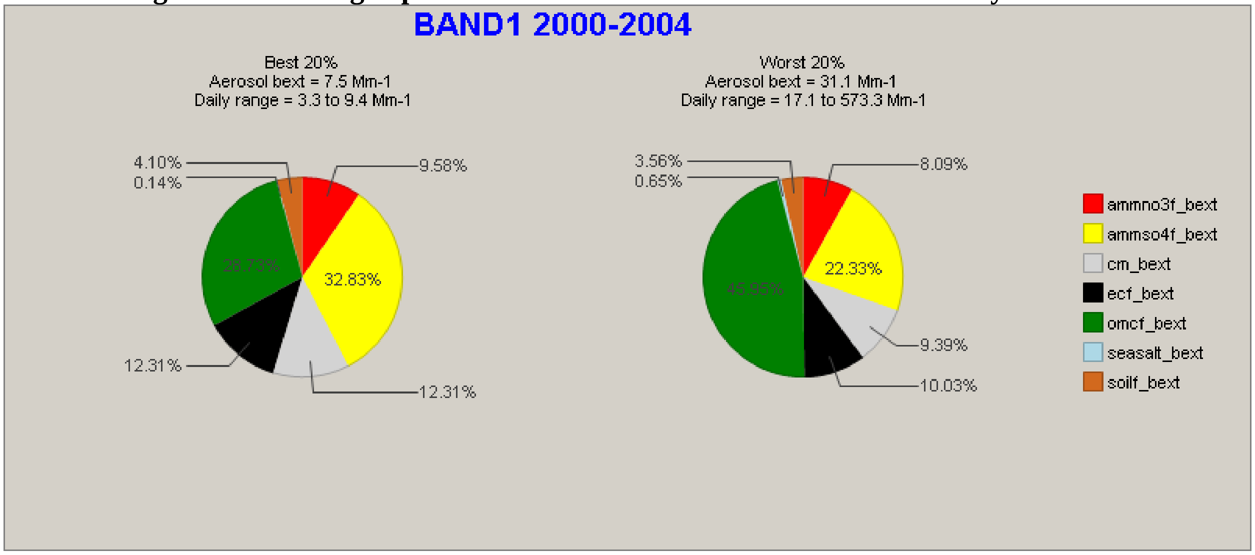


Figure 7-4 shows the light extinction for all haze-impairing pollutants over the baseline period. Extinction due to sulfate varies seasonally, increasing during the summer months. A spike in organic carbon occurred in May of 2000, which correlates with the Cerro Grande Fire which started in the Bandelier Wilderness. Sources of coarse mass vary throughout the year while nitrate appear to increase in the winter months (November through February).

Figure 7-4: Monthly Average Species Variation for All Sampled Days During the Baseline Period

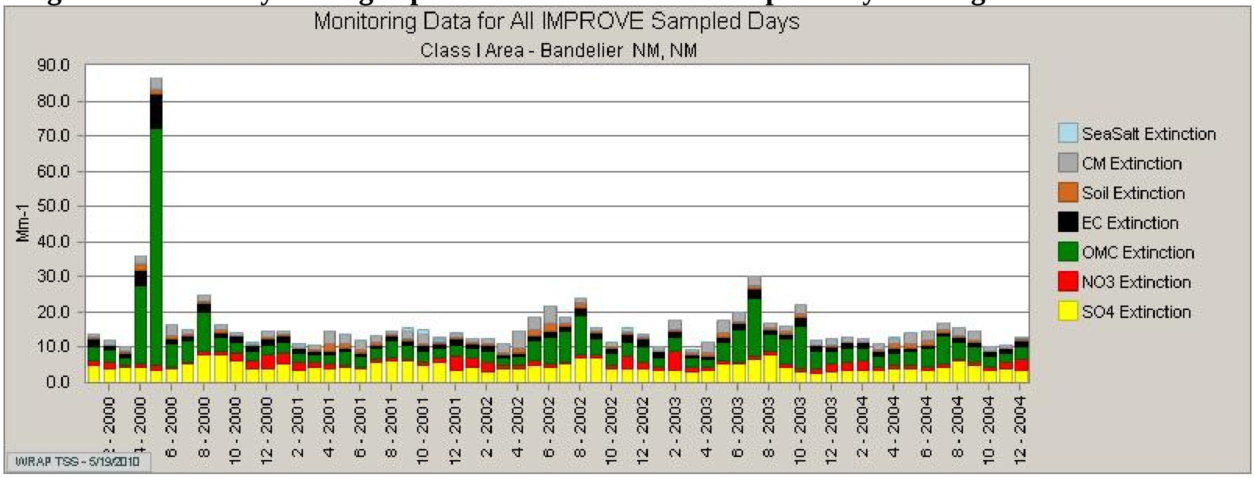
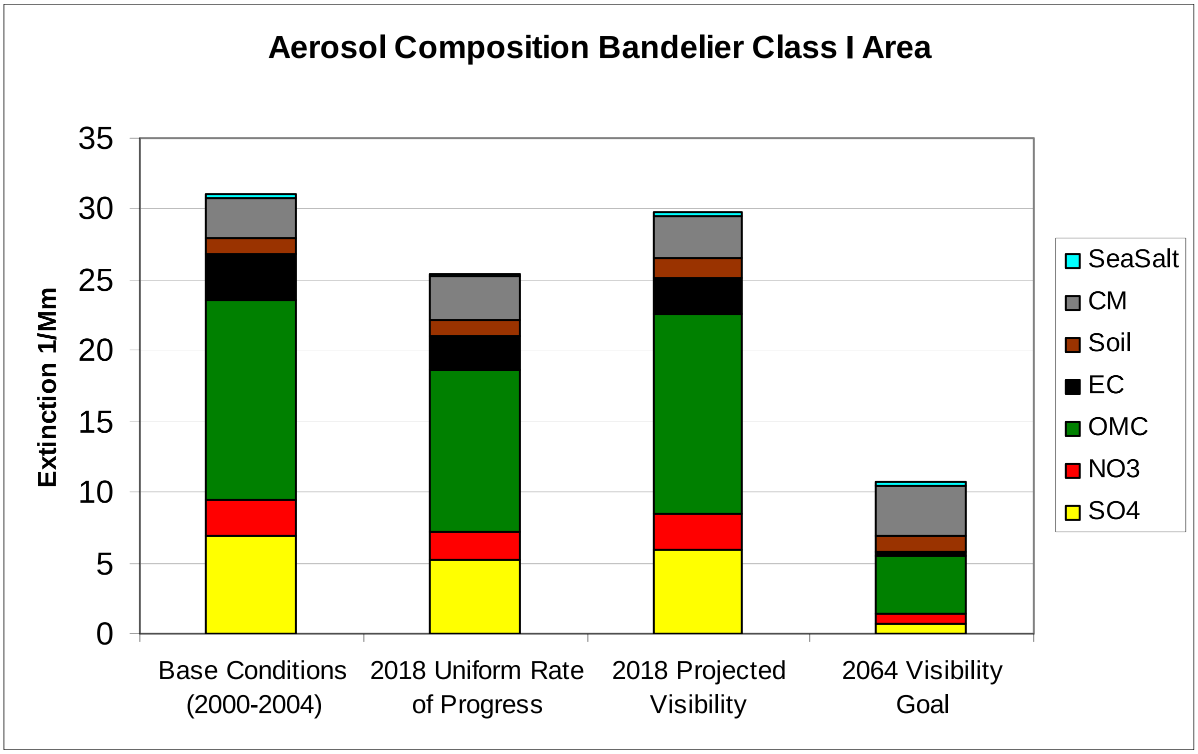


Figure 7-5 shows the light extinction for the baseline, the URP, the 2018 projected visibility, and natural conditions for all aerosol pollutants. The projected visibility condition, based on modeling, does not meet the 2018 URP.

Figure 7-5: Baseline Worst Day Aerosol Composition Compared to 2018 URP, 2018 Projected Visibility and 2064 Natural Conditions Goal



7.2 Bosque del Apache National Wildlife Refuge

Figure 7-6 shows that over the baseline period for best and worst days, the primary contributors to impairment are sulfate, organic carbon, and coarse mass. The visibility on best days has more impairment due to sulfate, whereas on worst days, organic carbon is the primary pollutant.

Figure 7-6: Average Species Contribution to 20% Best and Worst Days Baseline

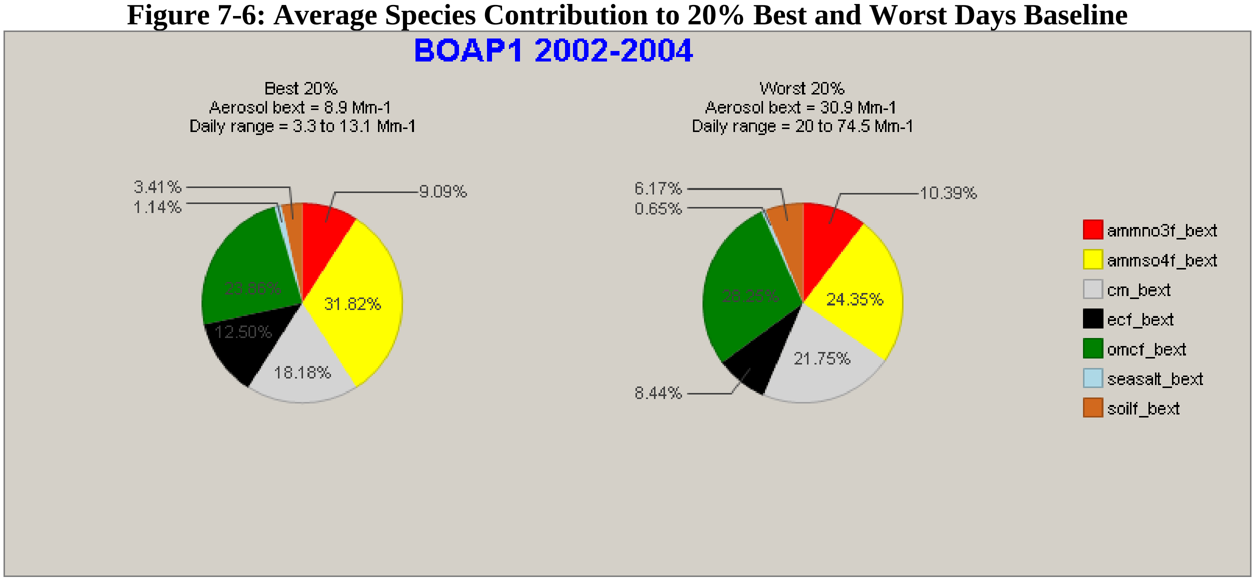


Figure 7-7 shows the species variation for all IMPROVE sampled days over the baseline period. Light extinction due to sulfate and organic carbon varies seasonally, increasing during the summer. There is a spike in organic carbon extinction (6/2002), which is likely due to fire. The Rodeo/Chediski Fire in Arizona started on June 18, 2002, and the Ponil Fire in New Mexico started on June 2, 2002. Nitrate extinction appears to increase during winter months.

Figure 7-7: Monthly Average Species Variation for All Sampled Days during the Baseline Period

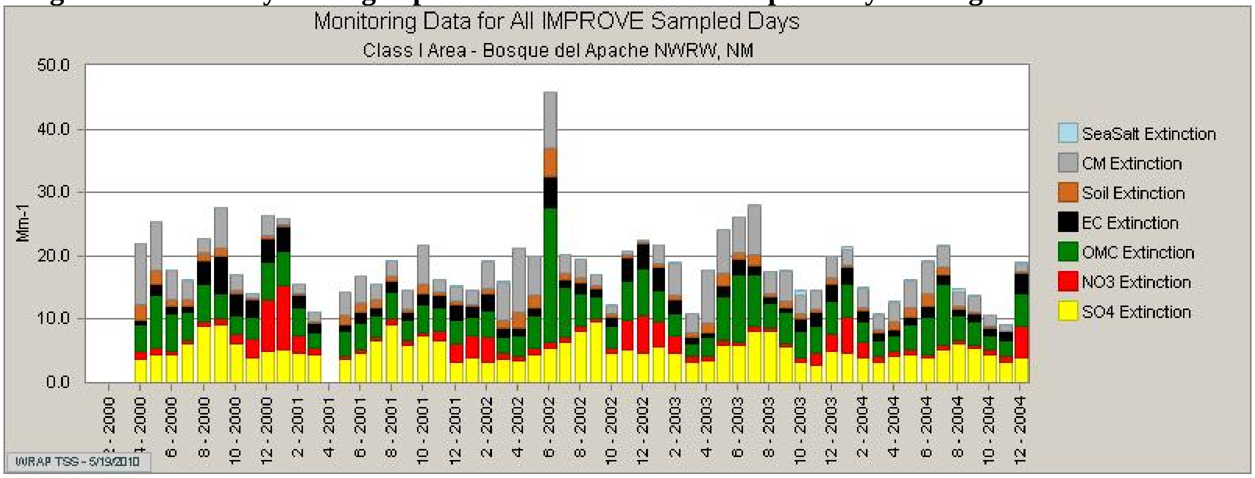
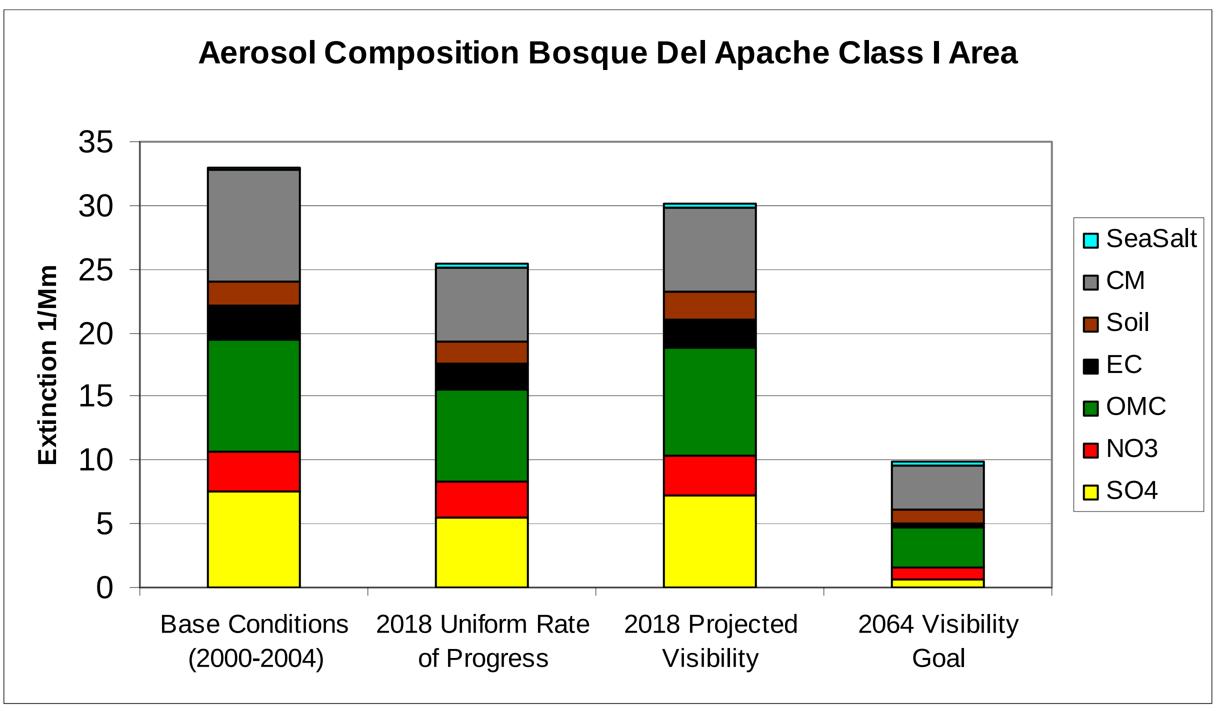


Figure 7-8 shows the light extinction for the baseline, the URP, the 2018 projected visibility, and natural conditions for all aerosol pollutants. The projected visibility condition, based on modeling, does not meet the 2018 URP.

Figure 7-8: Baseline Worst Day Aerosol Composition Compared to 2018 URP, 2018 Projected Visibility and 2064 Natural Conditions Goal



7.3 Carlsbad Caverns National Park

For the 20% best and worst days over the baseline period the primary contributors are sulfate, coarse mass, and organic carbon. Figure 7.9 shows that worst days are dominated by sulfate and coarse mass with a lesser contribution from organic carbon. The percentage contribution changes slightly on best days where the light extinction due to coarse mass is reduced, but sulfate and elemental carbon have a higher percentage.

Figure 7-9: Average Species Contribution to 20% Best and Worst Days Baseline

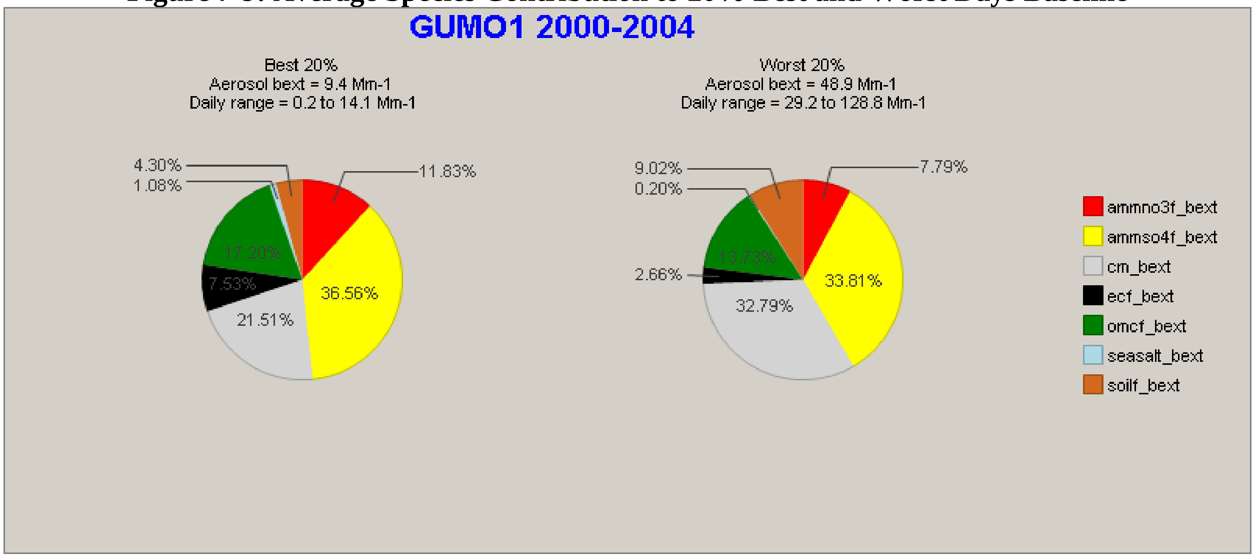


Figure 7-10 shows that sulfate and coarse mass increase during the summer. Extinction due to nitrates increased during the winter.

Figure 7-10: Monthly Average Species Variation for All Sampled Days during the Baseline Period

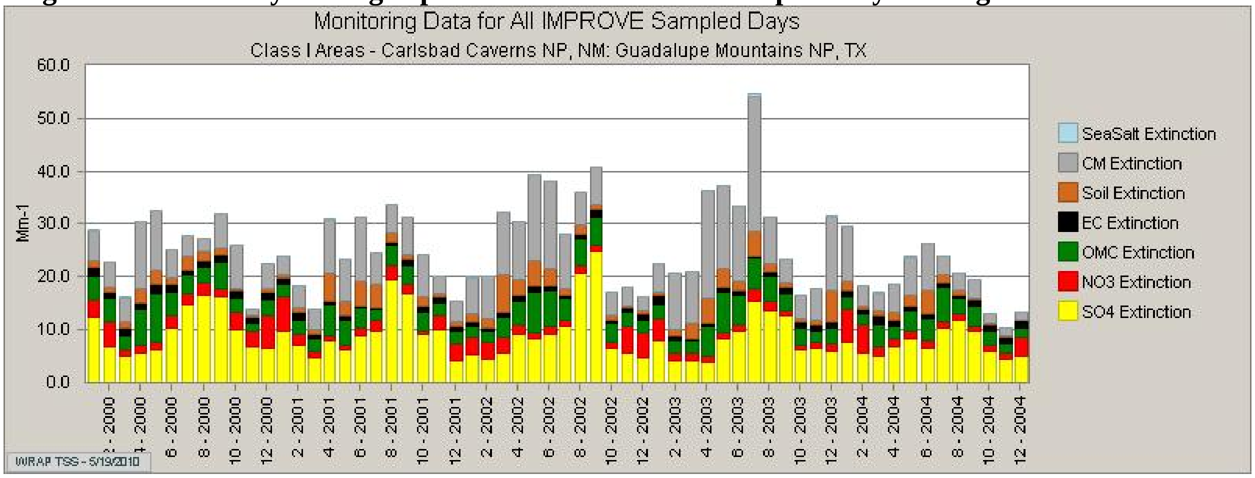
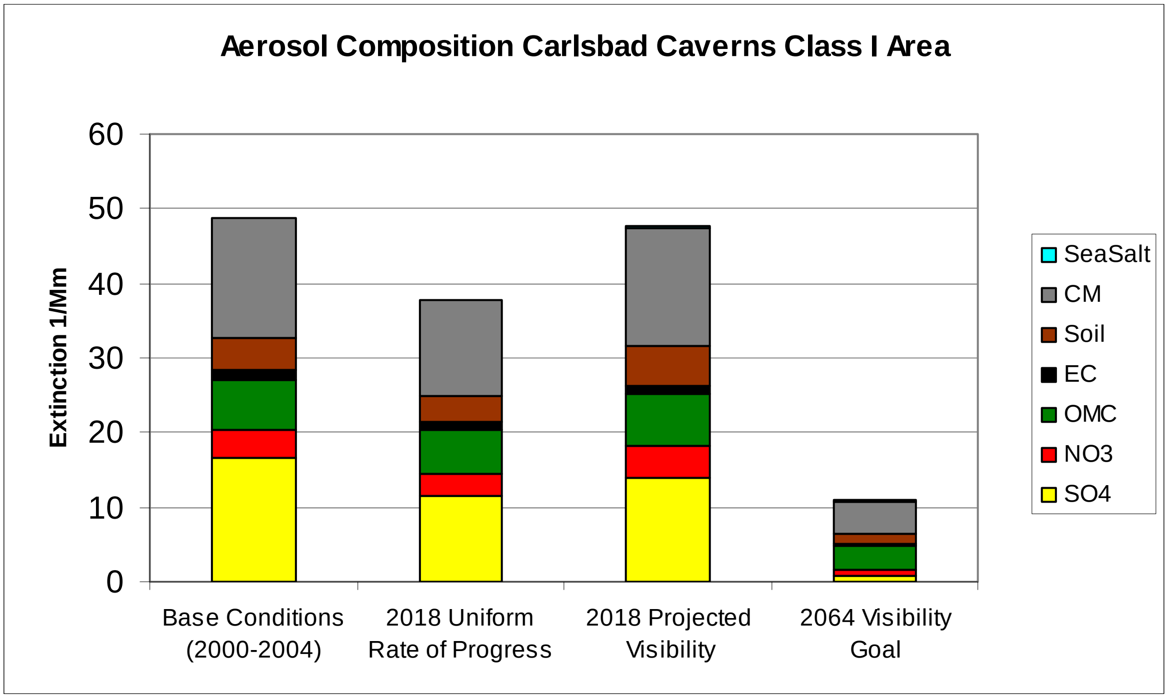


Figure 7-11 shows the light extinction for the baseline, the URP, the 2018 projected visibility, and natural conditions for all aerosol pollutants. The projected visibility condition, based on modeling, does not meet the 2018 URP.

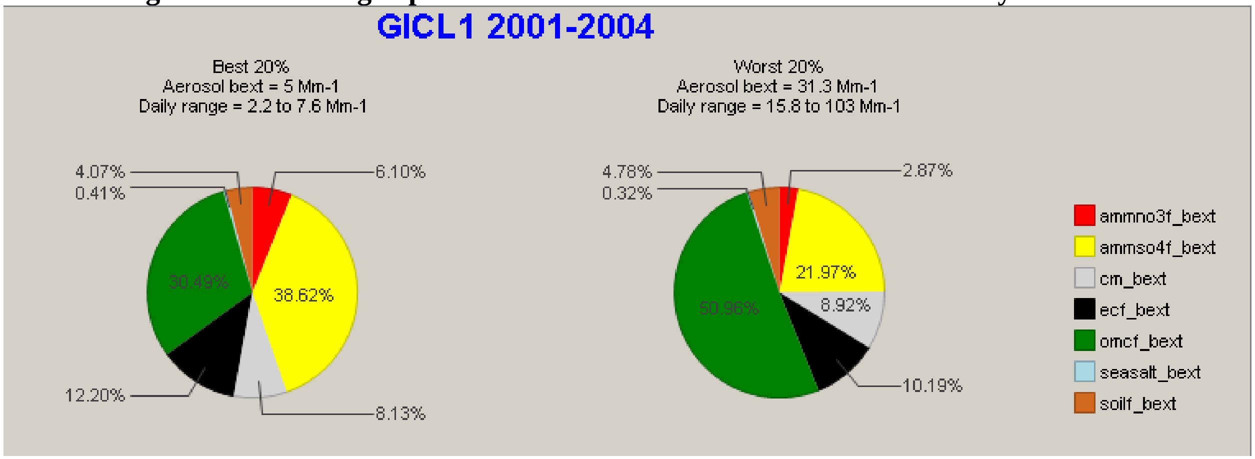
Figure 7-11: Baseline Worst Day Aerosol Composition Compared to 2018 URP, 2018 Projected Visibility and 2064 Natural Conditions Goal



7.4 Gila Wilderness

Figure 7-12 shows that over the baseline period for best and worst days, the primary contributors to impairment are sulfate, organic carbon, and elemental carbon. The visibility on best days has more impairment due to sulfate, whereas on worst days, organic carbon is the primary pollutant.

Figure 7-12: Average Species Contribution to 20% Best and Worst Days Baseline



The average species variation for all sampled days over the baseline period is shown in Figure 7-13. Sulfates increase during the summer months, while nitrates increase during the winter. There are a couple of spikes in light extinction due to nitrates during December 2000 and January 2001. Organic carbon and coarse mass show a slight increase in light extinction during the summer. There are two spikes in organic carbon extinction (summer 2000 and summer 2003), which appear to be due to fire. The year 2000 was a very active fire year, and in 2003 there were a number of wildland fires in the Gila Wilderness. Fires in 2000 include the Sierra Fire and the Bloodgood Fire in the Gila. In 2003, the Aspen Fire in Arizona grew to 84,750 acres, and numerous fires in the Gila were also burning in the same time period.

Figure 7-13: Monthly Average Species Variation for All Sampled Days during the Baseline Period

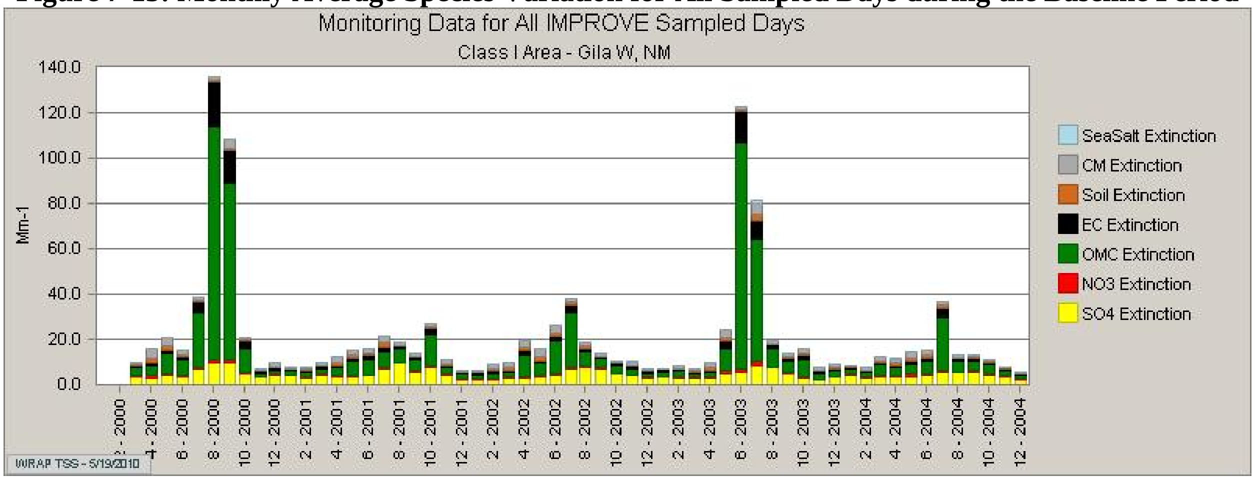
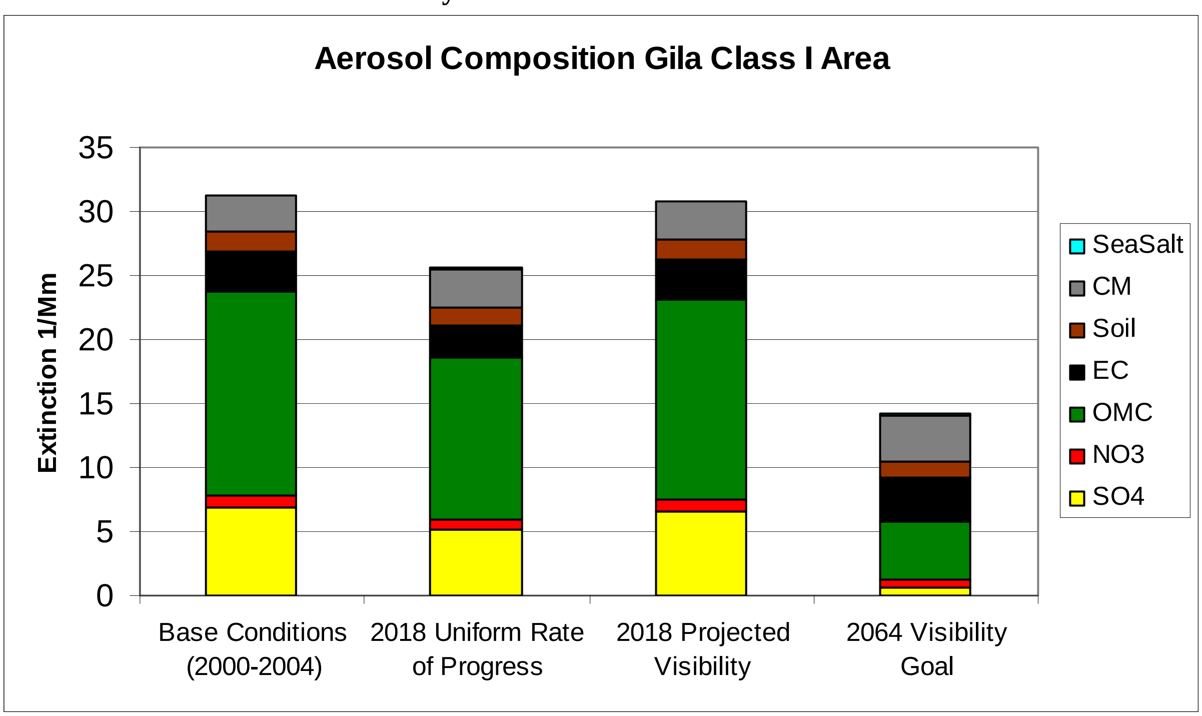


Figure 7-14 shows the light extinction for the baseline, the URP, the 2018 projected visibility, and natural conditions for all aerosol pollutants. The projected visibility condition, based on modeling, does not meet the 2018 URP.

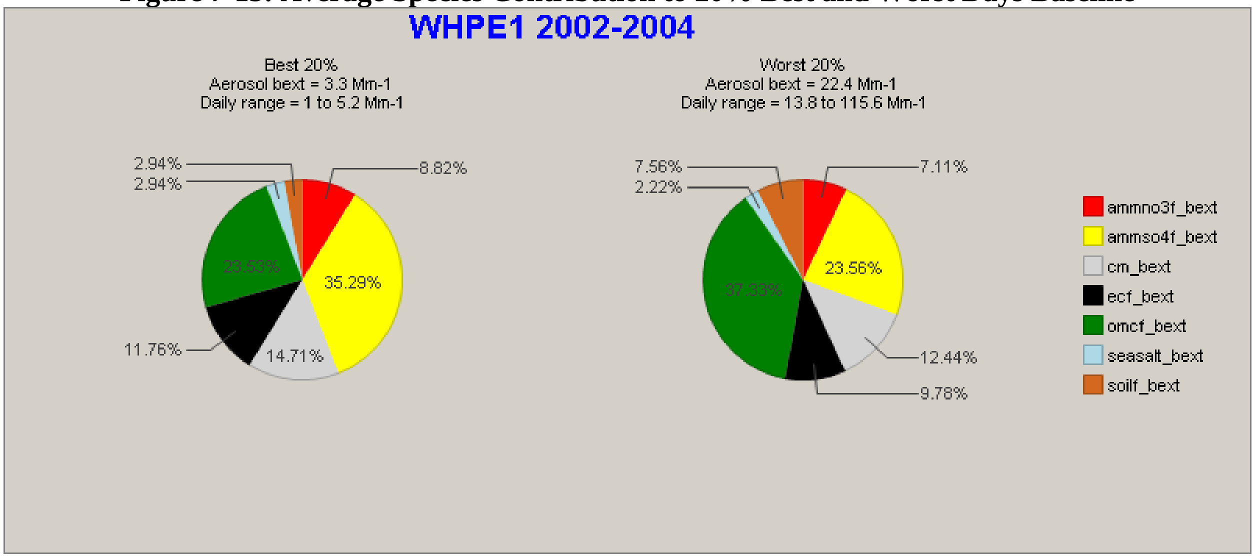
Figure 7-14: Baseline Worst Day Aerosol Composition Compared to 2018 URP, 2018 Projected Visibility and 2064 Natural Conditions Goal



7.5 Pecos Wilderness, Wheeler Peak Wilderness

Figure 7-15 shows that over one-third of the light extinction at the Wheeler Peak IMPROVE monitor is due to organic carbon on worst days. Sulfates are also a large contributor on worst days. Best days on dominated by sulfate, with organic carbon and coarse mass also contributing large percentages.

Figure 7-15: Average Species Contribution to 20% Best and Worst Days Baseline



For all IMPROVE sampled days sulfate, organic carbon, and coarse mass increase during the summer. Organic carbon showed a spike in July 2002. Extinction due to elemental carbon is relatively consistent throughout the year; however there are slight increases during the winter. Fires, especially the Rodeo-Chediski Fire in Arizona, contributed a large spike in extinction in June 2002.

Figure 7-16: Monthly Average Species Variation for All Sampled Days during the Baseline Period

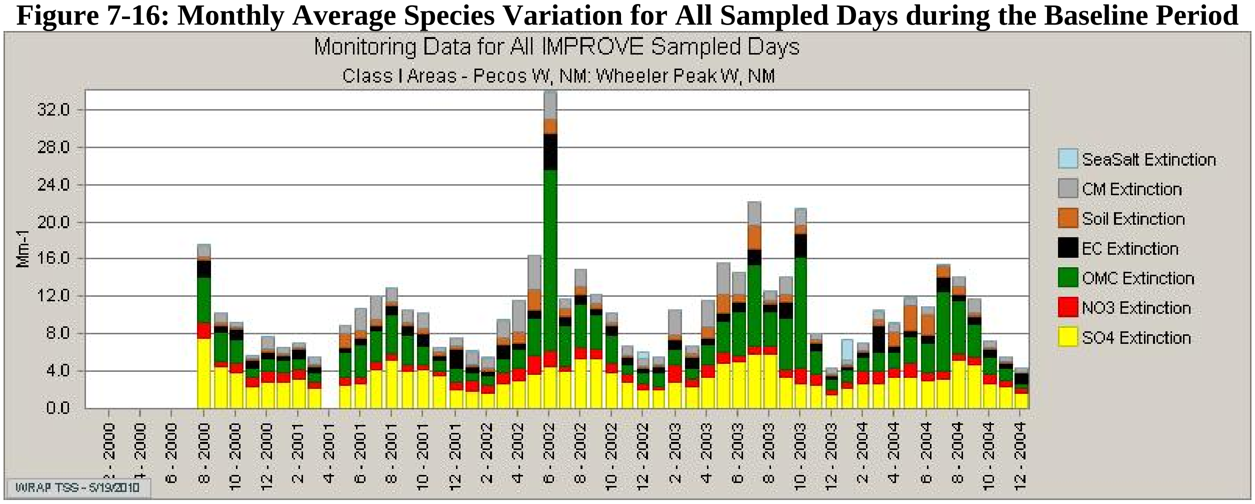
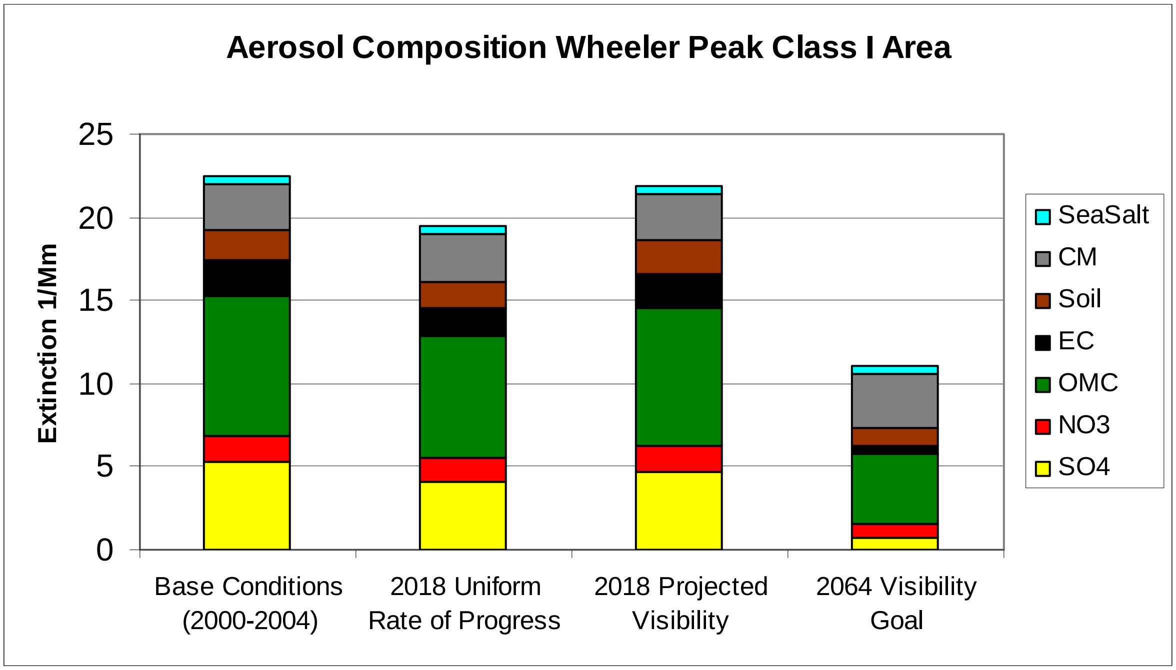


Figure 7-17 shows the light extinction for the baseline, the URP, the 2018 projected visibility, and natural conditions for all aerosol pollutants. The projected visibility condition, based on modeling, does not meet the 2018 URP.

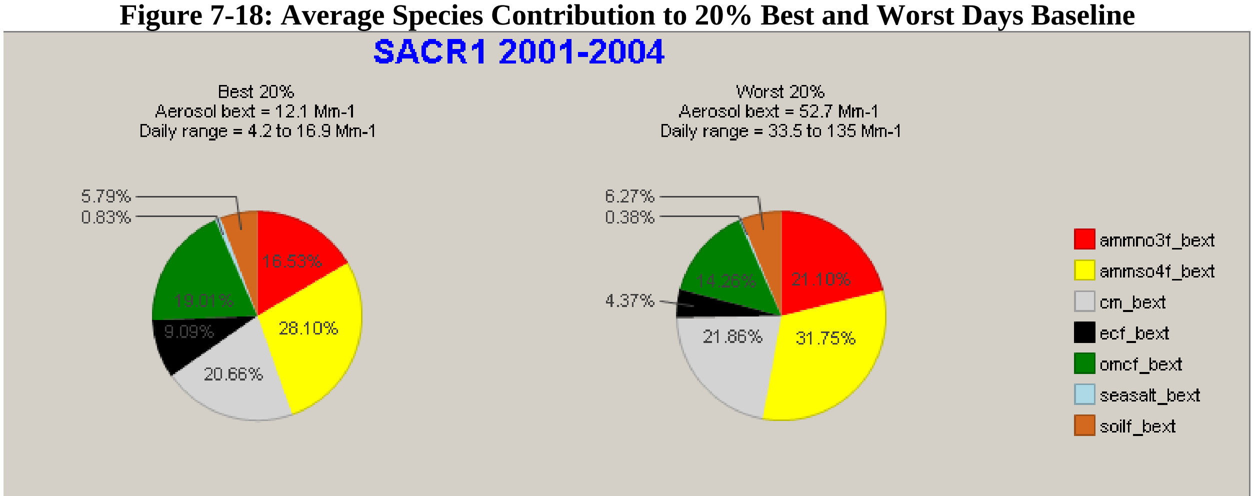
Figure 7-17: Baseline Worst Day Aerosol Composition Compared to 2018 URP, 2018 Projected Visibility and 2064 Natural Conditions Goal



7.6 Salt Creek Wilderness

Figure 7-18 shows that light extinction at the Salt Creek Wilderness is due to a mix of sulfate, nitrate, and coarse mass. Organic carbon is also a large contributor on worst days. Best days on dominated by sulfate, with organic carbon and coarse mass also contributing large percentages.

Figure 7-18: Average Species Contribution to 20% Best and Worst Days Baseline



For all IMPROVE sampled days sulfate, organic carbon, and coarse mass increase during the summer. Extinction due to elemental carbon is relatively consistent throughout the year; however there are slight increases during the winter.

Figure 7-19: Monthly Average Species Variation for All Sampled Days during the Baseline Period

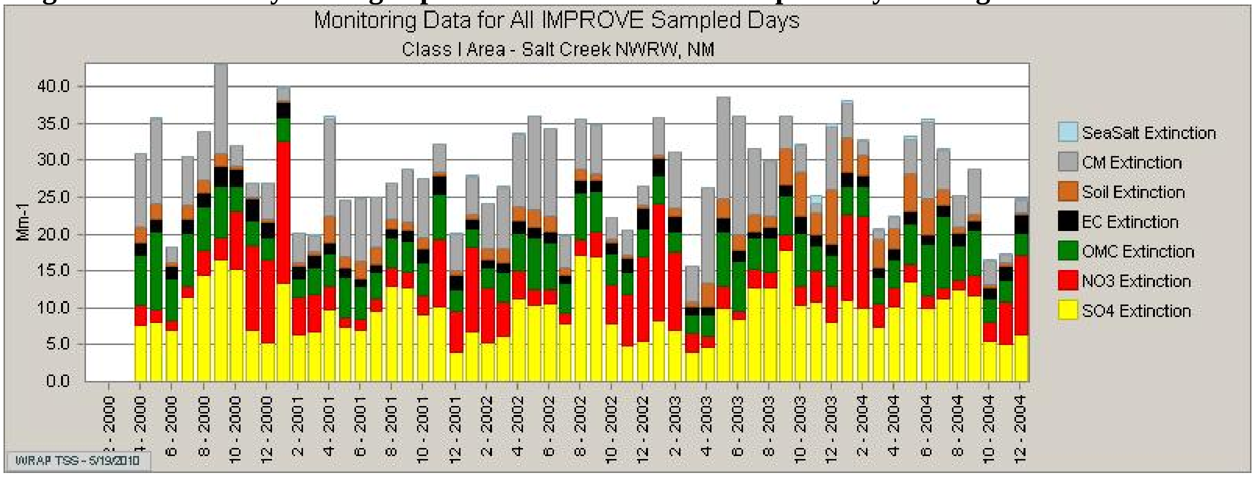
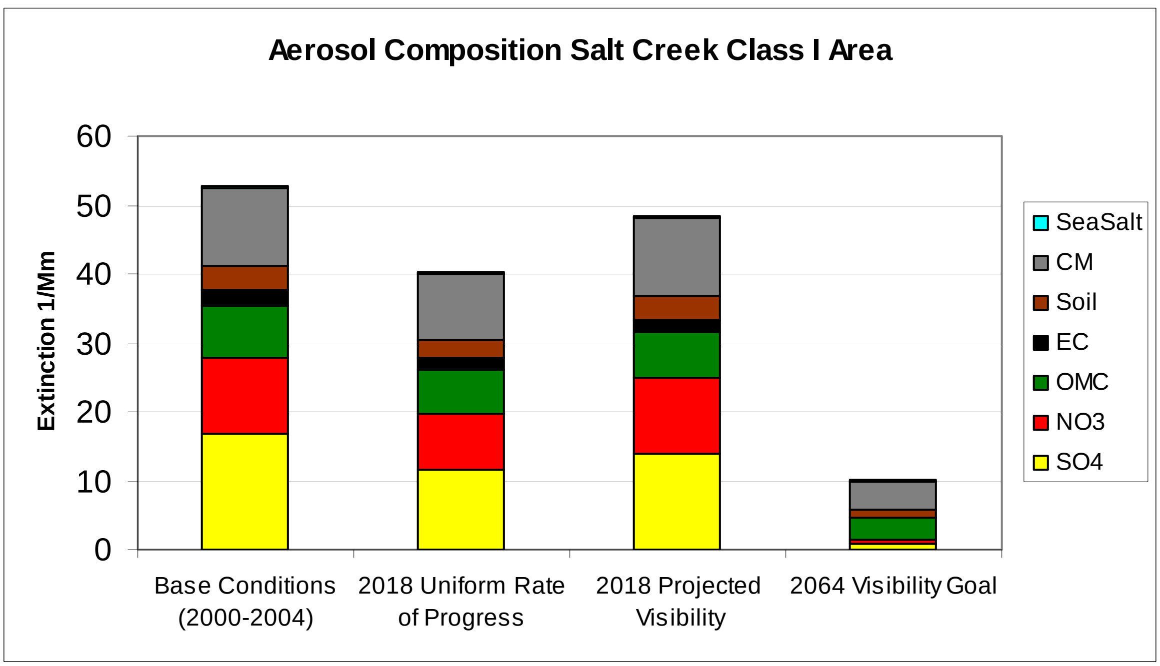


Figure 7-20 shows the light extinction for the baseline, the URP, the 2018 projected visibility, and natural conditions for all aerosol pollutants. The projected visibility condition, based on modeling, does not meet the 2018 URP.

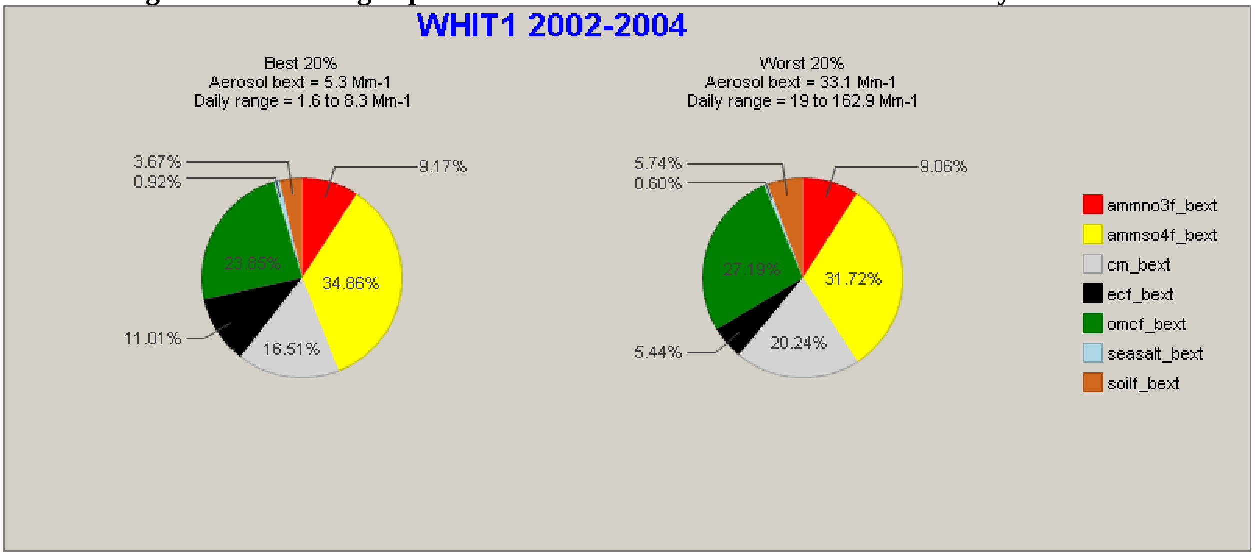
Figure 7-20: Baseline Worst Day Aerosol Composition Compared to 2018 URP, 2018 Projected Visibility and 2064 Natural Conditions Goal



7.7 White Mountain Wilderness

Figure 7-21 shows that about one-third of the light extinction at the White Mountain Wilderness is due to sulfate on worst days. Organic carbon and coarse mass are also large contributors on worst days. Best days are dominated by sulfate, with organic carbon and coarse mass also contributing large percentages.

Figure 7-21: Average Species Contribution to 20% Best and Worst Days Baseline



For all IMPROVE sampled days sulfate, organic carbon, and coarse mass increase during the summer. Organic carbon showed a spike in July 2002. Extinction due to elemental carbon is relatively consistent throughout the year; however there are slight increases during the winter. Fires, especially the Rodeo-Chediski Fire in Arizona, contributed a large spike in extinction in June 2002.

Figure 7-22: Monthly Average Species Variation for All Sampled Days during the Baseline Period

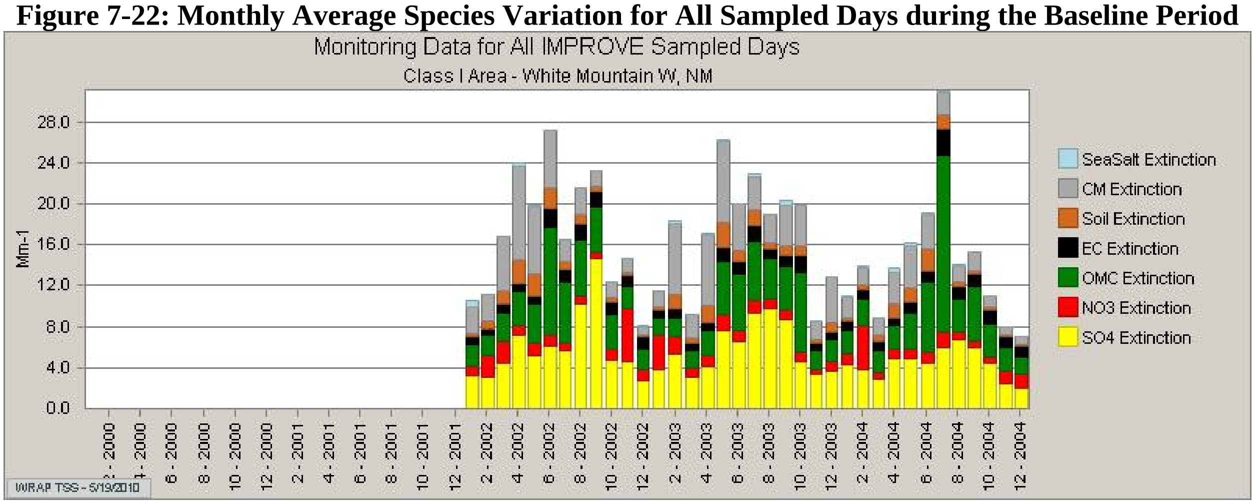
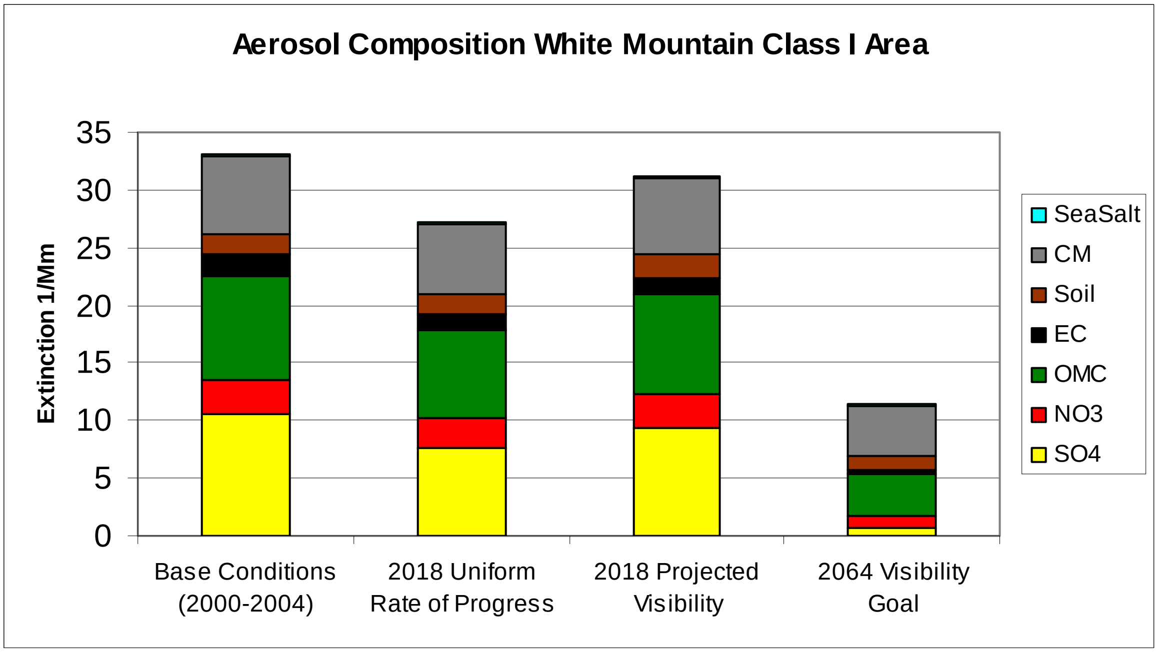


Figure 7-23 shows the light extinction for the baseline, the URP, the 2018 projected visibility, and natural conditions for all aerosol pollutants. The projected visibility condition, based on modeling, does not meet the 2018 URP.

Figure 7-23: Baseline Worst Day Aerosol Composition Compared to 2018 URP, 2018 Projected Visibility and 2064 Natural Conditions Goal



CHAPTER 8: SOURCES OF VISIBILITY IMPAIRMENT

8.1 Anthropogenic Sources

Anthropogenic (human caused) sources of visibility impairment include anything directly attributable to human caused activities that produce emissions of visibility impairing pollutants. Some examples include transportation, agricultural activities, mining operations, and fuel combustion. Anthropogenic visibility conditions are not constant; they vary with changing human activities throughout the years. For purposes of this SIP anthropogenic emissions include those emissions originating within the boundaries of the U.S. but also include international anthropogenic emissions that originate outside of U.S. boundaries and are transported into the country. These include, but are not necessarily limited to, emissions from Canada, Mexico, and maritime shipping emissions from Pacific offshore sources.

Although anthropogenic sources contribute to visibility impairment, international emissions cannot be regulated, controlled, or prevented by the states and are therefore beyond the scope of this planning document. Any reductions in international emissions would likely fall under the purview of the U.S. EPA.

8.2 Natural Sources

Natural sources of visibility impairment include anything not directly attributed to human-caused emissions of visibility impairing pollutants. Natural events (e.g. windblown dust, wildfire, volcanic activity, biogenic emissions) also introduce pollutants that contribute to haze in the atmosphere. Natural visibility conditions are not constant; they vary with changing natural processes throughout the year. Specific natural events can lead to high short-term concentrations of visibility impairing particulate matter and its precursors. For purposes of this planning document, natural visibility conditions are represented by a long-term average of conditions expected to occur in the absence of emissions normally attributed to human activities. Natural visibility conditions reflect contemporary vegetated landscape, land-use patterns, and meteorological/climatic conditions. The 2064 visibility goal is the natural visibility conditions for the 20% worst natural conditions days.

Natural sources contribute to visibility impairment but natural emissions cannot be realistically controlled or prevented by the states and therefore are beyond the scope of this planning document. Current methods of analysis of IMPROVE data do not provide a distinction between natural and anthropogenic emissions.

8.3 Overview of Emission Inventory System – WRAP Technical Support System

The WRAP developed the Technical Support System (TSS) as an internet access portal to all the data and analysis associated with the development of the technical foundations of regional haze plans for Western States. The TSS provides state, county, and grid cell level emissions information for typical criteria pollutants such as SO_2, NO_X, and other secondary particulate forming pollutants such as VOC and NH_3. Eleven different emission inventories were developed comprising the following source categories: point, area, on-road mobile, off-road mobile, oil and gas, anthropogenic fire, natural fire, biogenic, road dust, fugitive dust, and windblown dust. Appendix A, Emissions Overview, is a WRAP document describing the emissions inventory process that supported the WRAP modeling effort for regional haze in the WRAP region. More detailed information on the emission inventory information can be found on the WRAP TSS website at the following link: http://vista.cira.colostate.edu/TSS/Results/Emissions.aspx.

Additional emission information, including regional emissions, can be found on the WRAP Regional Modeling Center website at the following link: http://pah.cert.ucr.edu/aqm/308/.

During the WRAP process Western states and EPA agreed that the tremendous amount of data collected, analyzed, and maintained by the WRAP would be impracticable and nearly infeasible to include in individual technical support documents for individual states. For purposes of administrative efficiency, WRAP data and analyses that the member states are utilizing to develop their Regional Haze SIPs are available through the WRAP and the TSS website.

8.4 New Mexico Emissions Data

CFR 40.51.308(d)(4)(v) requires a statewide emission inventory of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any mandatory Class I area. The pollutants inventoried by the WRAP that New Mexico will use include sulfur dioxide (SO_2), volatile organic compounds (VOC), primary organic aerosol (POA), elemental carbon (EC), fine particulate matter (Soil-$PM_{2.5}$), coarse particulate matter ($PM_{2.5}$ to PM_{10}), and ammonia (NH_3). An inventory was developed for the baseline year 2002 and projections of future emissions have been made for 2018. New Mexico will provide updates to WRAP on this inventory on a periodic basis. A summary of the inventory results follows.

It should be noted that area emissions growth was based on use of an EPA model that was subsequently withdrawn by EPA. Overall growth in emissions was estimated at 4.5 percent.

Emission inventories are developed for all of the species or pollutants known to directly or indirectly impact visibility. Inventories are used with air quality models to predict concentrations of pollutants at future dates. WRAP developed emission inventories with input and data provided by Western states and stakeholders. A description of the development and content of the emission inventories can be found on the WRAP TSS website at the following link: http://vista.cira.colostate.edu/TSS/Results/Emissions.aspx

Dispersion modeling predicts daily atmospheric concentrations of pollutants for the baseline year and these modeled results are compared to monitored data taken from the IMPROVE network. A second inventory is created to predict emission in 2018 based on expected controls, growth, or other factors. Additional inventories are created for future years to simulate the impact of different control strategies. The process for inventorying sources is similar for all species of interest. The number and types of sources is identified by various methods. For example, major stationary sources report actual annual emission rates to the EPA national emission database. New Mexico collects annual emission data from both major sources. This information is used as input into the emissions inventory. In other cases, such as mobile sources, an EPA mobile source emissions model is used to develop emission projections. Population, employment, and household data are used in other parts of the emission modeling to characterize emissions from area sources such as home heating. Thus, for each source type, emissions are calculated based on an emission rate and the amount of time the source is operating. Emission rates can be based on actual measurements from the source, or EPA emission factors based on data from tests of similar types of emission sources. In essence all sources go through the same process. The number of sources is identified, emission rates are determined by measurements of those types of sources and the time of operation is determined. By multiplying the emission rate times the hours of operation in a day, a daily emission rate can be calculated.

The following tables represent New Mexico emissions posted on the TSS. "Plan02d" means baseline emissions for the years 2000-2004. The Plan02d emissions inventory was developed Summer 2007, is based on Plan02a-b-c predecessors, and was used for final baseline regional haze analysis and modeling. Information came from WRAP region States and Tribes with gap-filling based on EPA data. "Prp18b" means the projected emissions for 2018. Version B of the 2018 Preliminary Reasonable Progress (PRP18b) emission inventory provides data for assessment of reasonable progress toward visibility goals by WRAP region states and EPA offices, building from PRP18a. This is the final estimate of 2018 regional emissions for the baseline regional haze implementation plans. The PRP18b inventory includes BART determinations as reported by states and EPA offices, projection of future fossil-fuel electrical generation plants, revised control strategy rulemakings, and updated permit limits for point and area sources in the WRAP region, as of Spring 2009.

Table 8-1: New Mexico SO_2 Emission Inventory – 2002 & 2018

New Mexico Planning and Baseline Emission Inventories			
Source Category	New Mexico SOx		
	Plan02d (tpy)	Prp18b (tpy)	Net Change (%)
Point	36,736	29,640	-19
Anthro Fire	94	72	-24
Natural Fire	2,727	2,727	0
Area	2,383	3,983	67
Wrap Area O&G	250	12	-95
On-Road Mobile	1,643	252	-85
Off-Road Mobile	3,540	228	-94
Road Dust	4	5	34
Fugitive Dust	5	6	21
Total	47,381	36,924	-22

Table 8-2: New Mexico NO_X Emission Inventory – 2002 & 2018

New Mexico Planning and Baseline Emission Inventories			
Source Category	New Mexico NOx		
	Plan02d (tpy)	Prp18b (tpy)	Net Change (%)
Point	98,115	69,996	-29
Anthro Fire	395	263	-34
Natural Fire	8,608	8,607	0
Biogenic	41,950	41,950	0
Area	13,023	16,781	29
Wrap Area O&G	56,196	74,648	33
On-Road Mobile	51,623	15,360	-70
Off-Road Mobile	42,277	26,606	-37
Road Dust	1	1	0
Fugitive Dust	5	6	0
Total	312,193	254,218	-19

Table 8-3: New Mexico VOC Emission Inventory – 2002 & 2018

New Mexico Planning and Baseline Emission Inventories			
Source Category	**New Mexico VOC**		
	Plan02d (tpy)	**Prp18b (tpy)**	**Net Change (%)**
Point	17,277	25,871	50
Anthro Fire	607	387	-36
Natural Fire	18,834	18,833	0
Biogenic	1,007,457	1,007,457	0
Area	37,106	53,163	43
Wrap Area O&G	224,156	267,846	0
On-Road Mobile	28,897	11,679	-60
Off-Road Mobile	10,462	6,765	-35
Total	1,344,795	1,392,002	4

Table 8-4: New Mexico Primary Organic Aerosol (POA) Emission Inventory – 2002 & 2018

New Mexico Planning and Baseline Emission Inventories			
Source Category	**New Mexico Primary Organic Aerosol**		
	Plan02d (tpy)	**Prp18b (tpy)**	**Net Change (%)**
Point	968	240	-75
Anthro Fire	681	441	-35
Natural Fire	16,257	16,256	0
Area	2,023	2,279	13
On-Road Mobile	497	508	2
Off-Road Mobile	471	281	-40
Road Dust	102	136	34
Fugitive Dust	268	275	2
Total	21,268	20,417	-4

Table 8-5: New Mexico Elemental Carbon (EC) Emission Inventory – 2002 & 2018

New Mexico Planning and Baseline Emission Inventories			
Source Category	**New Mexico Elemental Carbon**		
	Plan02d (tpy)	**Prp18b (tpy)**	**Net Change (%)**
Point	12	13	4
Anthro Fire	123	85	-31
Natural Fire	3,291	3,291	0
Area	244	287	17
On-Road Mobile	586	160	-73
Off-Road Mobile	1,355	662	-51
Road Dust	8	11	34
Fugitive Dust	18	19	2
Total	5,638	4,526	-20

Table 8-6: New Mexico Soil (PM Fine/$PM_{2.5}$) Emission Inventory – 2002 & 2018

New Mexico Planning and Baseline Emission Inventories			
Source Category	**New Mexico Fine PM**		
	Plan02d (tpy)	**Prp18b (tpy)**	**Net Change (%)**
Point	1,160	1,126	-3
Anthro Fire	87	44	-49
Natural Fire	1,220	1,220	0
Area	2,318	2,973	28
Road Dust	1,192	1,591	33
Fugitive Dust	5,158	5,446	6
WB Dust	16,305	16,305	0
Total	27,440	28,705	5

Table 8-7: New Mexico Coarse Mass (PM Coarse) Emission Inventory – 2002 & 2018

New Mexico Planning and Baseline Emission Inventories			
Source Category	**New Mexico Coarse PM**		
	Plan02d (tpy)	**Prp18b (tpy)**	**Net Change (%)**
Point	1,953	1,731	-11
Anthro Fire	105	63	-41
Natural Fire	5,398	5,398	0
Area	534	723	36
On-Road Mobile	306	357	0
Road Dust	10,206	13,618	33
Fugitive Dust	36,306	41,429	14
WB Dust	146,747	146,747	0
Total	201,555	210,066	4

Table 8-8: New Mexico Ammonia (NH_3) Emission Inventory – 2002 & 2018

New Mexico Planning and Baseline Emission Inventories			
Source Category	**New Mexico Ammonia**		
	Plan02d (tpy)	**Prp18b (tpy)**	**Net Change (%)**
Point	51	66	30
Anthro Fire	75	42	-44
Natural Fire	1,873	1,873	0
Area	29,112	29,343	1
On-Road Mobile	1,605	2,139	33
Off-Road Mobile	23	32	38
Total	32,740	33,495	2

CHAPTER 9: VISIBILITY MODELING AND SOURCE APPORTIONMENT

9.1 Modeling Overview

Appendix B is a WRAP document that includes a detailed description of the air quality modeling performed for the WRAP region. Additional information on visibility modeling is available on both WRAP's website at http://vista.cira.colostate.edu/TSS/Results/Modeling.aspx and at the Regional Modeling Center's website at http://pah.cert.ucr.edu/rmc/index.shtml.

CMAQ

The Regional Modeling Center (RMC) Air Quality Modeling Group is responsible for regional haze modeling for the WRAP. The RMC is located at the University of California – Riverside in the College of Engineering Center for Environmental Research and Technology.

The RMC modeling analysis is based on a model domain comprising the continental U.S. using the Community Multi-Scale Air Quality (CMAQ) model. The EPA developed the CMAQ modeling system in the late 1990s. CMAQ was designed as a "one atmosphere" modeling system to encompass modeling of multiple pollutants and issues, including ozone, PM, visibility, and air toxics. This is in contrast to many earlier air quality models that focused on single-pollutant issues (e.g., ozone modeling by the Urban Airshed Model). CMAQ is an Eulerian Model; it is a grid-based model is which the frame of reference is a fixed, three-dimensional (3-D) grid with uniformly sized horizontal grid cells and variable vertical layer thicknesses. The key science processes included in CMAQ are emissions, advection and dispersion, photochemical transformation, aerosol. Thermodynamics and phase transfer, aqueous chemistry, and wet and dry deposition of trace species.

The RMC developed air quality modeling inputs including annual meteorology and emissions inventories for a 2002 actual emissions base case (Base02), a planning case to represent the 2000 – 2004 baseline period (Plan02), and a 2018 base case (Base 18) of projected emissions using factors known at the end of 2005. All emission inventories were developed during the Sparse Matrix Operator Kernel Emission (SMOKE) modeling system. These inventories were revised during the development process. The development of these emission scenarios is documented under the emissions inventory sections of the TSS.

The 2018 visibility projections (PRP18b) were developed using the Plan02d and Base 18b CMAQ 36-km modeling results. Projections were made using relative response factors (RRFs), which are defined as the ratio of the future-year modeling results to the current year modeling results. The calculated RRFs are applied to the baseline observed visibility conditions to project future year observed visibility.

The CMAQ modeling for PRP18b included emissions after reductions from the following programs and regulations:

- Smoke Management Program accounted for using Emissions Reduction Techniques (ERTs) applied to the 2000-2004 average fire emissions.
- New permits and State/EPA consent agreements since 2002 reviewed with each State through 2007.
- Ozone and PM_{10} SIPs in place within the WRAP region
- State Oil and Gas emission control programs.
- Mobile sources:
    - Heavy Duty Diesel (2007) Engine Standard
    - Tier 2 Tailpipe

- Large Spark Ignition and Recreational Vehicle rule
- Nonroad Diesel Rule

- Combustion Turbine and Industrial Boiler/Process Heater/RICE MACT
- Known BART control in the WRAP region.
- Presumptive SO_2 BART for EGUs in the WRAP region.

Generally, emission inputs were prepared by individual States and Tribes for point, area, and most dust emissions categories. The following WRAP Forums were relied upon to summarize this data and provide it to the RMC.

- Point Source emissions were obtained from a project commissioned by the Stationary Source Joint Forum and the Emission Forum.
- Area Source emissions were obtained from a project commissioned by the Stationary Source Joint Forum and the Emission Forum.
- Mobile Source emissions were from a project commissioned by the Emissions Forum.
- Fire (natural and anthropogenic) emissions were from projects commissioned by the Fire Emissions Joint Forum
- Ammonia, Dust, & Biogenic emissions were from projects commissioned by the Dust Emissions Joint Forum and the Modeling Forum.
- Emissions from Pacific Offshore shipping were from a project conducted by the RMC.
- Other emissions from North America were from projects commissioned by the Emission Forum and the Modeling Forum. The Mexico emission are from 1999 and were held constant for 2018. Canada emissions are from 2000 and were held constant for 2018.
- Boundary conditions reaching North America from the rest of the world were from a project commissioned by the VISTAS Regional Planning Organization, on behalf of the five regional planning organizations working on regional haze.

The 2018 Preliminary Reasonable Progress, version B (PRP18b), makes a second revision to the 2018 emissions inventory projections for point and area sources in the WRAP region to provide a more current assessment of the reasonable progress toward visibility goals by the WRAP. The PRP18b addresses changes that occurred since January 2007 in the following areas.

- BART determinations (or expected BART control levels where BART had not been finalized);
- Projections of "future" fossil-fuel plants needed to achieve 2018 federal electrical generation demand forecasts;
- New rulemaking, permit limits, and consent decrees; and
- Other outstanding issues that were identified by the federal, state, or local agencies within the WRAP domain as needing to be corrected or updated.

PSAT

The RMC also developed the Particulate Matter Source Apportionment Technology (PSAT) algorithm in the Comprehensive Air Quality Model with extensions (CAMx) model to assess source attribution. The PSAT analysis is used to attribute particle species, particularly sulfate and nitrate from a specific location within the WRAP modeling domain. The PSAT algorithm applies nitrate-sulfate-ammonia chemistry to a system of tracers or "tags" to track the chemical transformations, transport and removal of emissions.

Each state or region (i.e., Mexico, Canada) is assigned a unique number that is used to tag the emissions from each 36-kilometer grid cell within the WRAP modeling domain. Due to time and computational limitations, only point, mobile, area and fire emissions were tagged.

The PSAT algorithm was also used, in a limited application (e.g. no state or regional attribution) due to resource constraints, to track natural and anthropogenic species of organic aerosols at each Class I Area. The organic aerosol tracer tracked both primary and secondary organic aerosols (POA & SOA).

Weighted Emissions Potential

The Weighted Emissions Potential (WEP) is a screening tool that helps to identify source regions that have the potential to contribute to haze formation at specific Class I areas. Unlike PSAT, this method does not account for chemistry or deposition. The WEP combines emissions inventories, wind patterns, and residence time of air mass over each area where emissions occur, to estimate the percent contribution of different pollutants. Like PSAT, the WEP tool compares baseline (2000-2004) to 2018, to show the improvement expected by the 2018 URP, for sulfate, nitrate, organic carbon, elemental carbon, fine PM, and coarse PM.

9.2 Summary of Modeling Results for CMAQ

This section provides the visibility projections for New Mexico's Class I areas using the CMAQ model. The projections were calculated from modeled results by multiplying a species-specific relative response factor (RRF) with the baseline monitored results, and then converting to extinction and deciview. The RRF is defined as the ratio of future-to-current modeled mass. The projected visibility conditions are used to define the reasonable progress goals found in Chapter 11.

Table 9-1 provides the 2018 uniform progress for each Class I area and the visibility modeling projection for 2018 for both 20% worst and 20% best days. None of New Mexico's Class I areas are projected to meet the URP for 2018, although all [~~but one (Gila Wilderness)~~] are projected to be below baseline conditions on the worst 20% days. Modeling shows degradation on best days for [~~two~~] one of the IMPROVE monitors, Guadalupe Mountain which includes Carlsbad Caverns National Park. The following section provides a breakdown of the visibility impairment for each pollutant. [~~This is addressed in the~~] The Chapter 12 discussion regarding the Long Term Strategy addresses New Mexico’s strategies for improving visibility at all Class I areas.

Table 9-1: Summary of CMAQ Modeling Progress Towards 2018

New Mexico Class I Area	20% Worst Days Visibility			20% Best Days Visibility		
	2000-2004 Baseline (dv)	2018 URP Goal (dv)	2018 Projected Visibility (dv)	2000-2004 Baseline (dv)	2018 Projected Visibility (dv)	2018 Projection less than Baseline?
Bandelier W	12.22	10.83	11.9	4.95	4.89	Y
Bosque del Apache NWR	18.03	15.41	17.33	7.84	7.43	Y
Carlsbad Caverns NP	17.19	14.73	16.93	5.95	6.14	N
Gila W	13.11	11.61	12.99 [~~15.17~~]	3.31	3.2 [~~3.45~~]	Y [~~N~~]
Pecos W, Wheeler Peak W	10.41	9.40	10.23	1.22	1.13	Y
Salt Creek W	18.03	15.41	17.33	7.84	7.43	Y
White Mountain W	13.7	12.09	13.27	3.55	3.42	Y

9.2.1 CMAQ Modeling by Pollutant

The following graphs and tables show the breakdown of visibility impairment for each pollutant on 20% worst days. The visibility projections for the individual pollutants at each Class I area shows that most pollutants will not meet their respective 2018 goal for worst days. The tables summarize the impairment of each pollutant and identify the relative impact from anthropogenic or non-anthropogenic pollutants.

The results of the breakdown show that nitrate (anthropogenic) has greater improvement than the other pollutants. With the exceptions of organic carbon and fine soil, all other pollutants are below the baseline condition. The tables also show that the primary contributors to extinction are organic carbon, sulfate, and coarse mass. The sulfate is likely from industrial sources while the organic carbon can be attributed mostly to fire and coarse mass from natural sources.

Figure 9-1: URP by Pollutant on 20% Worst Days for Bandelier Wilderness

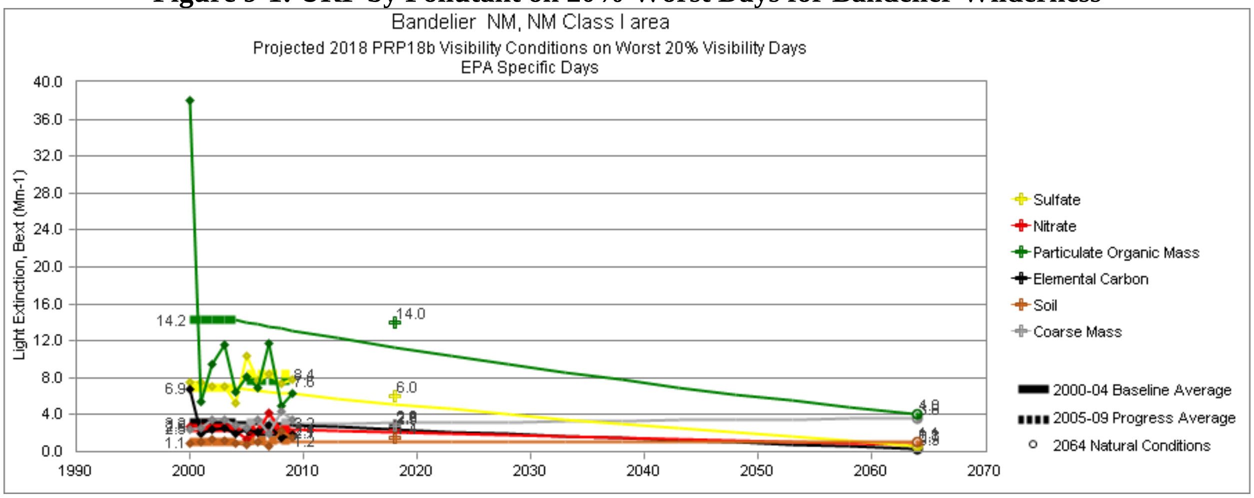


Table 9-2: Pollutant Breakdown on 20% Worst Days for Bandelier Wilderness

Pollutant	Bandelier Wilderness 2000-2004 Baseline (Mm-1)	2018 URP Goal (Mm-1)	2018 Projected Visibility (Mm-1)	2064 Natural Conditions (Mm-1)	2018 under URP Goal?
Sulfate	6.89	5.17	5.99	0.65	No
Nitrate	2.51	2.09	2.53	0.81	No
Organic Carbon	14.23	11.32	14	4.01	No
Elemental Carbon	3.15	2.43	2.65	0.32	No
Fine Soil	1.12	1.11	1.43	1.07	No
Coarse Mass	2.93	3.09	NA	3.64	NA
Sea Salt	0.24	0.24	NA	0.24	NA

NA - Visibility projections not available due to poor model performance.

Figure 9-2: URP by Pollutant on 20% Worst Days for Bosque del Apache NWR

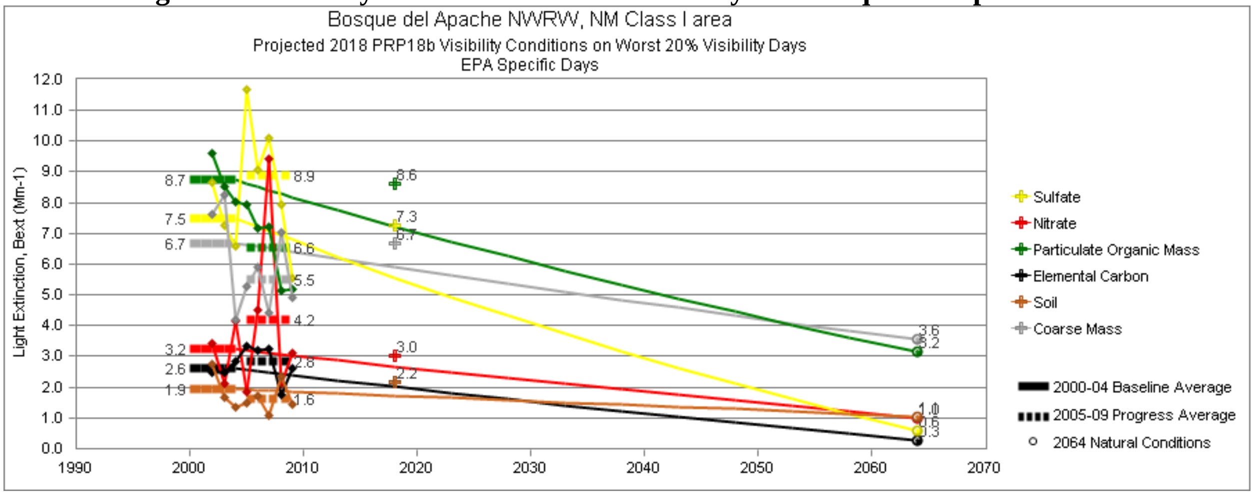


Table 9-3: Pollutant Breakdown on 20% Worst Days for Bosque del Apache NWR

Pollutant	Bosque del Apache NWR				
	2000-2004 Baseline (Mm-1)	2018 URP Goal (Mm-1)	2018 Projected Visibility (Mm-1)	2064 Natural Conditions (Mm-1)	2018 under URP Goal?
Sulfate	7.51	5.57	7.27	0.58	No
Nitrate	3.24	2.68	3.02	1.01	No
Organic Carbon	8.73	7.24	8.6	3.15	No
Elemental Carbon	2.6	2.02	2.15	0.29	No
Fine Soil	1.94	1.73	2.16	1.06	No
Coarse Mass	6.69	5.90	NA	3.56	NA
Sea Salt	0.19	0.21	NA	0.25	NA

NA - Visibility projections not available due to poor model performance.

Figure 9-3: URP by Pollutant on 20% Worst Days for Carlsbad Caverns NP

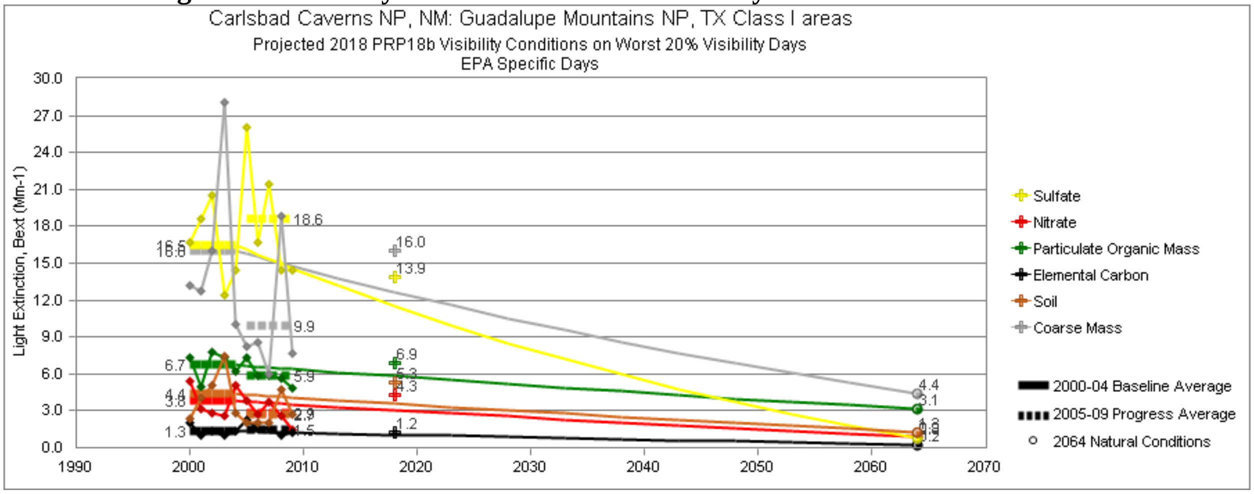


Figure 9-4: URP for Nitrate, Organic Carbon and Fine Soil on 20% Worst Days for Carlsbad Caverns NP

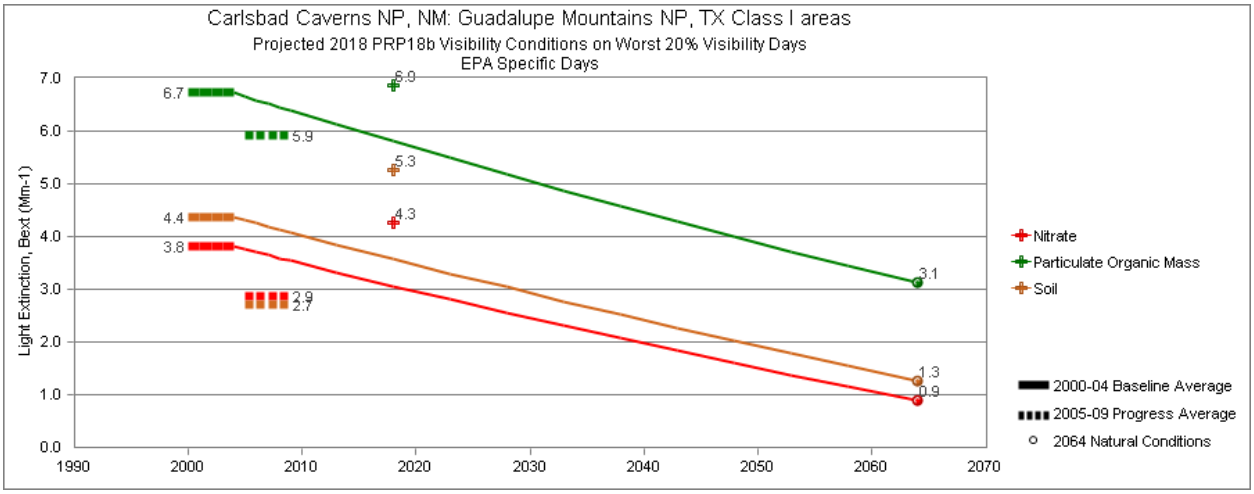


Table 9-4: Pollutant Breakdown on 20% Worst Days for Carlsbad Caverns NP

Pollutant	Carlsbad Caverns National Park				
	2000-2004 Baseline (Mm-1)	2018 URP Goal (Mm-1)	2018 Projected Visibility (Mm-1)	2064 Natural Conditions (Mm-1)	2018 under URP Goal?
Sulfate	16.51	11.50	13.92	0.8	No
Nitrate	3.81	3.06	4.27	0.89	No
Organic Carbon	6.73	5.81	6.88	3.13	No
Elemental Carbon	1.34	1.07	1.19	0.23	No
Fine Soil	4.37	3.57	5.26	1.27	No
Coarse Mass	16.02	12.66	NA	4.39	NA
Sea Salt	0.1	0.11	NA	0.14	NA

NA - Visibility projections not available due to poor model performance.

Figure 9-5: URP by Pollutant on 20% Worst Days for Gila Wilderness

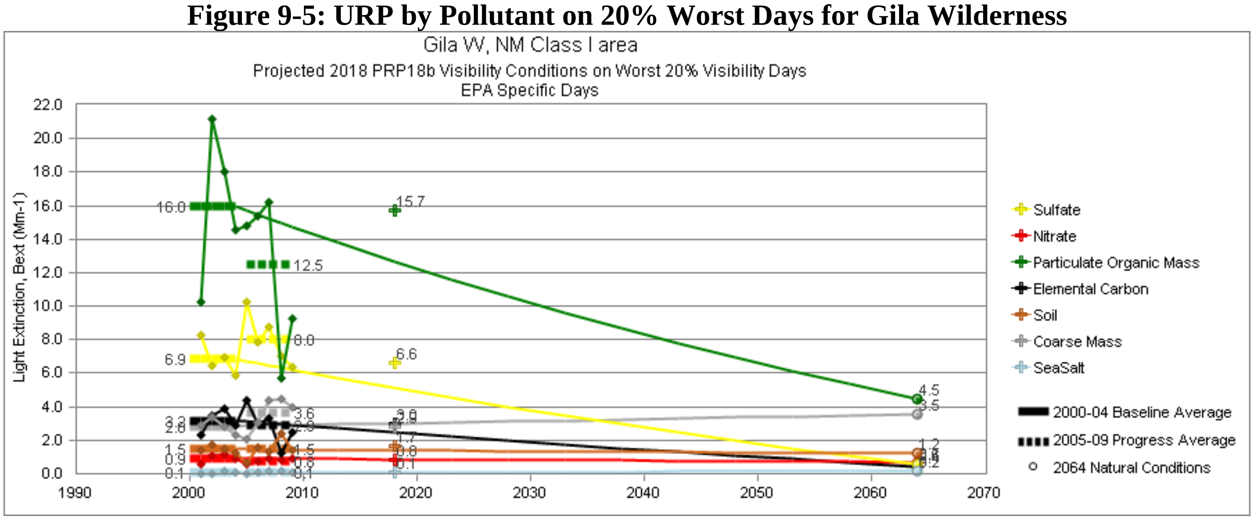


Figure 9-6: URP for Total Deciview, Sulfate, Organic Carbon, Elemental Carbon and Fine Soil on 20% Worst Days for Gila Wilderness

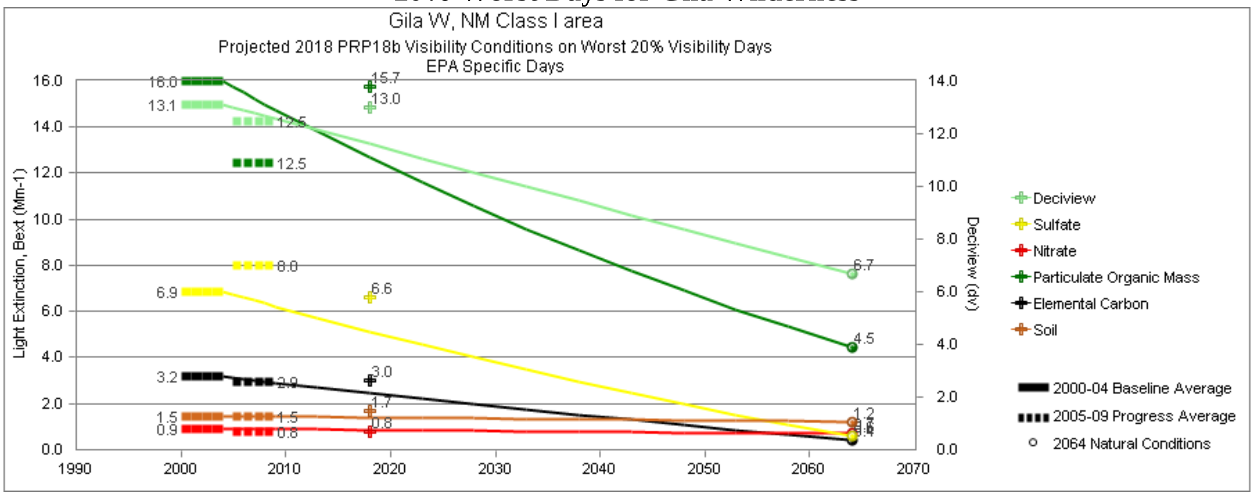


Table 9-5: Pollutant Breakdown on 20% Worst Days for Gila Wilderness

Pollutant	Gila Wilderness				
	2000-2004 Baseline (Mm-1)	**2018 URP Goal (Mm-1)**	**2018 Projected Visibility (Mm-1)**	**2064 Natural Conditions (Mm-1)**	**2018 under URP Goal?**
Sulfate	6.87	5.13	6.63 [~~7.67~~]	0.58	No
Nitrate	0.91	0.86	0.81 [~~0.49~~]	0.7	Yes [~~No~~]
Organic Carbon	16	12.67	15.73 [~~23.26~~]	4.46	No
Elemental Carbon	3.17	2.46	3.01 [~~5.7~~]	0.41	No
Fine Soil	1.45	1.40	1.69 [~~2.14~~]	1.21	No
Coarse Mass	2.85	3.00	NA	3.53	NA
Sea Salt	0.07	0.09	NA	0.16	NA

NA - Visibility projections not available due to poor model performance.

Figure 9-7: URP by Pollutant on 20% Worst Days for Pecos Wilderness, Wheeler Peak Wilderness

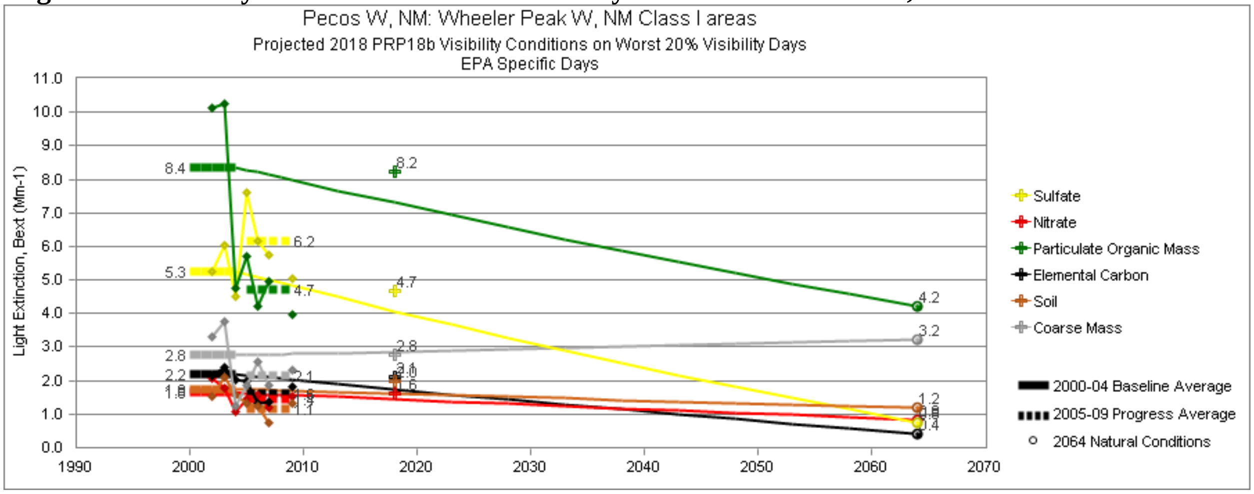


Table 9-6: Pollutant Breakdown on 20% Worst Days for Pecos Wilderness, Wheeler Peak Wilderness

Pollutant	Pecos Wilderness, Wheeler Peak Wilderness				
	2000-2004 Baseline (Mm-1)	2018 URP Goal (Mm-1)	2018 Projected Visibility (Mm-1)	2064 Natural Conditions (Mm-1)	2018 under URP Goal?
Sulfate	5.27	4.07	4.68	0.75	No
Nitrate	1.64	1.44	1.61	0.84	No
Organic Carbon	8.37	7.30	8.23	4.2	No
Elemental Carbon	2.18	1.74	2.1	0.4	No
Fine Soil	1.75	1.61	2	1.18	No
Coarse Mass	2.77	2.87	NA	3.21	NA
Sea Salt	0.47	0.48	NA	0.49	NA

NA - Visibility projections not available due to poor model performance.

Figure 9-8: URP by Pollutant on 20% Worst Days for Salt Creek Wilderness

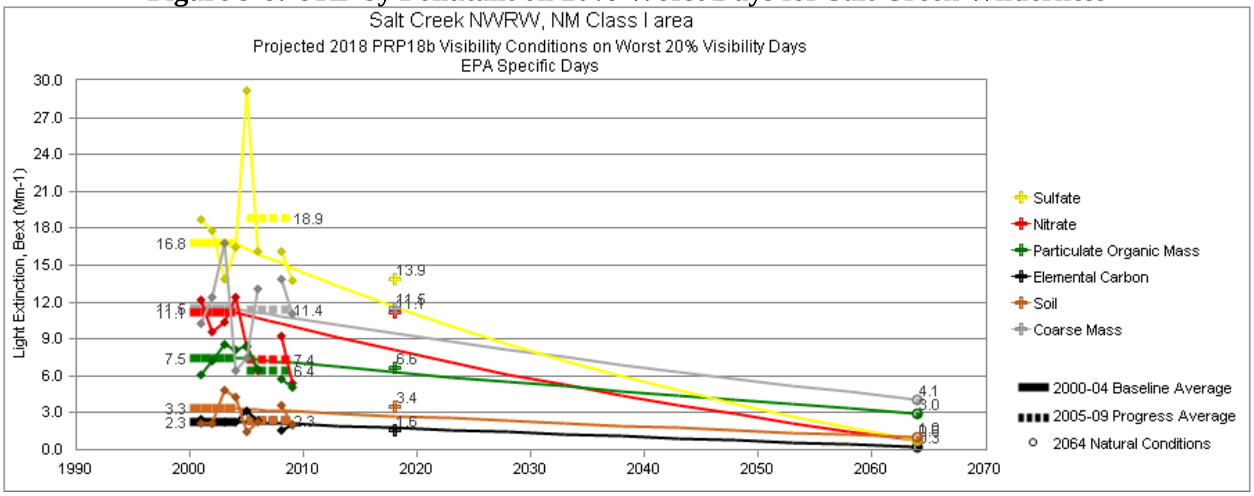


Table 9-7: Pollutant Breakdown on 20% Worst Days for Salt Creek Wilderness

Pollutant	Salt Creek Wilderness				
	2000- 2004 Baseline (Mm-1)	2018 URP Goal (Mm-1)	2018 Projected Visibility (Mm-1)	2064 Natural Conditions (Mm-1)	2018 under URP Goal?
Sulfate	16.75	11.64	13.9	0.78	No
Nitrate	11.15	8.07	11.11	0.77	No
Organic Carbon	7.49	6.31	6.64	2.97	No
Elemental Carbon	2.31	1.79	1.62	0.26	No
Fine Soil	3.34	2.75	3.44	0.98	No
Coarse Mass	11.47	9.46	NA	4.09	NA
Sea Salt	0.2	0.20	NA	0.2	NA

NA - Visibility projections not available due to poor model performance.

Figure 9-9: URP by Pollutant on 20% Worst Days for White Mountain Wilderness

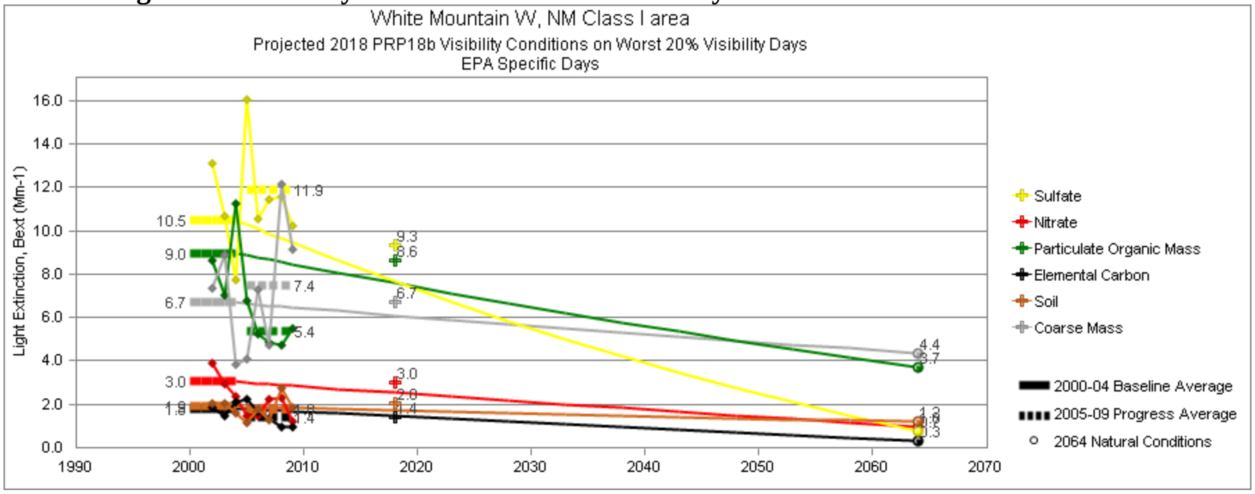


Table 9-8: Pollutant Breakdown on 20% Worst Days for White Mountain Wilderness

Pollutant	White Mountain Wilderness				
	2000- 2004 Baseline (Mm-1)	2018 URP Goal (Mm-1)	2018 Projected Visibility (Mm-1)	2064 Natural Conditions (Mm-1)	2018 under URP Goal?
Sulfate	10.51	7.64	9.33	0.74	No
Nitrate	3.05	2.53	2.99	0.98	No
Organic Carbon	8.97	7.59	8.64	3.72	No
Elemental Carbon	1.82	1.45	1.42	0.31	No
Fine Soil	1.89	1.72	2.02	1.19	No
Coarse Mass	6.68	6.10	NA	4.35	NA
Sea Salt	0.17	0.18	NA	0.22	NA

NA - Visibility projections not available due to poor model performance.

9.3 Summary of PSAT Modeling Results

This section provides a summary of the PSAT modeling results for the baseline and 2018 projections. The figures and graphs show the relative contribution of in-state versus out-of-state sources that contribute to visibility impairment at New Mexico's Class I areas. Results for [~~both~~] the 20% worst [~~and 20% best~~] days are shown.

The PSAT modeling focuses on sulfate and nitrate contribution only and takes into account chemistry and deposition. Modeling shows contribution from all regions including the WRAP States, CENRAP States, the eastern US States, Canada, Mexico, Pacific Offshore (shipping), and "Outside Domain" (global transport). The WEP analysis does not consider sulfate and nitrate chemistry and deposition, but does estimate contributions from Canada, Mexico, and Pacific Offshore regions. Because of these differences, the results show PSAT for sulfate and nitrate contributions (the primary anthropogenic pollutants) and

WEP results for identifying the contribution from organic carbon, elemental carbon, fine soil, and coarse matter (common non-anthropogenic pollutants).

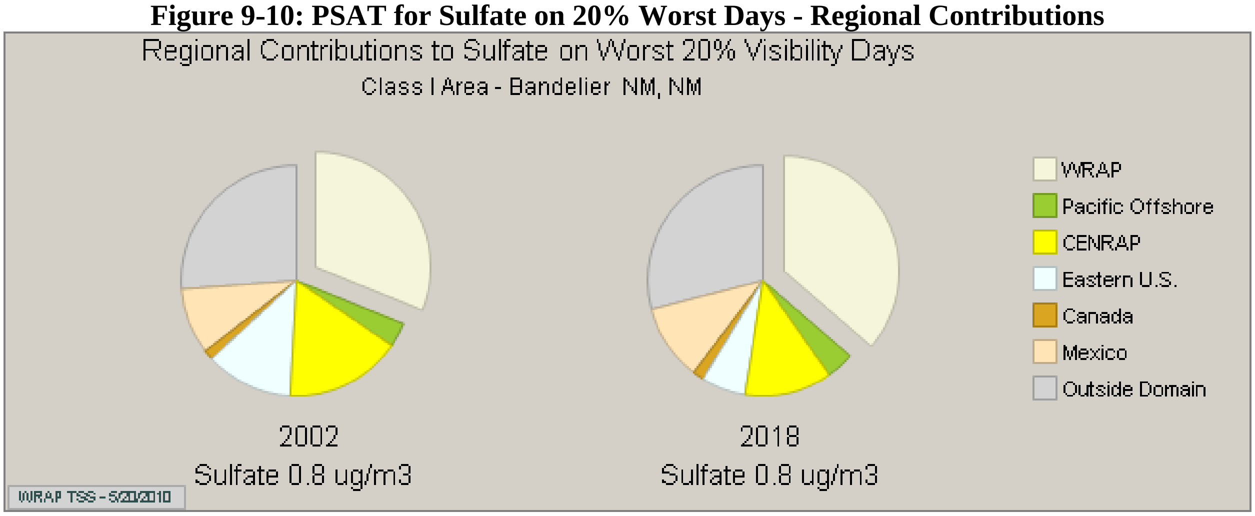
The following sections contain pie charts and graphs showing the State and regional contributions of sulfate and nitrate mass at the IMPROVE monitoring sites for the Class I areas. The pie charts show the regional contributions from the WRAP States, Canada, Mexico, Pacific offshore (PO), and outside the domain (OD). The WRAP States are indicated by the "break-out" slice of the pie chart. The PSAT bar graphs show the breakdown of contribution from the individual WRAP States for organic carbon, elemental carbon, fine PM, and coarse PM. The figures compare the baseline conditions with the projected concentration in 2018 based on PSAT modeling.

9.3.1 Bandelier Wilderness

Sulfate

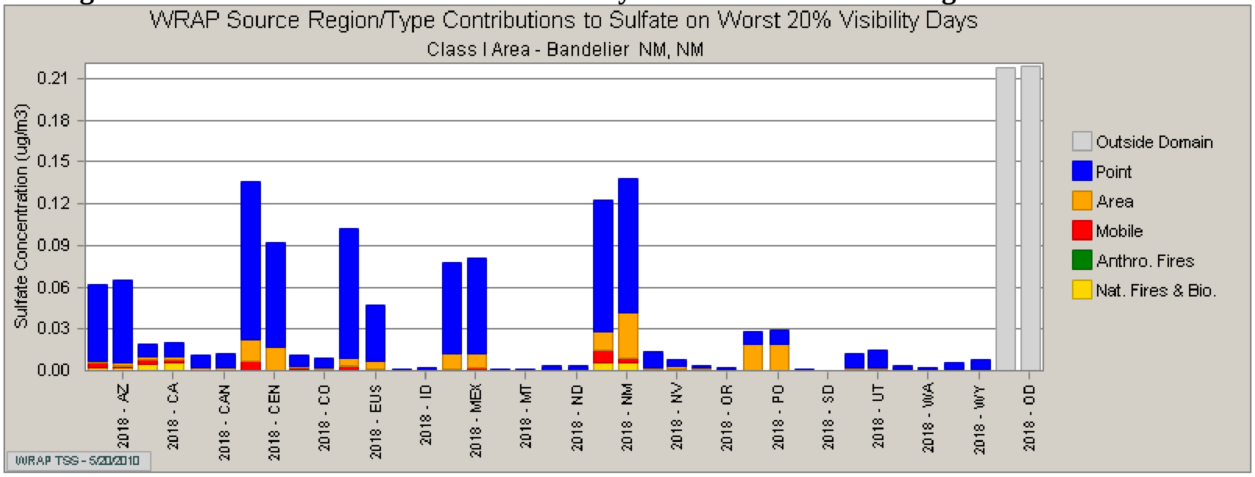
Figure 9-10 shows the concentration of sulfate for the 20% worst days. The overall concentration is projected to remain the same by 2018. Contributions from WRAP States and outside the domain are however, showing increased contributions. CENRAP States and Eastern U.S. States are decreasing. Concentrations from Mexico are increasing, mostly from point sources, which is likely to due to increasing industrial sources within Mexico.

Figure 9-10: PSAT for Sulfate on 20% Worst Days - Regional Contributions



The breakdown of the contributions from WRAP States and regionally, shows that point sources are the primary source of sulfate. Among the primary regional contributors, modeling shows that sulfate concentrations are decreasing by 2018, except for sulfate from New Mexico, Arizona and Mexico.

Figure 9-11: PSAT Sulfate on 20% Worst Days – WRAP States and Regional Contributions



Nitrate

Figure 9-12 shows the concentration of nitrate for the 20% worst days. The overall concentration is projected to remain the same by 2018.

Figure 9-12: PSAT for Nitrate on 20% Worst Days – Regional Contributions

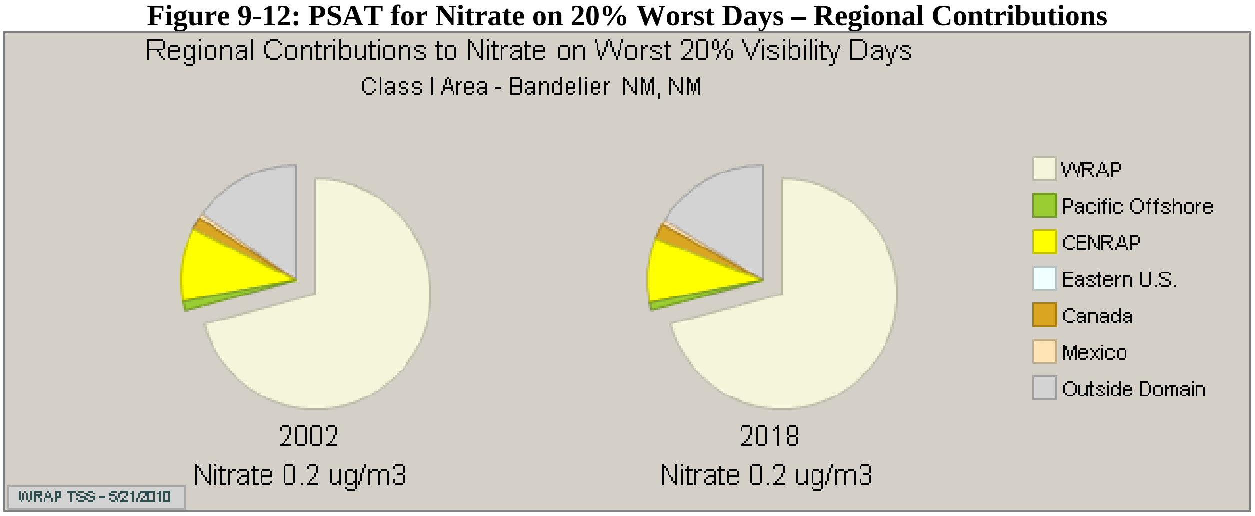
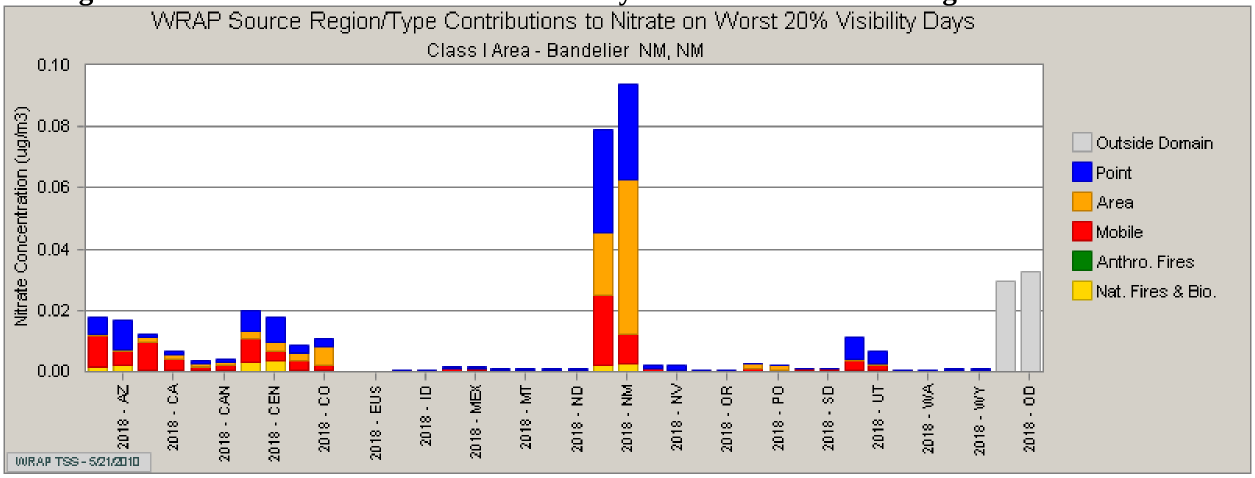


Figure 9-13 provides the nitrate concentrations from WRAP States in addition to other regional contributors. Among the WRAP States, New Mexico contributes the most to nitrate concentrations followed by CENRAP in both the baseline period and the 2018 projections. Nitrate concentrations are primarily from point and area sources. Area source projections show increases in New Mexico for 2018.

Figure 9-13: PSAT Nitrate on 20% Worst Days – WRAP States and Regional Contributions

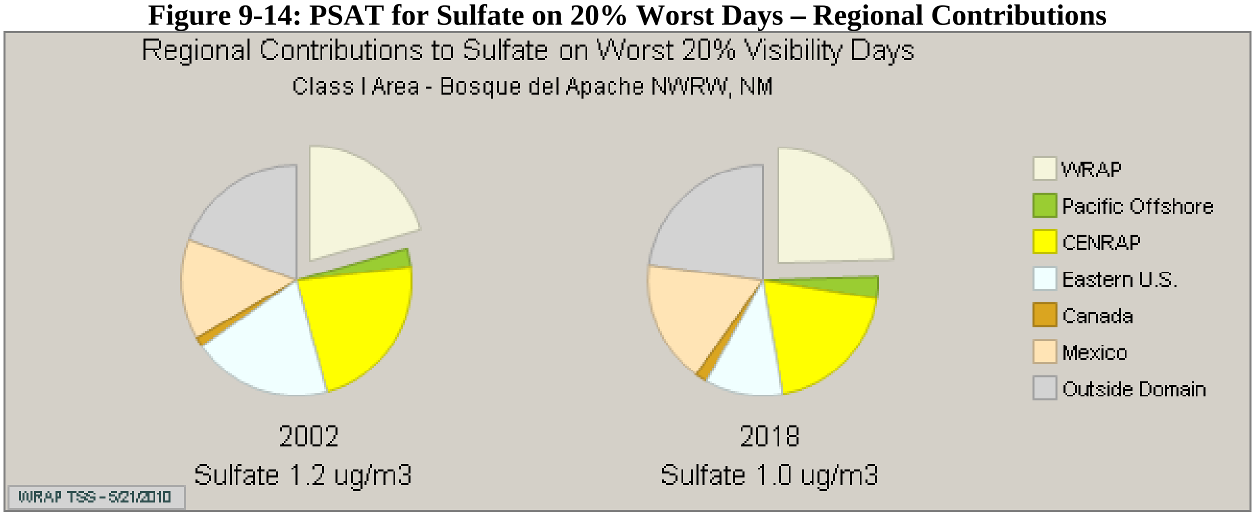


9.3.2 Bosque del Apache National Wildlife Refuge

Sulfate

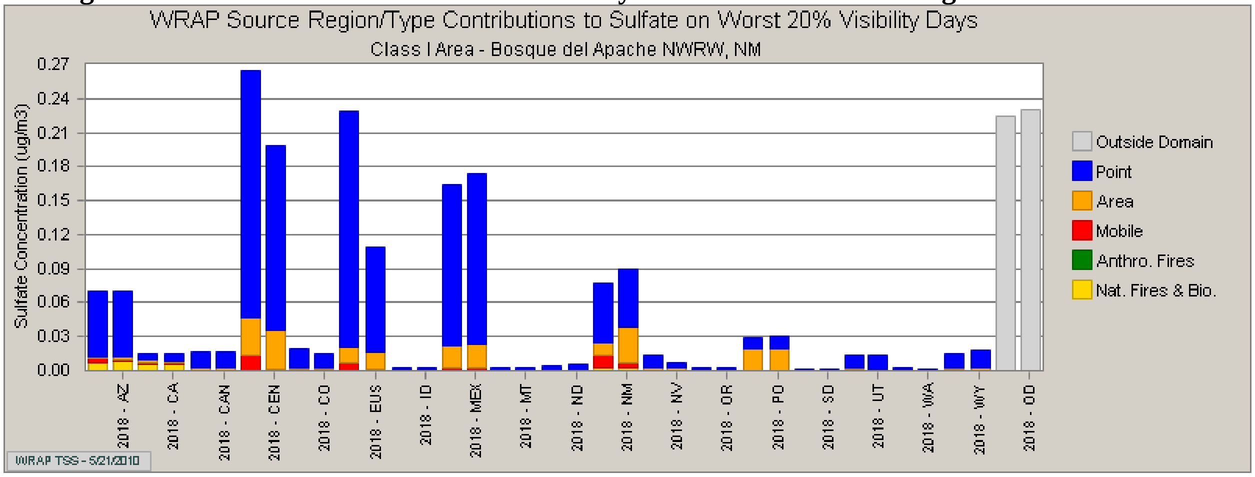
Figure 9-14 shows sulfate concentrations from the baseline period and projection in 2018. The States and regions contributing to most of the sulfate concentrations include WRAP States, Eastern U.S. states, CENRAP states, outside domain, and Mexico. Eastern US contribute at lower percentage for 2018.

Figure 9-14: PSAT for Sulfate on 20% Worst Days – Regional Contributions



In Figure 9-15, the breakdown of sulfate contributions indicates that CENRAP, Eastern U.S. and Mexican sources are the highest contributor, mostly from point sources. New Mexico contributions to sulfate concentrations are mostly from point sources. Area sources in New Mexico are projected to increase in 2018.

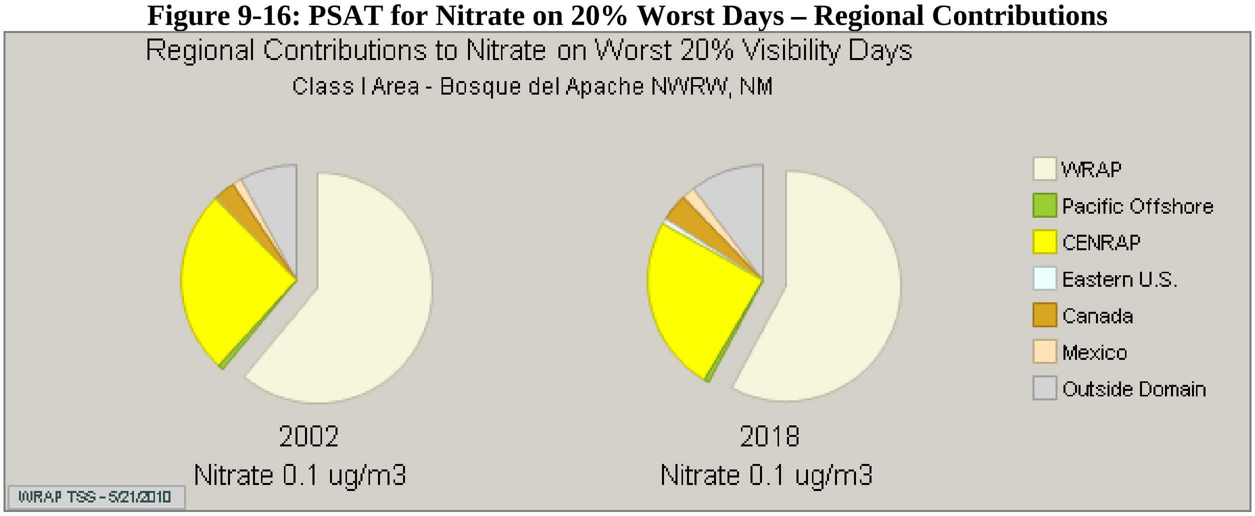
Figure 9-15: PSAT Sulfate on 20% Worst Days – WRAP States and Regional Contributions



Nitrate

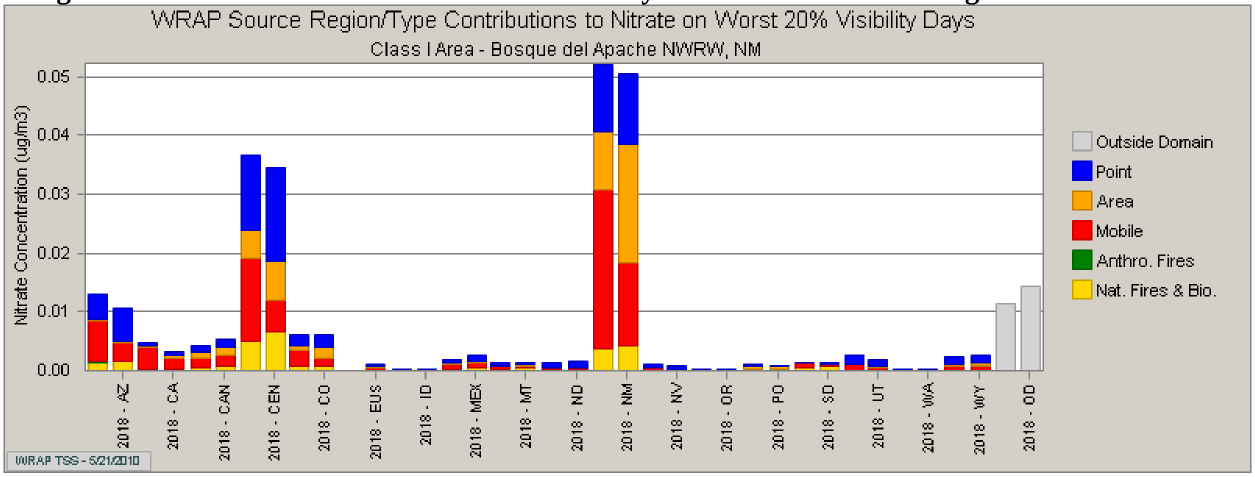
Regional nitrate concentrations are shown in Figure 9-16. Contributions to nitrate concentrations are mostly from WRAP States, followed by CENRAP states, both of which are projected to decrease by 2018.

Figure 9-16: PSAT for Nitrate on 20% Worst Days – Regional Contributions



As Figure 9-17 shows New Mexico is the primary contributor to nitrate, followed by CENRAP states and Arizona. New Mexico source types contributing to nitrate concentrations include natural mobile, area, and point sources. Most of the concentrations are from mobile sources. Area sources are projected to have increasing concentrations for 2018. CENRAP point and area sources are also projected to increase. However, there is a net decrease from both New Mexico and CENRAP for 2018. Increases are projected in 2018 from Mexico and outside the domain.

Figure 9-17: PSAT for Nitrate on 20% Worst Days – WRAP States and Regional Contributions

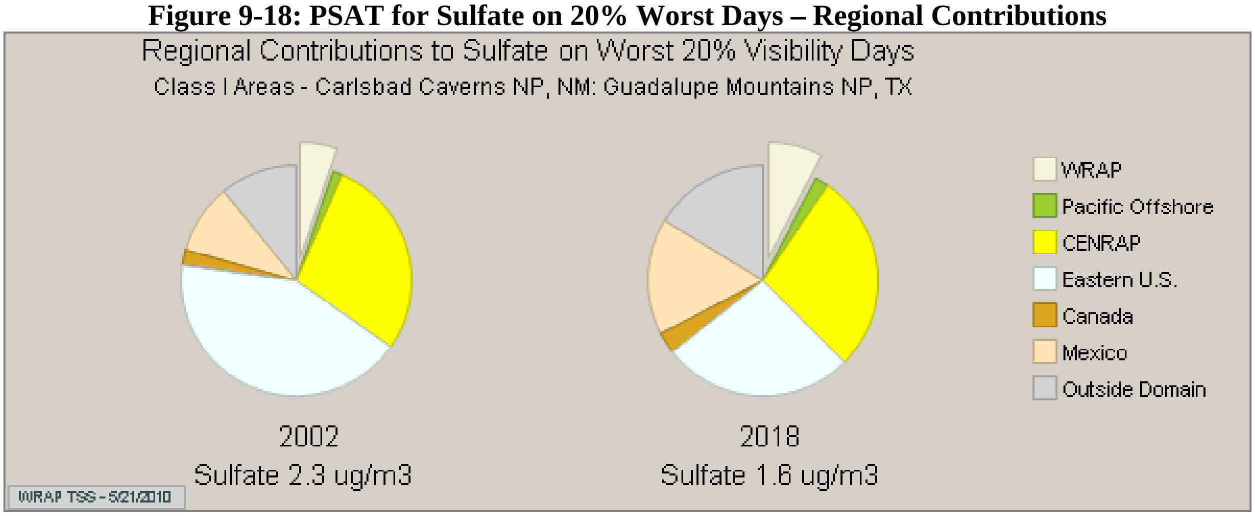


9.3.3 Carlsbad Caverns National Park

Sulfate

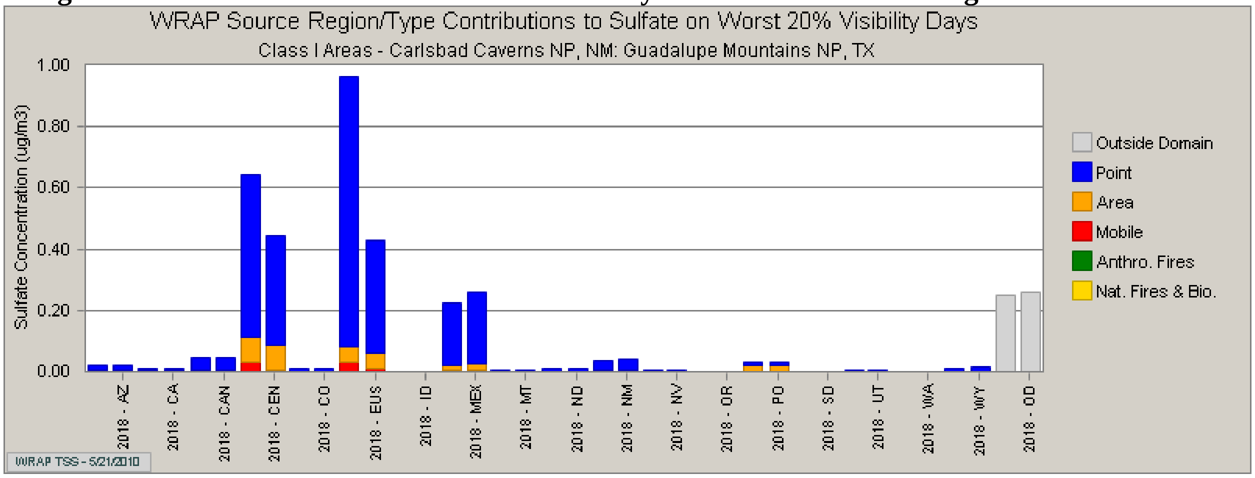
Source apportionment shows that the Eastern U.S. contributes almost half and CENRAP states contribute approximately one-fourth of the total sulfate concentrations at Carlsbad Caverns National Park for the baseline period. The regional contributions from each of these categories are expected to decrease in 2018, and total concentrations are projected to decrease.

Figure 9-18: PSAT for Sulfate on 20% Worst Days – Regional Contributions



The primary regional contributor to sulfate is the Eastern U.S., followed by CENRAP states and Mexico. It is evident that point sources account for most of the sulfate concentrations from all contributors. Sulfate contributions from Mexico and New Mexico are projected to increase in 2018, with concentrations from the CENRAP and Eastern U.S. states decreasing.

Figure 9-19: PSAT for Sulfate on 20% Worst Days – WRAP States and Regional Contributions



Nitrate

Figure 9-20 shows the regional contribution to nitrate at Carlsbad Caverns National Park. On the 20% worst days, the primary contributors are CENRAP and WRAP states. Regional contributions are projected to remain the same in 2018.

Figure 9-20: PSAT Nitrate on 20% Worst Days – Regional Contributions

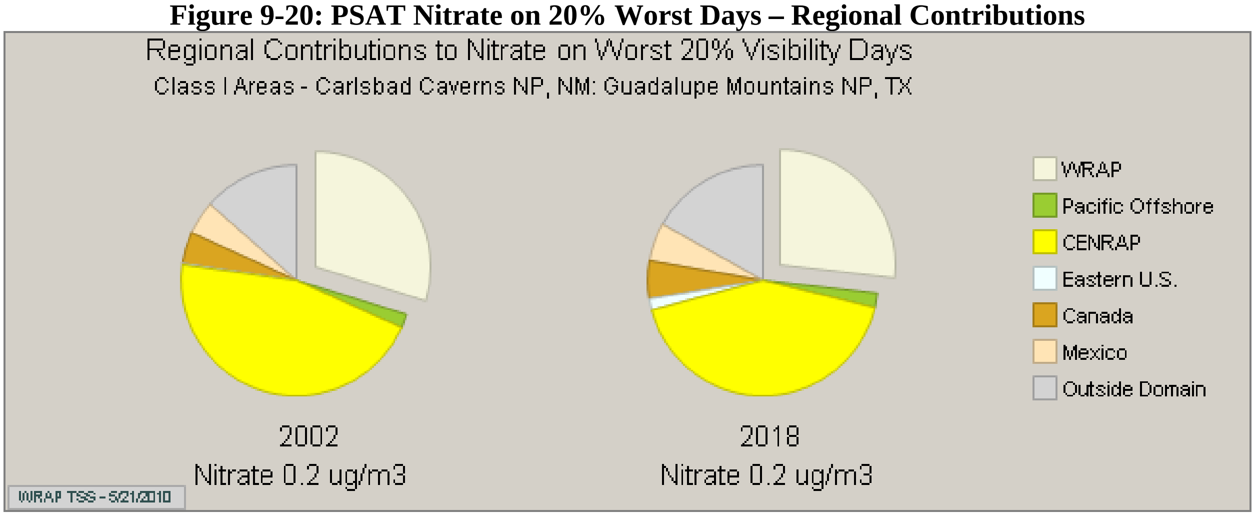
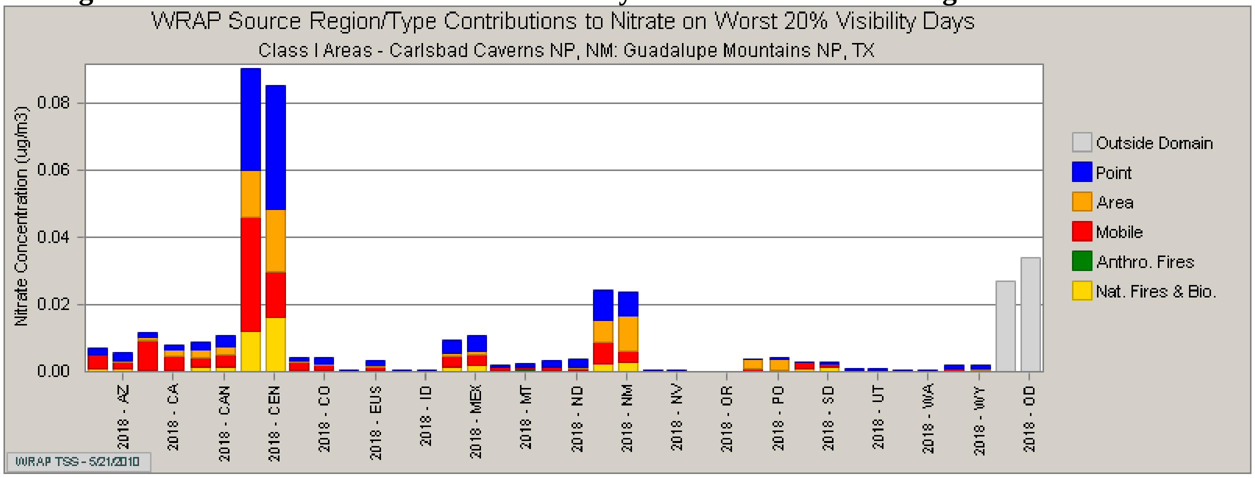


Figure 9-21 shows that CENRAP states contribute the most to nitrate followed by outside the domain, then New Mexico. Most of the concentrations are from mobile and point sources. Nitrate concentration from area sources in New Mexico are projected to increase in 2018.

Figure 9-21: PSAT Nitrate on 20% Worst Days – WRAP States and Regional Contributions

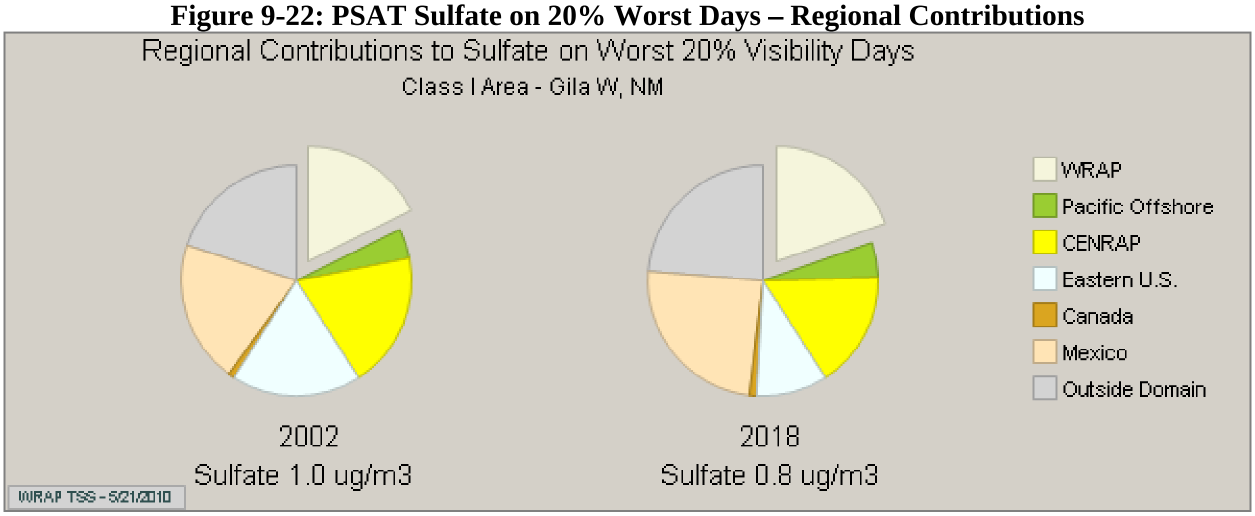


9.3.4 Gila Wilderness

Sulfate

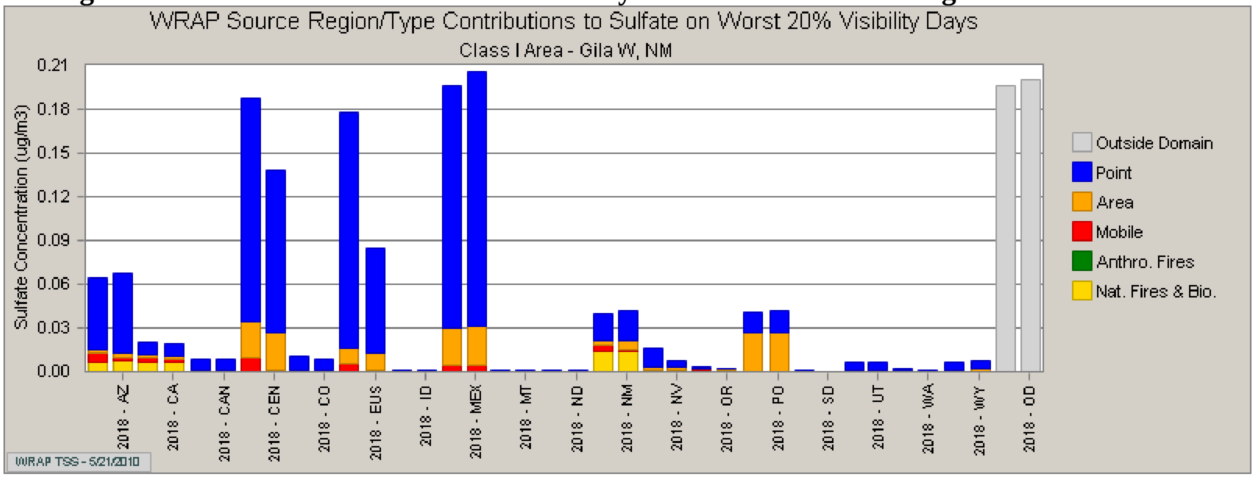
Figure 9-22 shows a fairly even distribution of the sulfate concentrations from WRAP States, Mexico, Eastern U.S., CENRAP states, and outside domain sources. The overall concentrations of sulfate in 2018 are projected to decrease.

Figure 9-22: PSAT Sulfate on 20% Worst Days – Regional Contributions



The breakdown of sulfate from WRAP States and other regional contributors shows that Mexico is the primary contributor followed by CENRAP States, and Eastern U.S. States. Sulfate is predominately from point sources, with a small amount from area sources within each regional contributor. Contributions of sulfate from Mexico, Arizona and New Mexico are projected to increase from point sources in 2018.

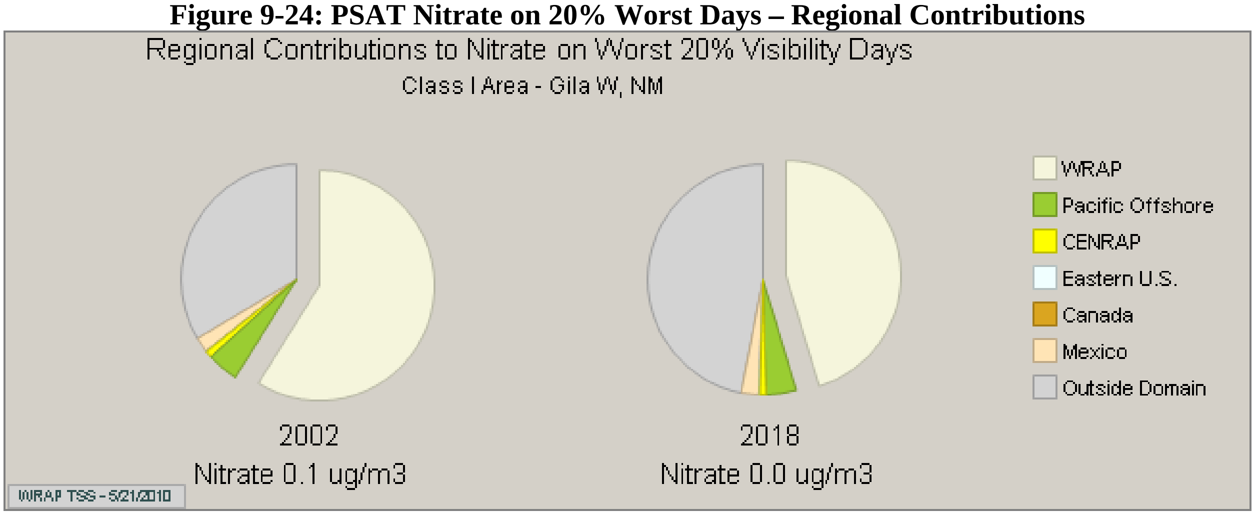
Figure 9-23: PSAT Sulfate on 20% Worst Days – WRAP States and Regional Contributions



Nitrate

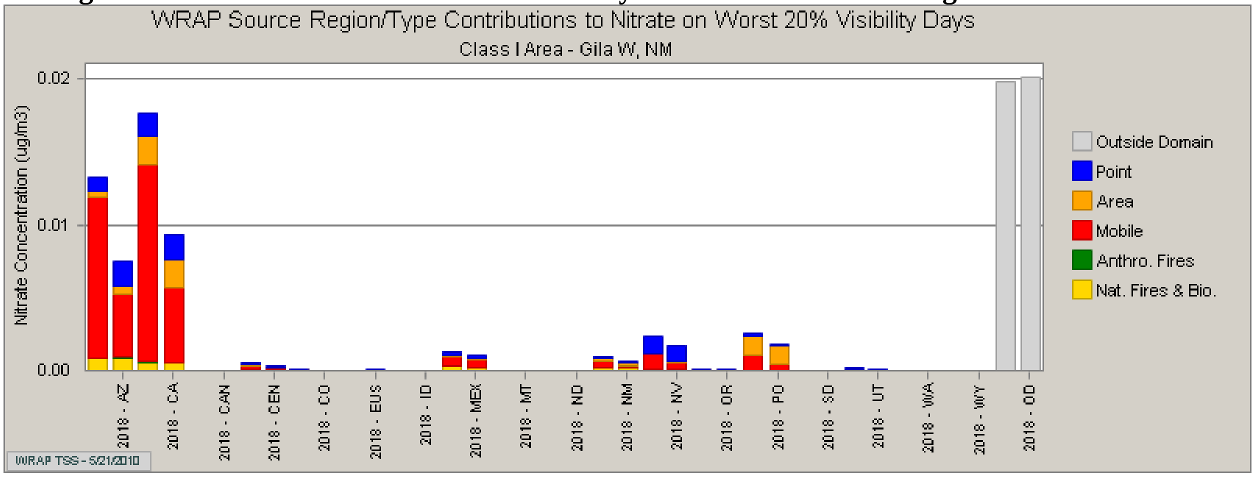
Nitrate concentrations at the East Unit are predominately from WRAP states and outside of the domain. Less than one-quarter of the remaining nitrate is from Mexico, CENRAP states, and Pacific Offshore.

Figure 9-24: PSAT Nitrate on 20% Worst Days – Regional Contributions



On the 20% worst days, California and Arizona are the greatest contributor to nitrate concentrations at Gila Wilderness. The majority of nitrate is from mobile sources, but nitrate from point sources is expected to increase by 2018. Nitrate from mobile sources is projected to decrease by 2018.

Figure 9-25: PSAT Nitrate on 20% Worst Days – WRAP States and Regional Contributions

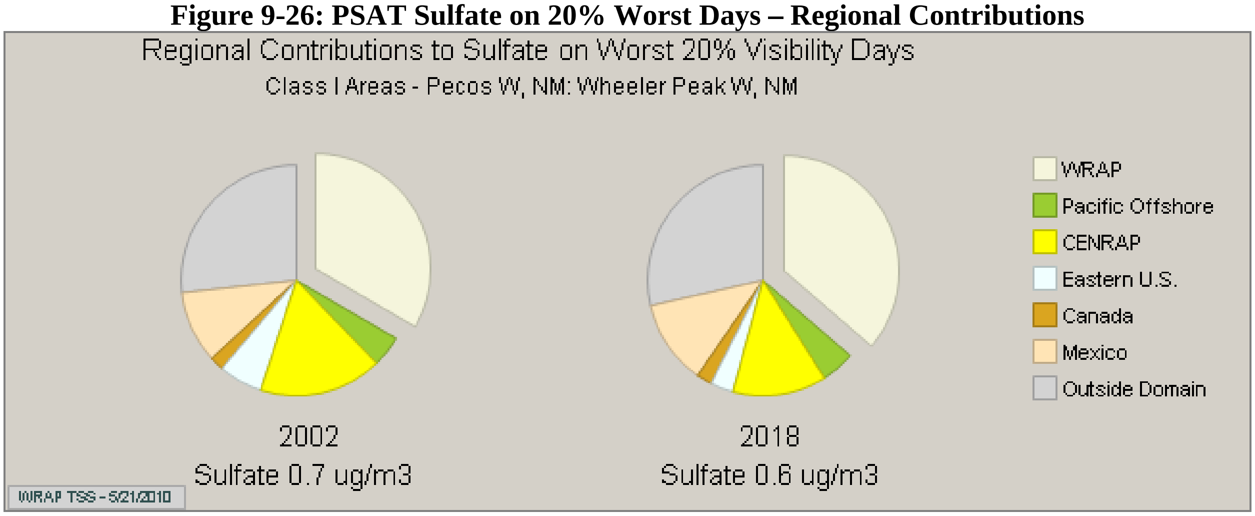


9.3.5 Pecos Wilderness, Wheeler Peak Wilderness

Sulfate

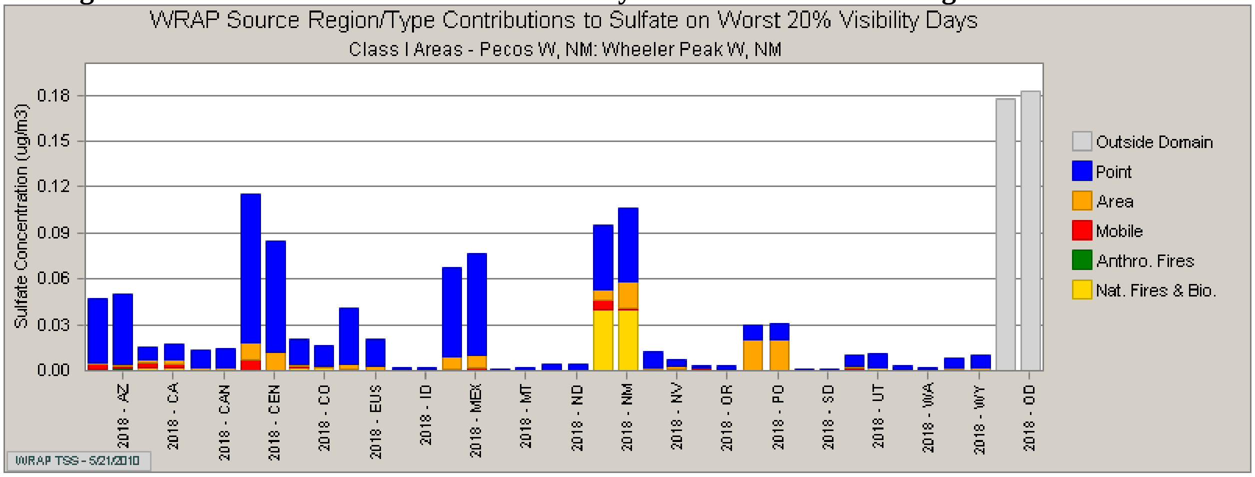
On a regional level, Figure 9-26 shows that approximately one-third of sulfate comes from the WRAP region in both the baseline period and 2018. Another one-fourth is from the outside domain. The remaining emissions are from CENRAP, Mexico, Eastern U.S., and Canada.

Figure 9-26: PSAT Sulfate on 20% Worst Days – Regional Contributions



The breakdown for WRAP States and other regional contributors in Figure 9-27 shows that the outside domain is the highest contributor to sulfate concentrations. The second highest contributor is Mexico, followed by Pacific offshore. Concentrations from Mexico are predominately from point sources, with a smaller amount from area sources. Source types from Pacific offshore are mostly area sources. Arizona is the third highest contributor to sulfate concentrations. Sulfate contributions from New Mexico, Mexico, Pacific offshore, and Arizona are projected to increase in 2018.

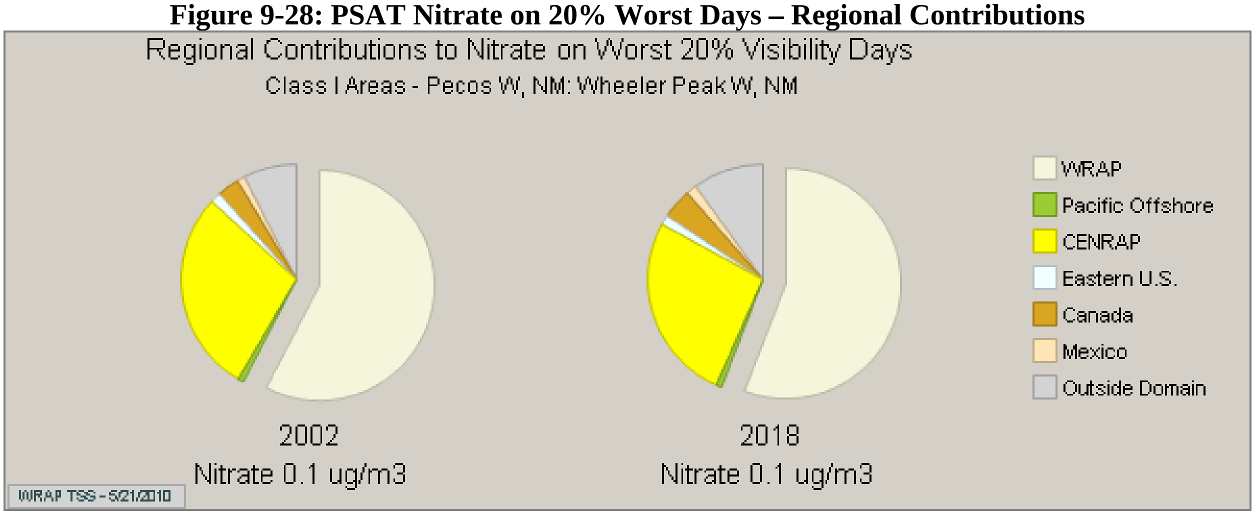
Figure 9-27: PSAT Sulfate on 20% Worst Days – WRAP States and Regional Contributions



Nitrate

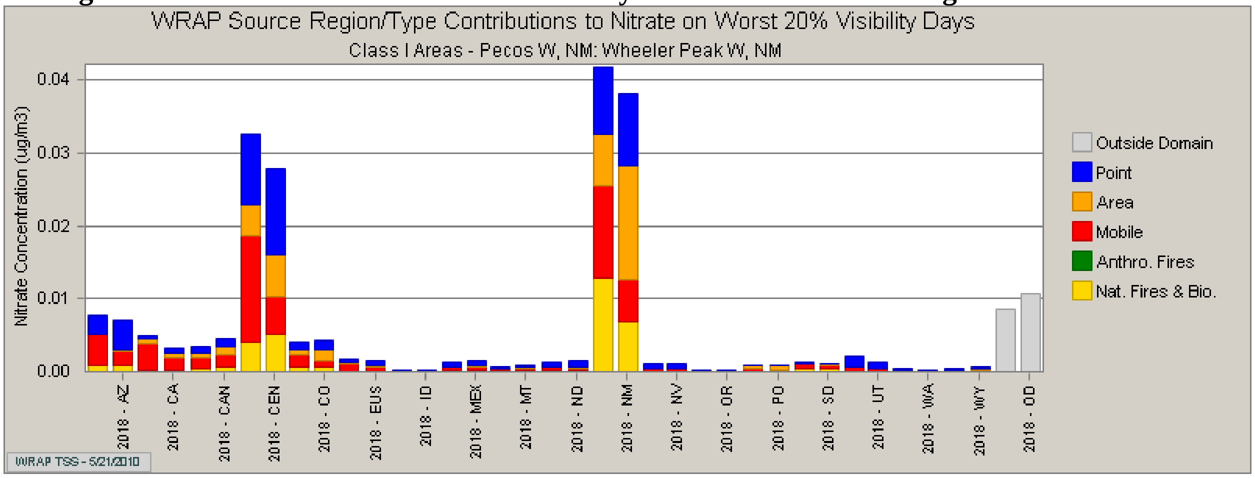
Almost two-thirds of emissions contributing to nitrate concentrations in 2018 are from the WRAP region. The remaining major contributor is CENRAP.

Figure 9-28: PSAT Nitrate on 20% Worst Days – Regional Contributions



Looking at contributors by State/region, the primary contributor to nitrate concentrations is New Mexico, followed by CENRAP states. Figure 9-28 shows the primary source types from New Mexico are area, point and mobile sources. Sources of nitrate from CENRAP are also mostly mobile and point with smaller amounts of nitrate from area sources.

Figure 9-29: PSAT Nitrate on 20% Worst Days – WRAP States and Regional Contributions



9.3.6 Salt Creek Wilderness

Sulfate

On a regional level about two-thirds of projected sulfate concentrations are from the Eastern U.S. and CENRAP regions.

Figure 9-30: PSAT Sulfate on 20% Worst Days – Regional Contributions

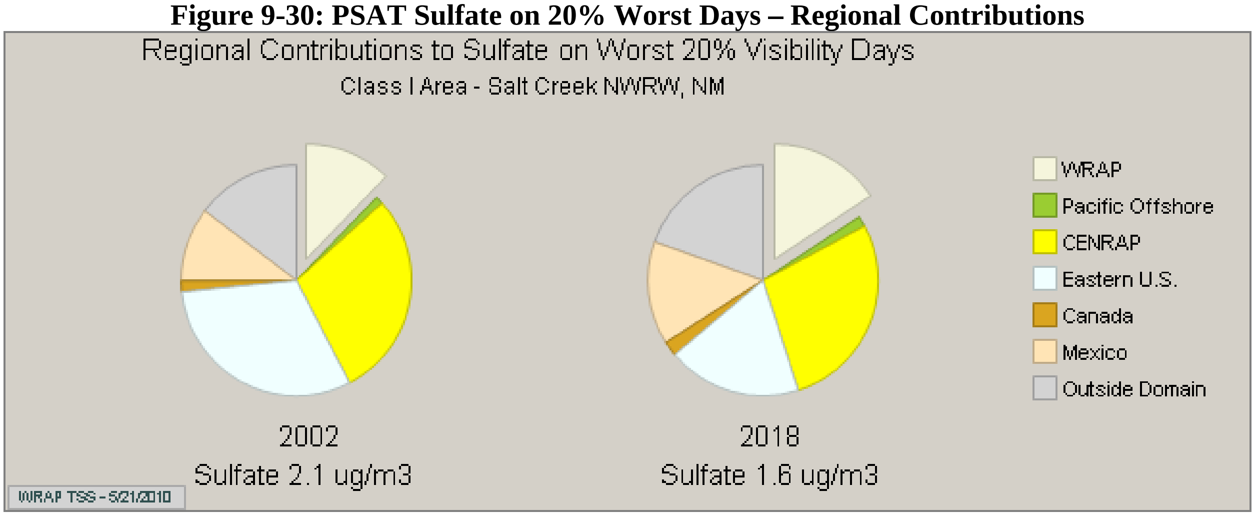
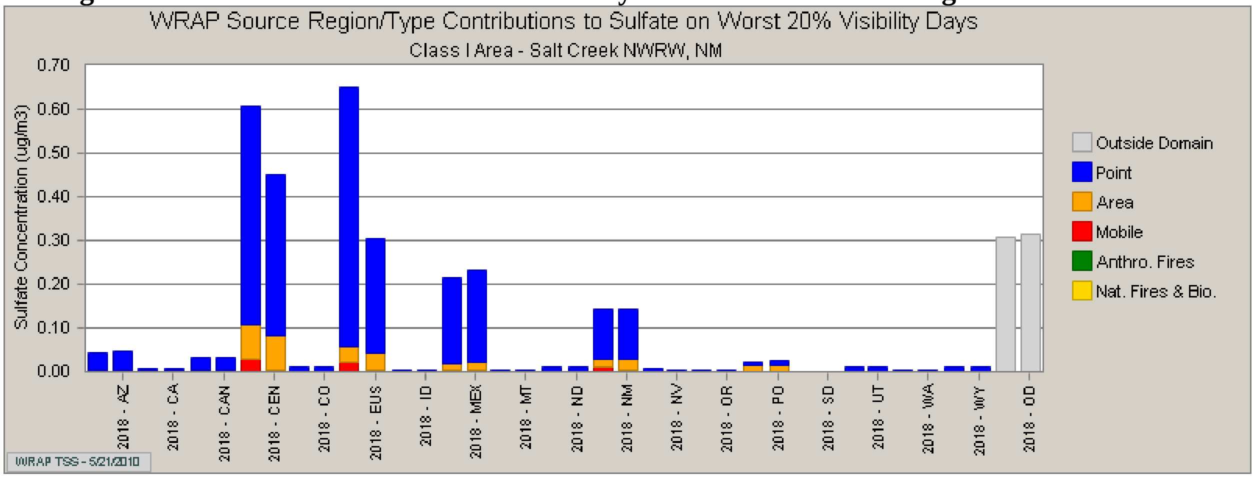


Figure 9-31 looks at the contribution of WRAP States and regional sources to sulfate concentrations. The highest concentrations are from the Eastern U.S. and CENRAP states, followed by outside domain, Mexico, and New Mexico. Sulfates are primarily from point sources. In New Mexico, sulfates from area sources are projected to increase in 2018.

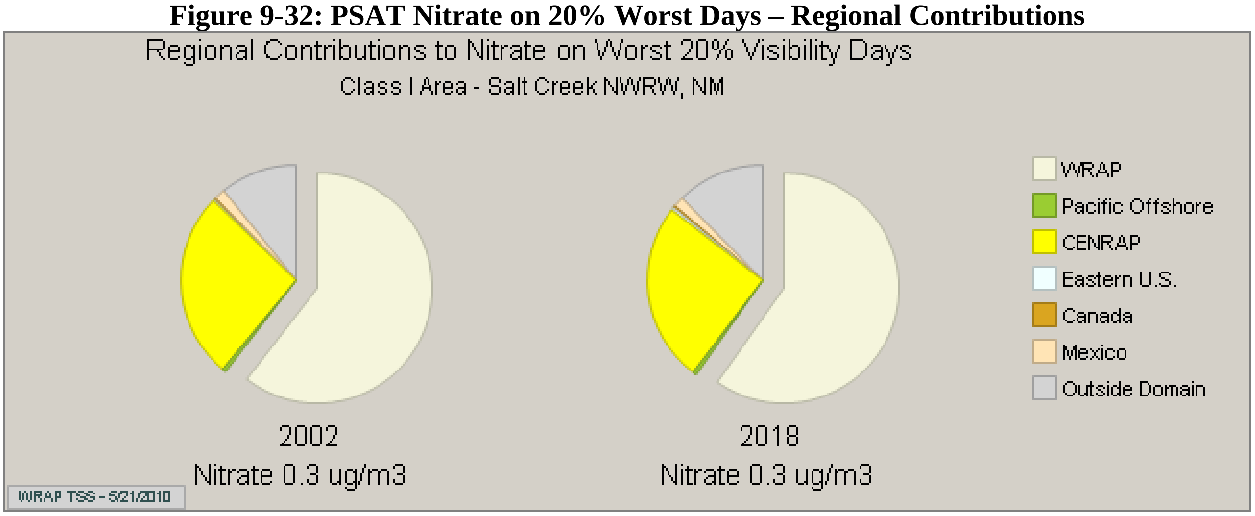
Figure 9-31: PSAT Sulfate on 20% Worst Days – WRAP States and Regional Contributions



Nitrate

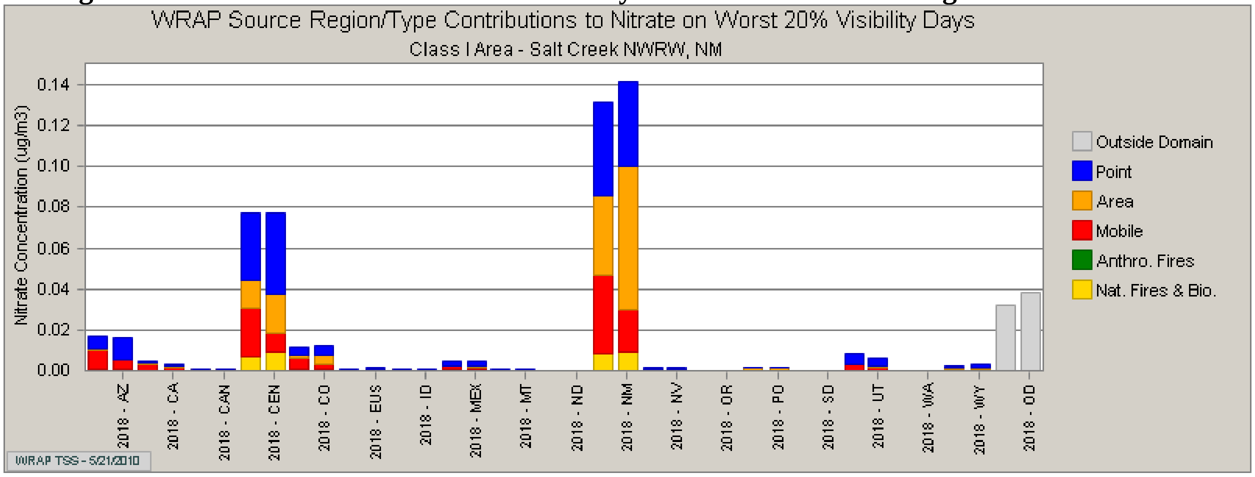
Figure 9-32 shows that about three-fourths of the nitrate concentrations at the Salt Creek Wilderness are from the WRAP region. The next highest contributor is CENRAP with most of the remaining emissions from outside the domain.

Figure 9-32: PSAT Nitrate on 20% Worst Days – Regional Contributions



Looking at contributions from WRAP States and other regional sources (Figure 9-33), the three highest contributors to nitrates are New Mexico, CENRAP, and outside domain. Point, mobile and area sources are the largest source of nitrate emissions. In New Mexico, nitrates are predicted to increase, generally from area sources.

Figure 9-33: PSAT Nitrate on 20% Worst Days – WRAP States and Regional Contributions



9.3.7 White Mountain Wilderness

Sulfate

On a regional level about two-thirds of projected sulfate concentrations are from the Eastern U.S. and CENRAP regions.

Figure 9-34: PSAT Sulfate on 20% Worst Days – Regional Contributions

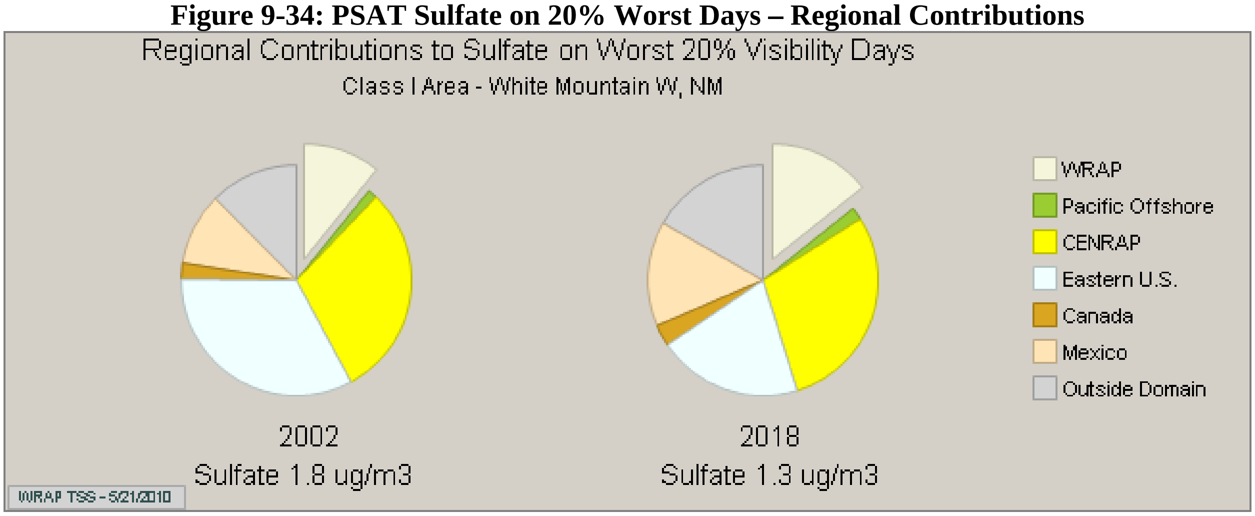
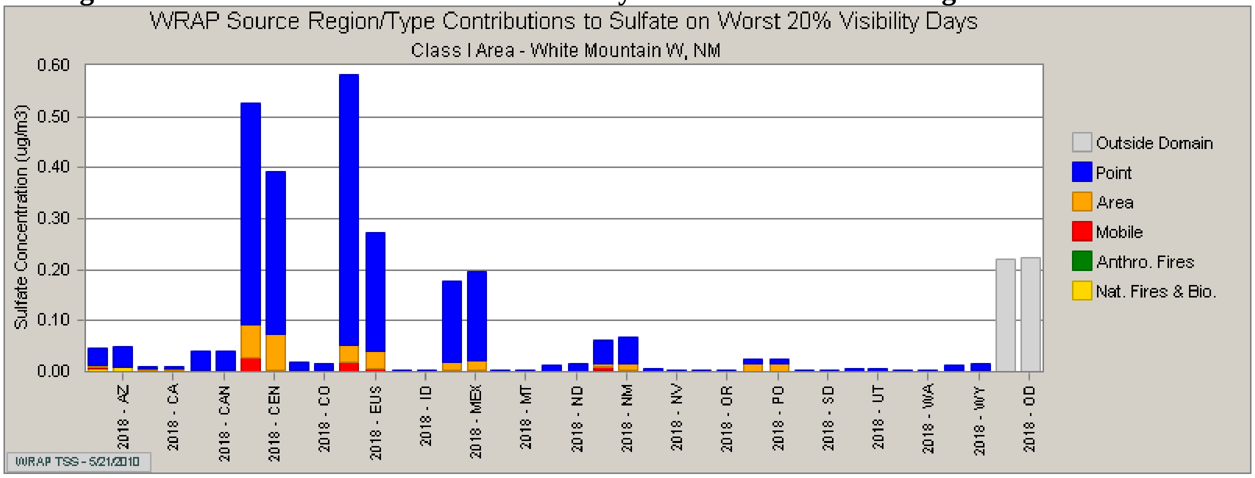


Figure 9-35 looks at the contribution of WRAP States and regional sources to sulfate concentrations. The highest concentrations are from the Eastern U.S. and CENRAP states, followed by outside domain, Mexico, and New Mexico. Sulfates are primarily from point sources. In New Mexico, sulfates from area sources are projected to increase in 2018.

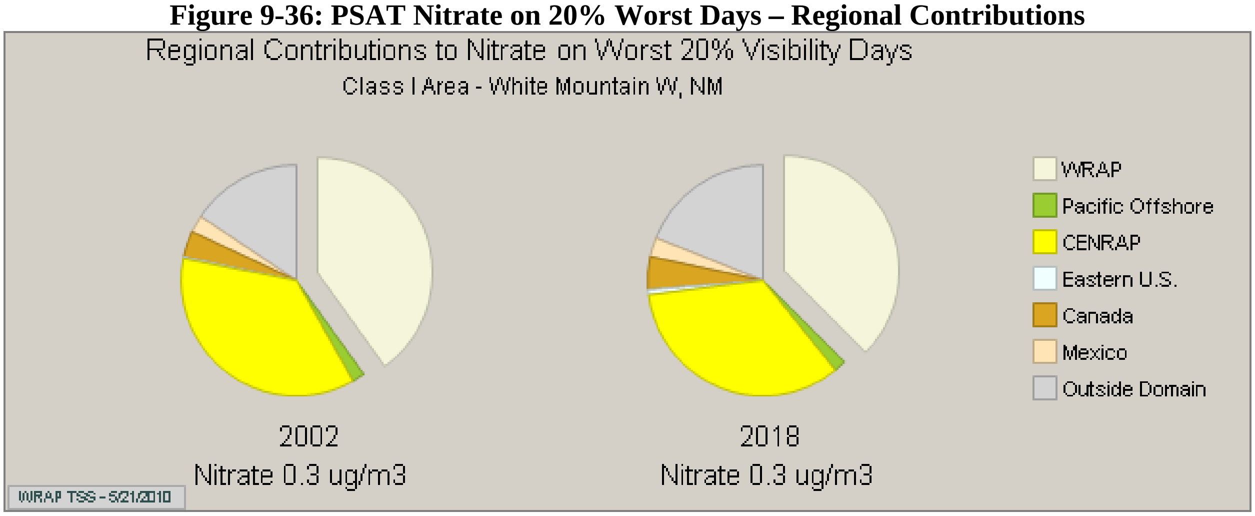
Figure 9-35: PSAT Sulfate on 20% Worst Days – WRAP States and Regional Contributions



Nitrate

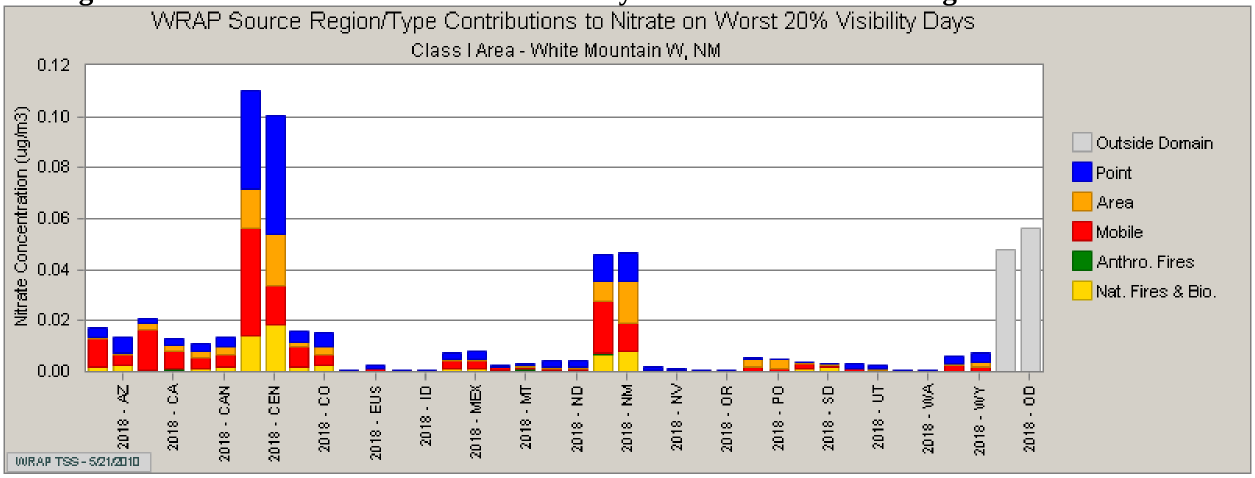
Figure 9-36 shows that over one-third of the nitrate concentrations at the Salt Creek Wilderness are from the WRAP region, with another third from CENRAP.

Figure 9-36: PSAT Nitrate on 20% Worst Days – Regional Contributions



Looking at contributions from WRAP States and other regional sources (Figure 9-37), the three highest contributors to nitrates are CENRAP, New Mexico, and outside domain. Mobile and point sources are the largest source of nitrate emissions. In New Mexico, nitrates are predicted to increase, generally from area sources.

Figure 9-37: PSAT Nitrate on 20% Worst Days – WRAP States and Regional Contributions



9.4 Summary of WEP Results

Nitrogen oxides (NOx), sulfur oxides (SOx), organic carbon (primary organic aerosol), elemental carbon, fine soil, and coarse mass were analyzed using the Weighted Emissions Potential (WEP) tool. The WEP analysis was developed as a screening tool for states to decide which source regions have the potential to contribute to haze formation at specific Class I areas, based on both the baseline and 2018 emissions inventories. Unlike the SOx/NOx Tracer analysis, this method does not account for chemistry and removal processes. Instead, the WEP analysis relies on an integration of gridded emissions data, meteorological back trajectory residence time data, a one-over-distance factor to approximate deposition, and a normalization of the final results. Residence time over an area is indicative of general flow patterns, but does not necessarily imply the area contributed significantly to haze at a given receptor. Therefore, users are cautioned to view the WEP analysis as one piece of a larger, more comprehensive weight of evidence analysis.

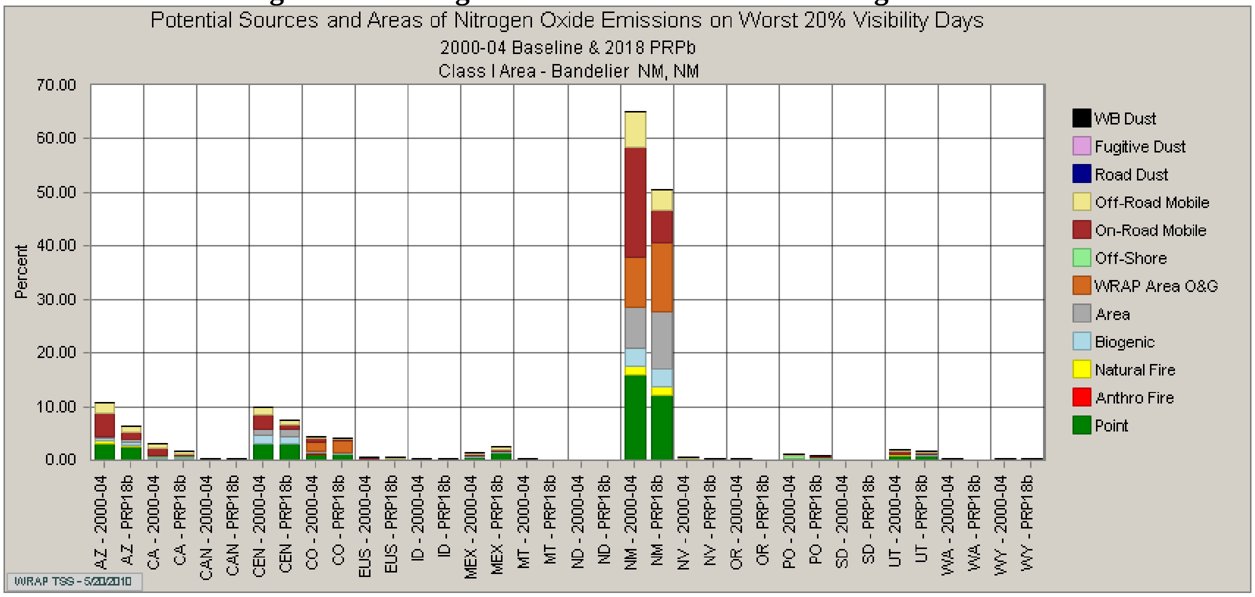
The WEP bar charts display normalized (unitless), residence time- and distance-weighted annual emissions value, by emissions source region. These WEP results are reminiscent of the SOx/NOx Tracer tool results. However, the WEP results are considered less rigorous and should be used only as a screening tool to identify regions with the potential to impact Class I areas. The bar chart presents results for the Baseline and 2018 PRP(b) emissions scenarios. Note that a reported change in regional percent contribution between two scenarios does not necessarily imply a larger or smaller impact on haze formation.

9.4.1 Bandelier Wilderness

Nitrogen Oxides

Figure 9-38 shows that New Mexico has the highest potential to contribute to nitrogen oxide emissions. Point and on-road mobile sources decrease from the baseline (2000-2004) to 2018, with area and area oil and gas sources increasing. Overall, New Mexico's contributions to nitrogen oxides decrease from the baseline period to 2018. Contributions from Mexico increase over the planning period.

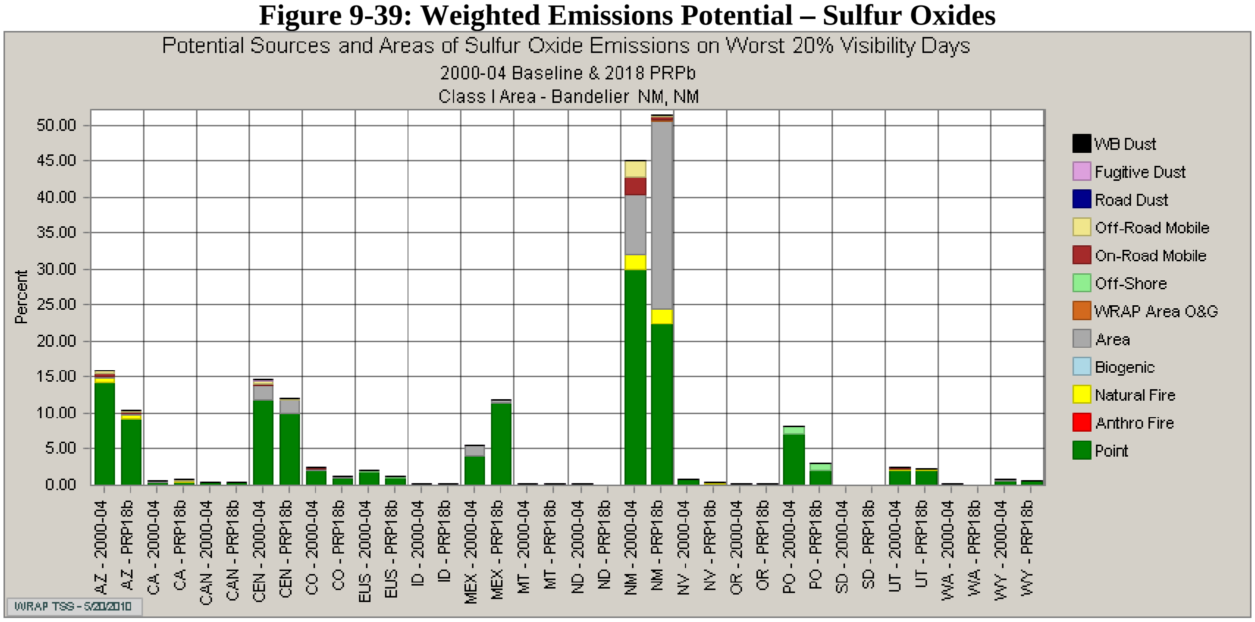
Figure 9-38: Weighted Emissions Potential – Nitrogen Oxides



Sulfur Oxides

Figure 9-39 shows that New Mexico has the highest potential to contribute to sulfur oxide emissions. Point and on-road mobile sources decrease from the baseline (2000-2004) to 2018, with area sources more than doubling in contribution. Overall, New Mexico's contributions to sulfur oxides increase from the baseline period to 2018 because of the increased contribution from area sources. Contribution from Mexico also increases over the planning period.

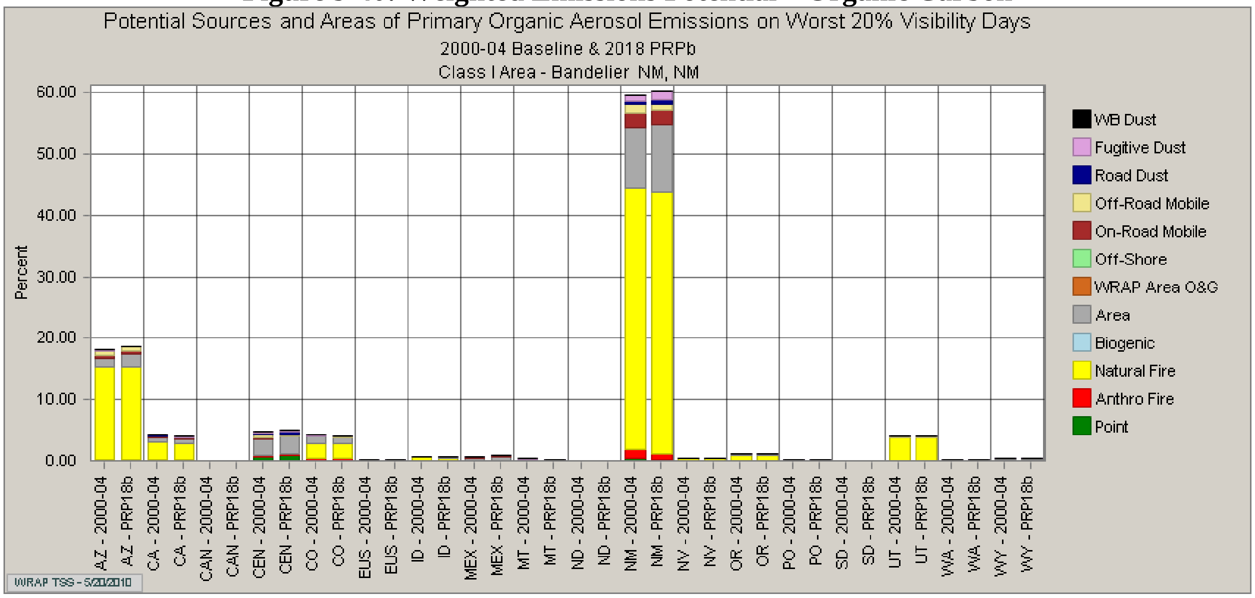
Figure 9-39: Weighted Emissions Potential – Sulfur Oxides



Organic Carbon

Figure 9-40 shows that New Mexico has the highest potential to contribute to organic carbon emissions. The source category with the greatest potential to contribute is natural fire. The other categories include area, on-road and off-road mobile, and fugitive dust sources. Total potential for New Mexico sources to emit organic carbon is projected to increase in 2018, mostly from area sources.

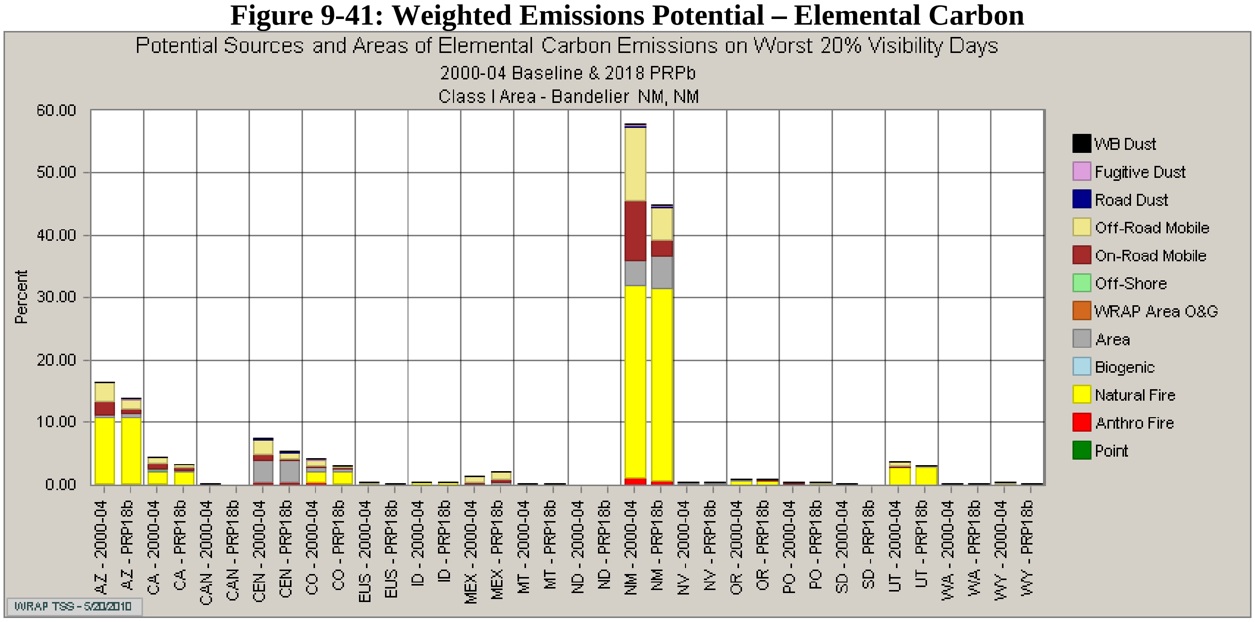
Figure 9-40: Weighted Emissions Potential – Organic Carbon



Elemental Carbon

As shown in Figure 9-41, New Mexico has the greatest potential to contribute to elemental carbon. The primary source is natural fire, followed by on- and off-road mobile sources. Elemental carbon from on- and off-road mobile sources is expected to decrease by 2018.

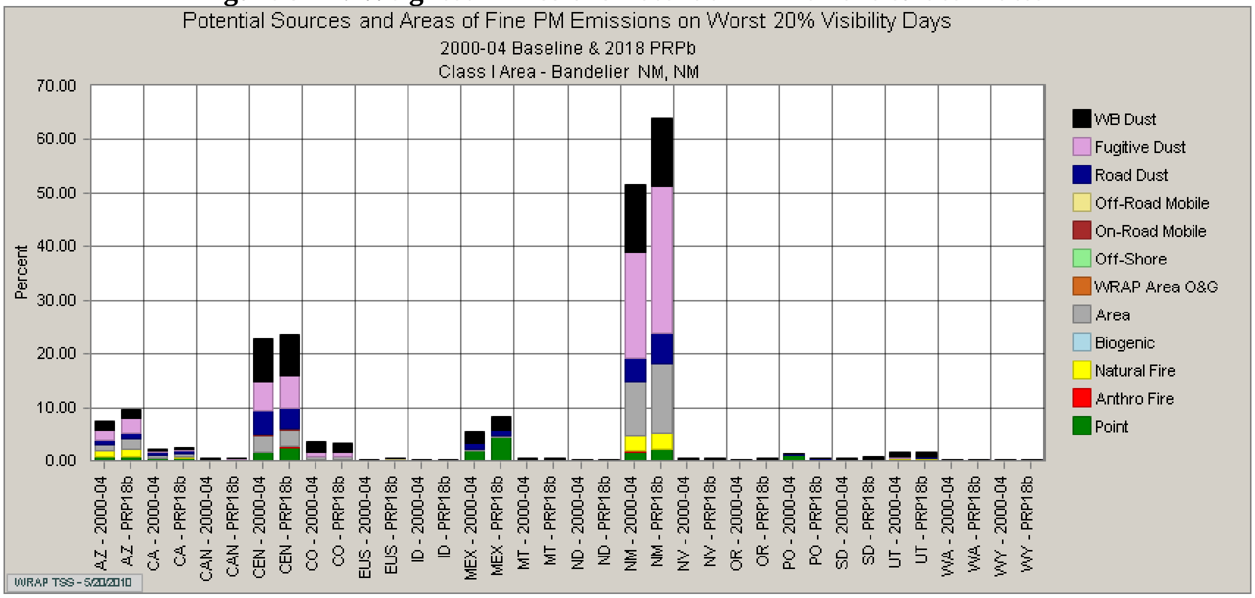
Figure 9-41: Weighted Emissions Potential – Elemental Carbon



Fine Particulate Matter

Sources of fine particulate matter from New Mexico have the greatest potential to contribute on the 20% worst days. The potential for fine PM from New Mexico, CENRAP states, Arizona and Mexico is expected to increase in 2018. The source categories in New Mexico with the greatest potential to contribute are area and fugitive dust.

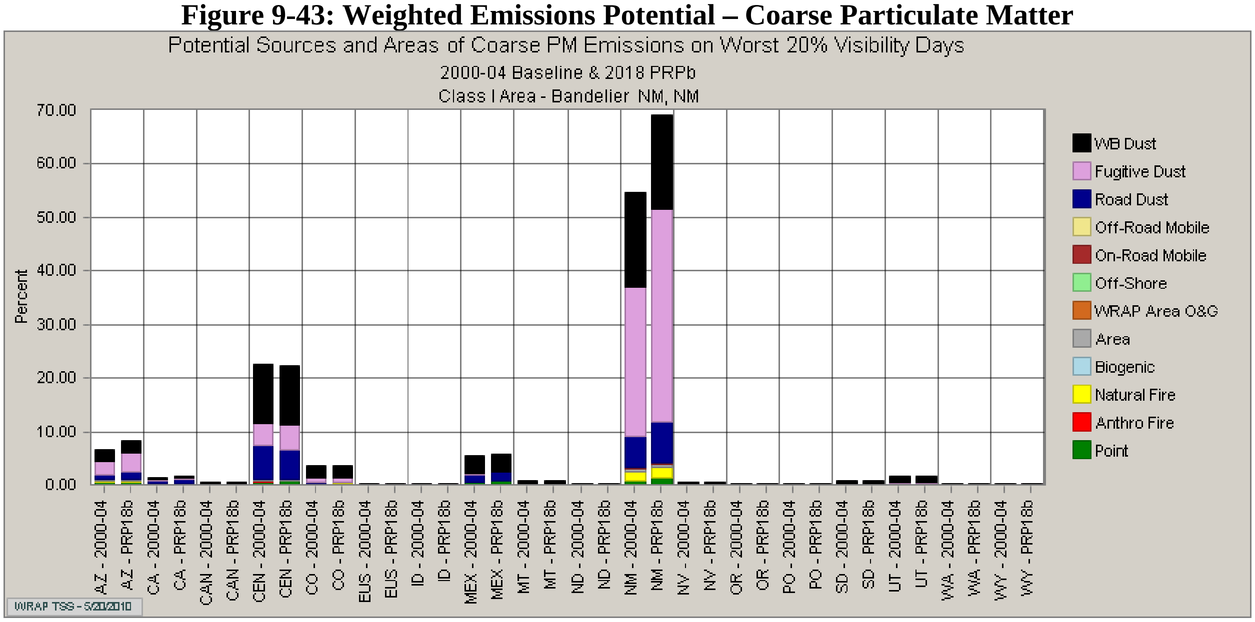
Figure 9-42: Weighted Emissions Potential – Fine Particulate Matter



Coarse Particulate Matter

Figure 9-43 shows that fugitive dust from New Mexico has the greatest potential to contribute to coarse mass.

Figure 9-43: Weighted Emissions Potential – Coarse Particulate Matter

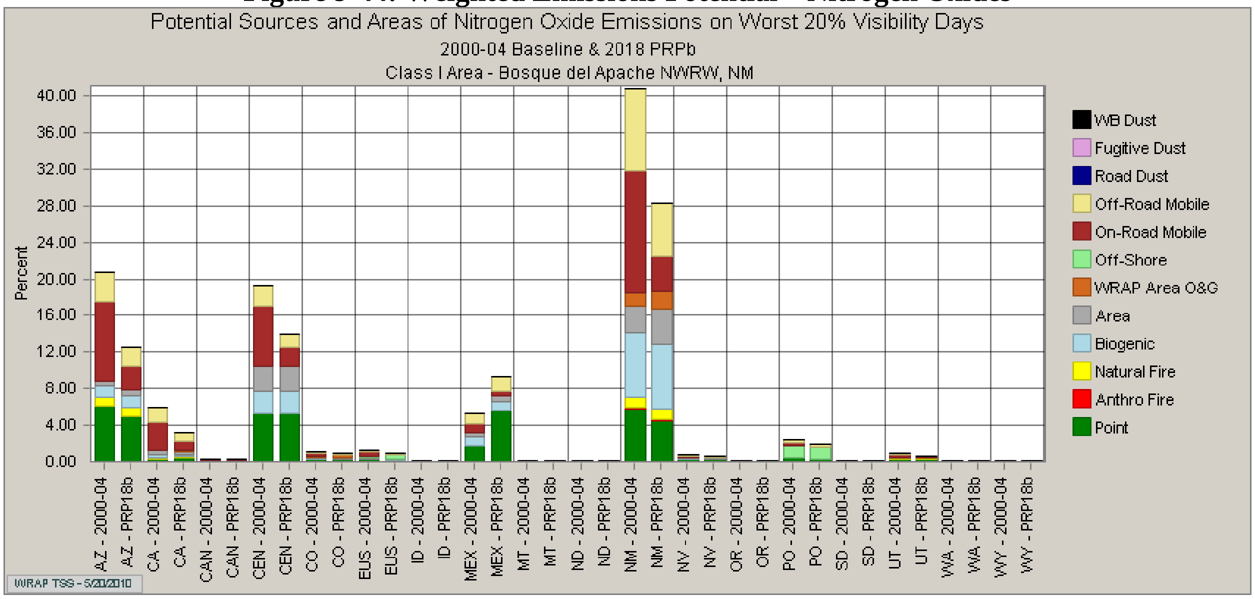


9.4.2 Bosque del Apache National Wildlife Refuge

Nitrogen Oxides

Figure 9-44 shows that New Mexico has the highest potential to contribute to nitrogen oxide emissions. Point, on- and off-road mobile sources decrease from the baseline (2000-2004) to 2018, with area and area oil and gas sources increasing. Arizona and CENRAP also have a significant, but decreasing, contribution. Overall, New Mexico's contributions to nitrogen oxides decrease from the baseline period to 2018. Contributions from Mexico increase over the planning period.

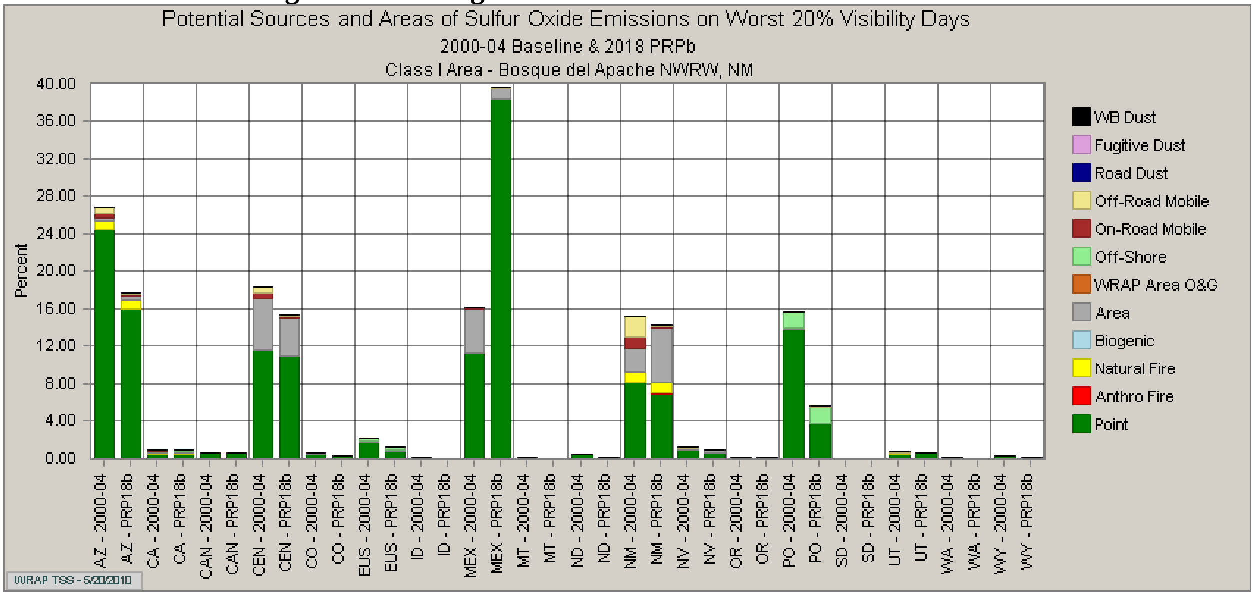
Figure 9-44: Weighted Emissions Potential – Nitrogen Oxides



Sulfur Oxides

Figure 9-45 shows that Mexico has the highest potential to contribute to sulfur oxide emissions, followed by Arizona and CENRAP. Point and on- and off-road mobile sources in New Mexico, Arizona and CENRAP decrease from the baseline (2000-2004) to 2018, with area sources in New Mexico more than doubling in contribution. Overall, New Mexico, Arizona and CENRAP's contributions to sulfur oxides decrease from the baseline period to 2018. Contribution from Mexico from point sources more than triples over the planning period.

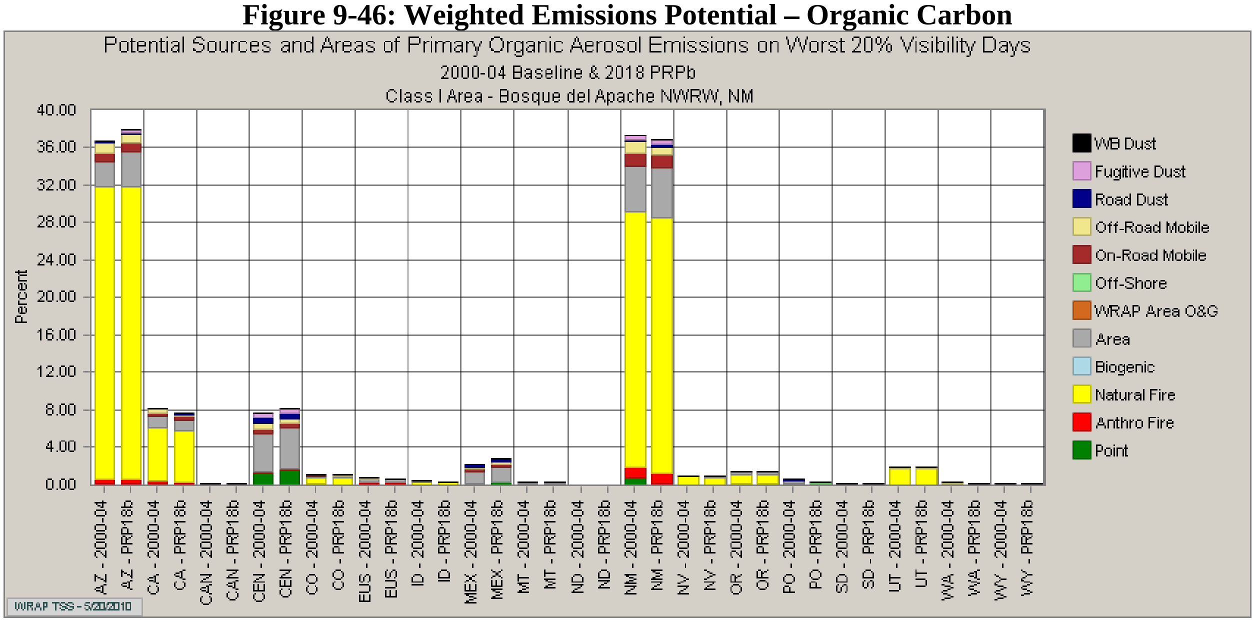
Figure 9-45: Weighted Emissions Potential – Sulfur Oxides



Organic Carbon

Figure 9-46 shows that Arizona and New Mexico have the highest potential to contribute to organic carbon emissions. The source category with the greatest potential to contribute is natural fire. Total potential for New Mexico sources to emit organic carbon is projected to decrease in 2018, with contributions from Arizona sources projected to increase, mostly from area sources.

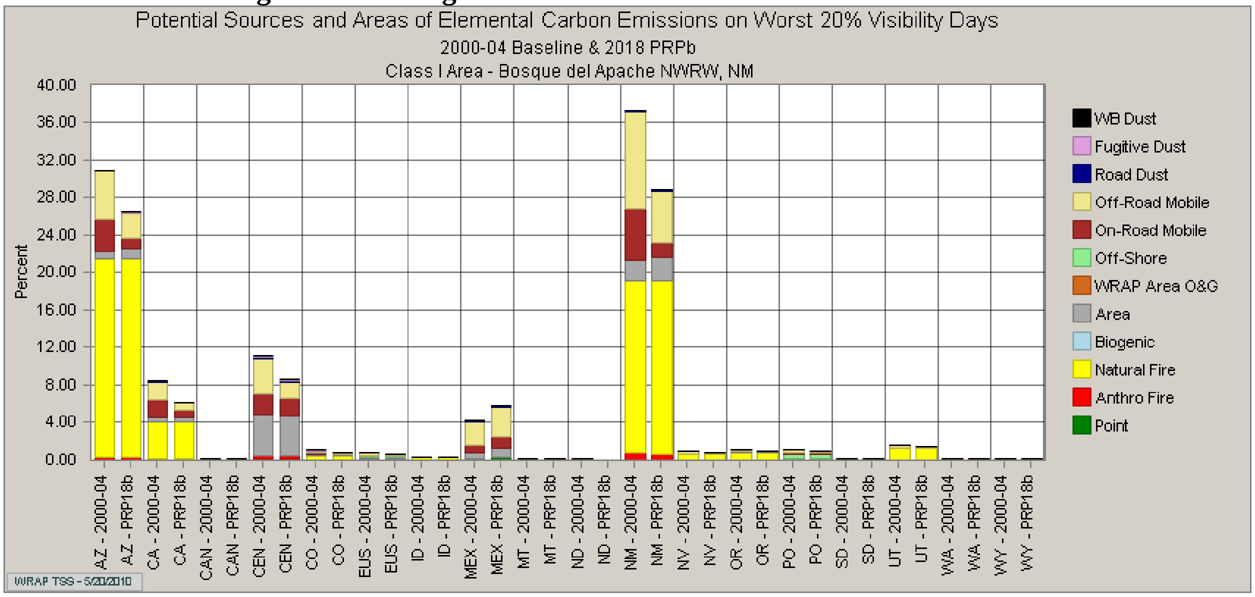
Figure 9-46: Weighted Emissions Potential – Organic Carbon



Elemental Carbon

As shown in Figure 9-47, New Mexico has the greatest potential to contribute to elemental carbon, with Arizona also having a large contribution. The primary source is natural fire, followed by on- and off-road mobile sources. Elemental carbon from on- and off-road mobile sources is expected to decrease by 2018.

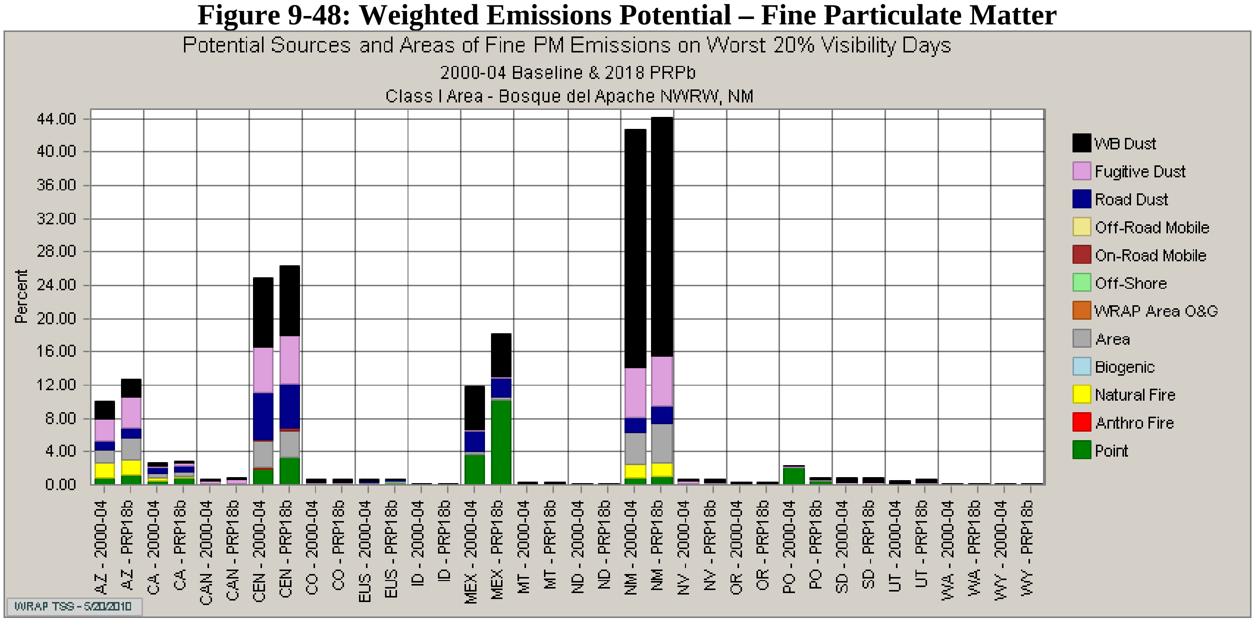
Figure 9-47: Weighted Emissions Potential – Elemental Carbon



Fine Particulate Matter

Sources of fine particulate matter from New Mexico have the greatest potential to contribute on the 20% worst days. The potential for fine PM from New Mexico, CENRAP states, Arizona and Mexico is expected to increase in 2018. The source category in New Mexico with the greatest potential to contribute is windblown dust.

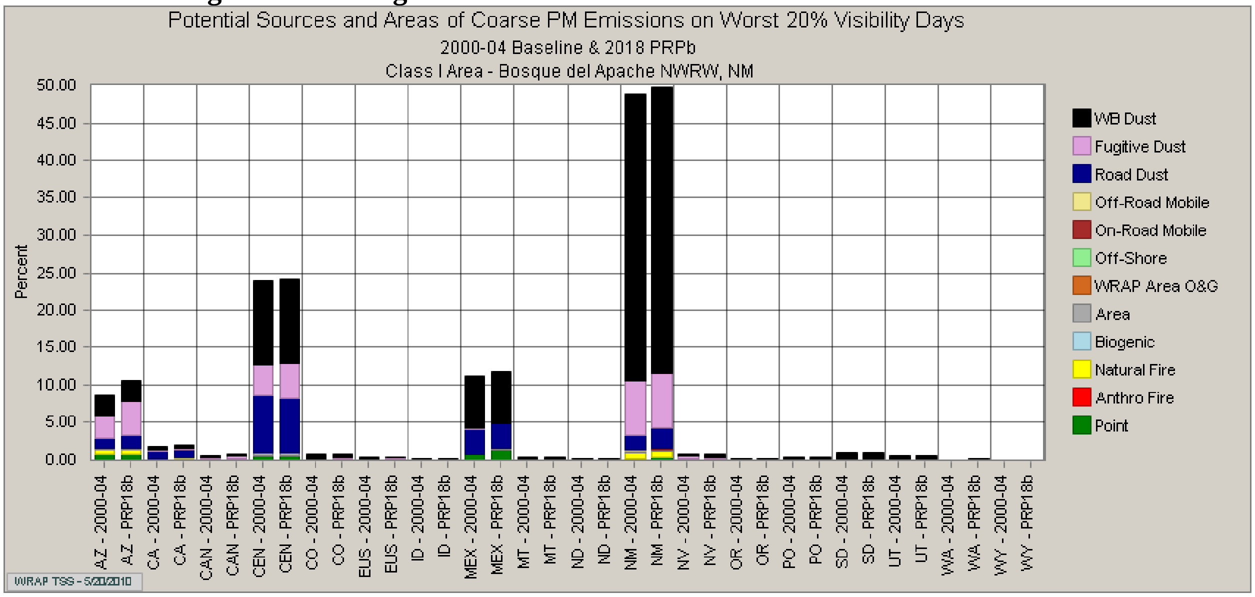
Figure 9-48: Weighted Emissions Potential – Fine Particulate Matter



Coarse Particulate Matter

Figure 9-49 shows that fugitive dust from New Mexico has the greatest potential to contribute to coarse mass, with the greatest contribution from windblown dust.

Figure 9-49: Weighted Emissions Potential – Coarse Particulate Matter

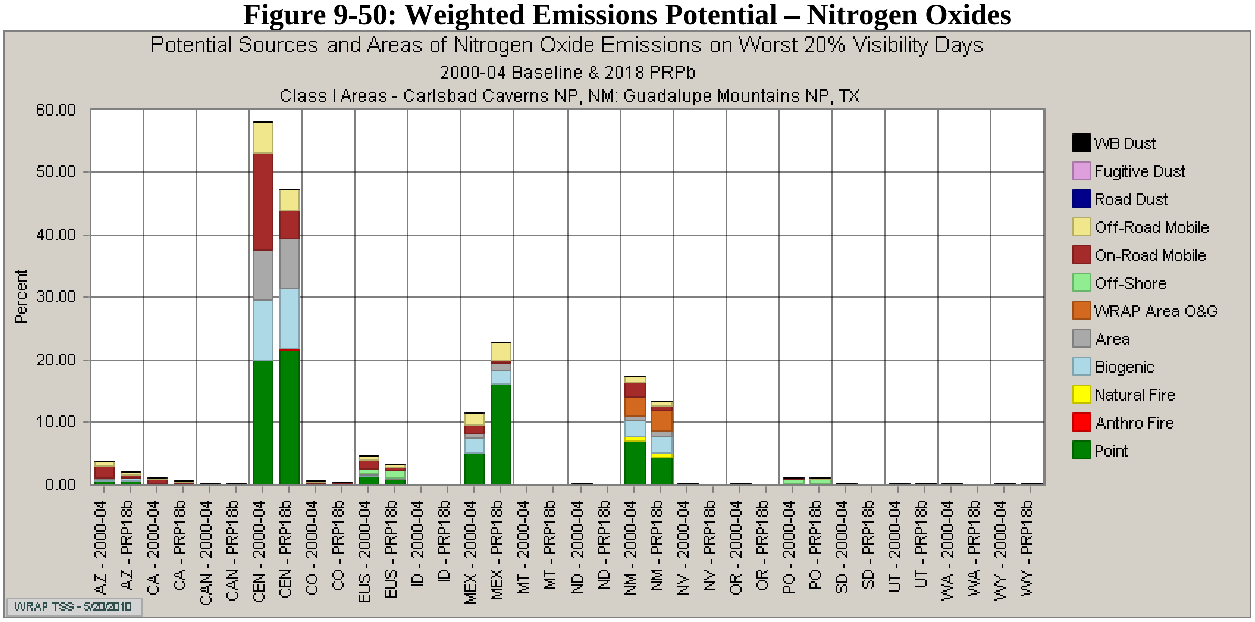


9.4.3 Carlsbad Caverns National Park

Nitrogen Oxides

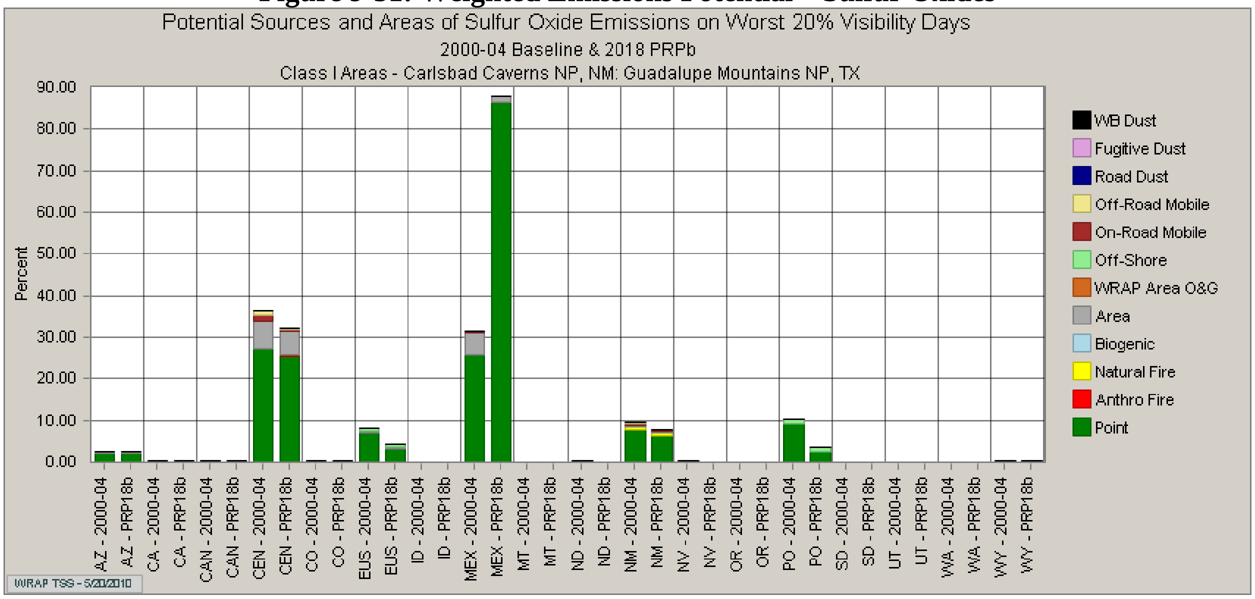
Figure 9-50 shows that CENRAP states have the highest potential to contribute to nitrogen oxide emissions. On- and off-road mobile sources decrease from the baseline (2000-2004) to 2018, with point sources increasing. Overall, New Mexico's contributions to nitrogen oxides decrease from the baseline period to 2018. Contributions from Mexico increase over the planning period with point sources tripling in contribution.

Figure 9-50: Weighted Emissions Potential – Nitrogen Oxides



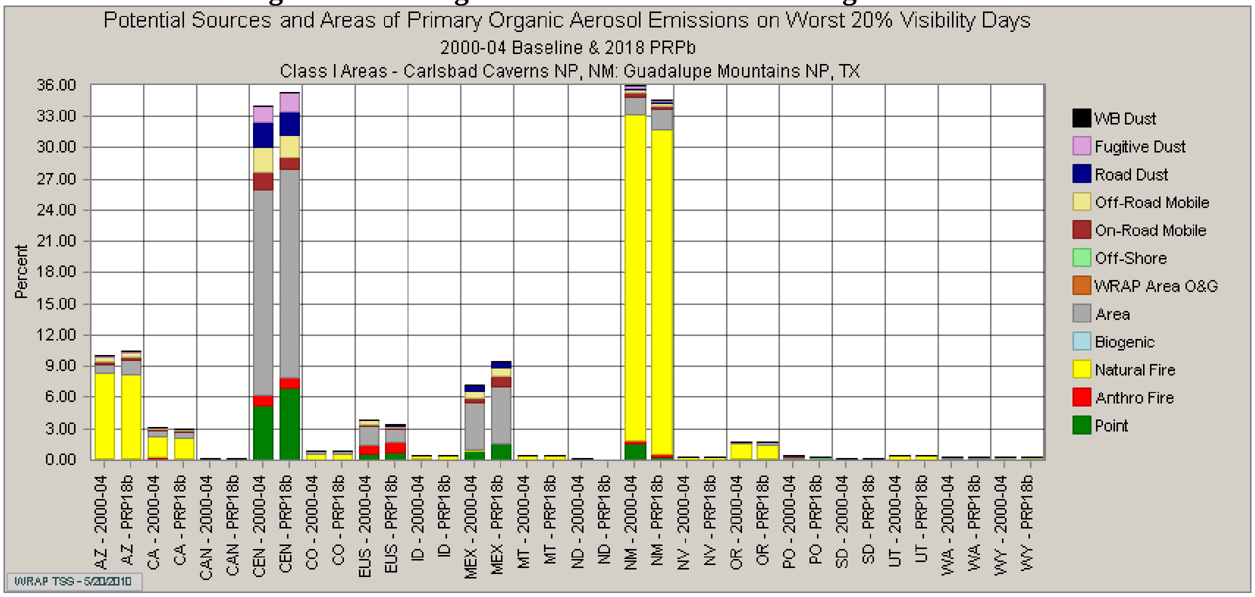
Sulfur Oxides
Figure 9-51 shows that Mexico has the highest potential to contribute to sulfur oxide emissions. Point sources almost triple in contribution. Overall, New Mexico's contributions to sulfur oxides decrease from the baseline period to 2018. CENRAP states' contribution is also significant, but decreases over the planning period.

Figure 9-51: Weighted Emissions Potential – Sulfur Oxides



Organic Carbon
Figure 9-52 shows that New Mexico has the highest potential to contribute to organic carbon emissions. The source category with the greatest potential to contribute is natural fire. Contribution from sources in the CENRAP region increase over the planning period, with increases in point and area sources. Contribution from Arizona and Mexico sources also increase over the planning period, with most of the increase coming from area sources. Total potential for New Mexico sources to emit organic carbon is projected to decrease in 2018.

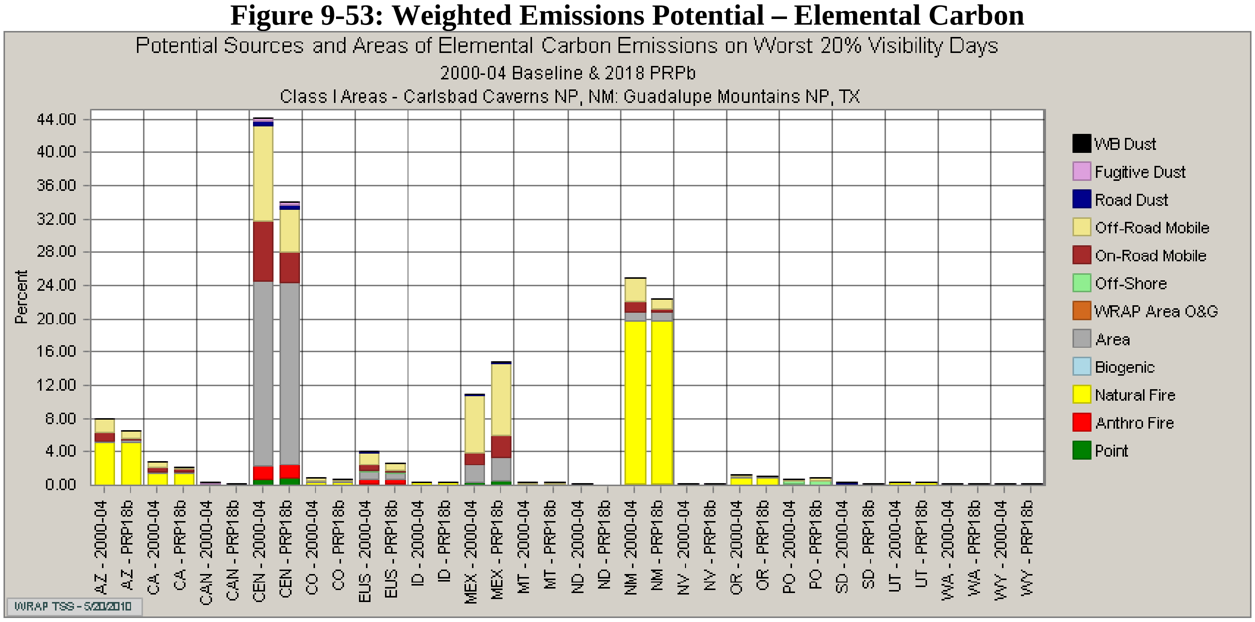
Figure 9-52: Weighted Emissions Potential – Organic Carbon



Elemental Carbon

As shown in Figure 9-53, contribution from CENRAP states is significant for Carlsbad Caverns for elemental carbon. The primary source category is area sources, followed by on- and off-road mobile sources. Elemental carbon from on- and off-road mobile sources is expected to decrease by 2018. Contributions from New Mexico are dominated by fire, and total New Mexico contributions are expected to decrease. Mexico source contributions are expected to increase over the planning period.

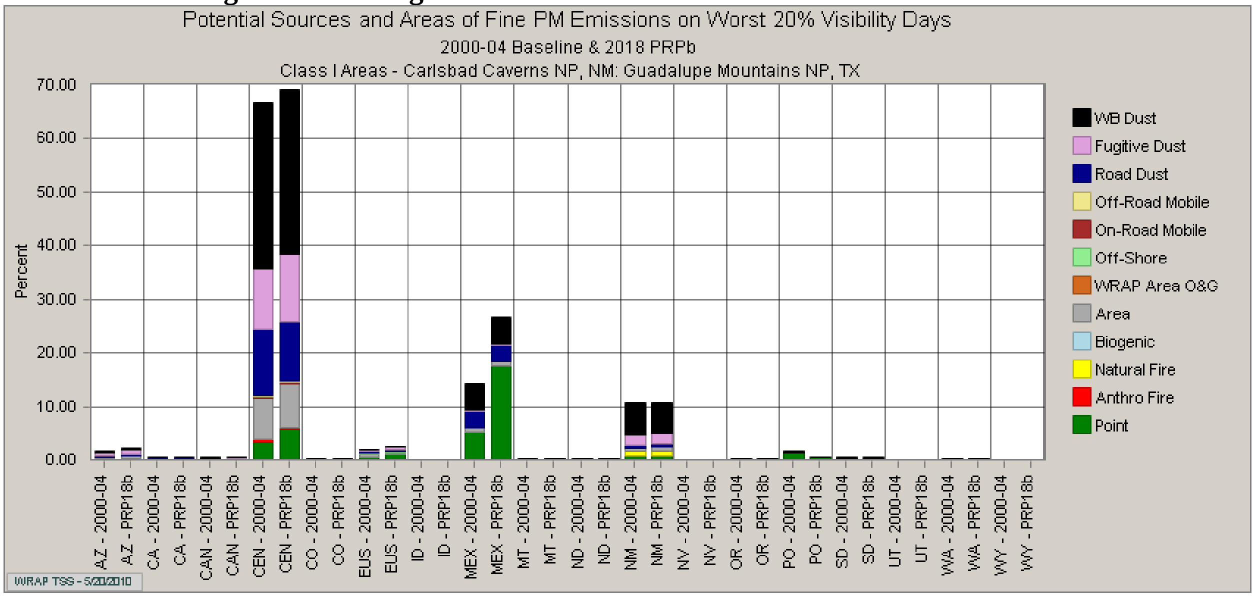
Figure 9-53: Weighted Emissions Potential – Elemental Carbon



Fine Particulate Matter

Sources of fine particulate matter from the CENRAP region have the greatest potential to contribute on the 20% worst days. The potential for fine PM from CENRAP states and Mexico is expected to increase in 2018, with increases in contribution from point sources. The source category in New Mexico with the greatest potential to contribute is windblown dust.

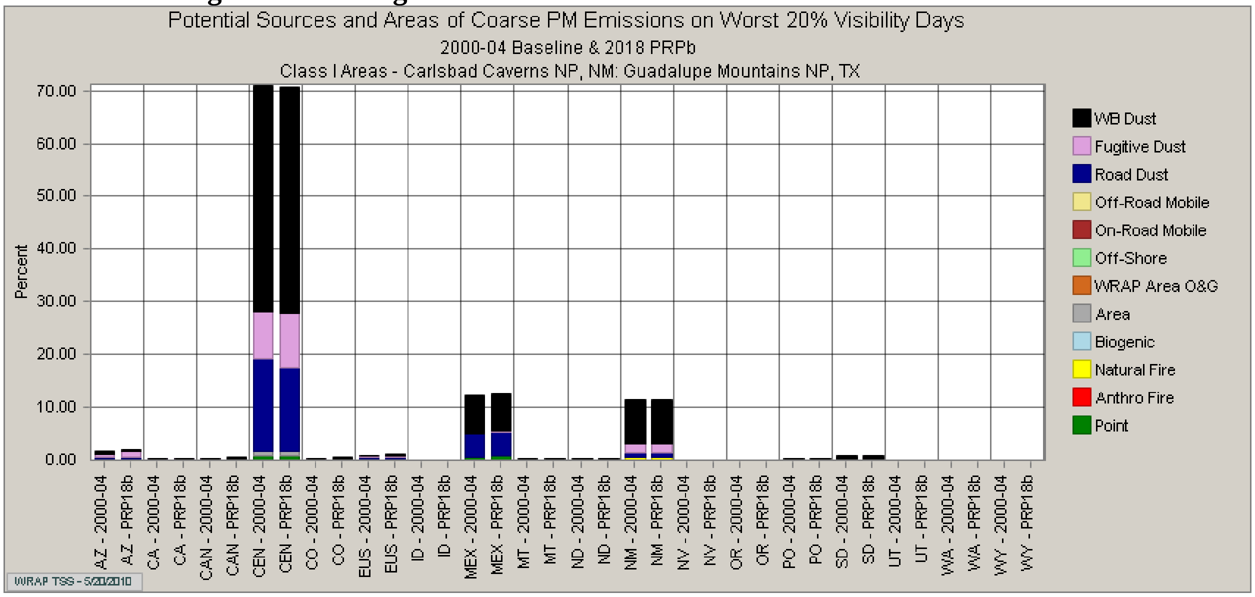
Figure 9-54: Weighted Emissions Potential – Fine Particulate Matter



Coarse Particulate Matter

Figure 9-55 shows that windblown dust from the CENRAP region has the greatest potential to contribute to coarse mass. There is also a significant contribution of coarse particulate matter from windblown dust in Mexico and New Mexico.

Figure 9-55: Weighted Emissions Potential – Coarse Particulate Matter

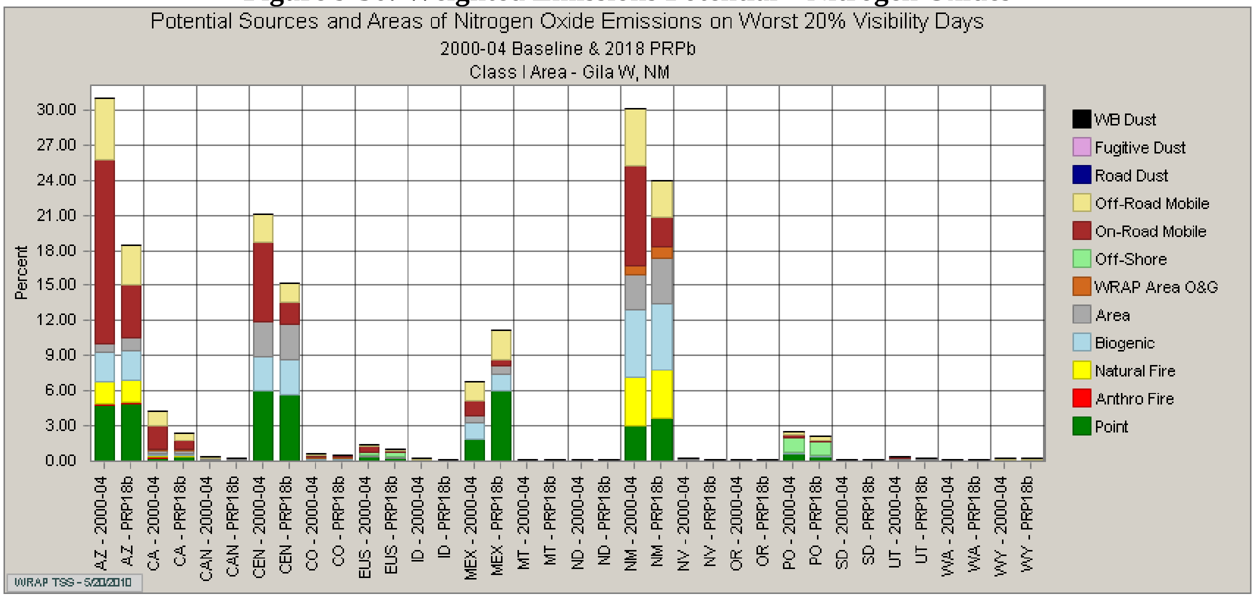


9.4.4 Gila Wilderness

Nitrogen Oxides

Figure 9-56 shows that Arizona, New Mexico and the CENRAP region have the highest potential to contribute to nitrogen oxide emissions. Overall, these contributions decrease from the baseline period to 2018 with the decreases attributable to on- and off-road mobile sources. Contributions from Mexico increase over the planning period.

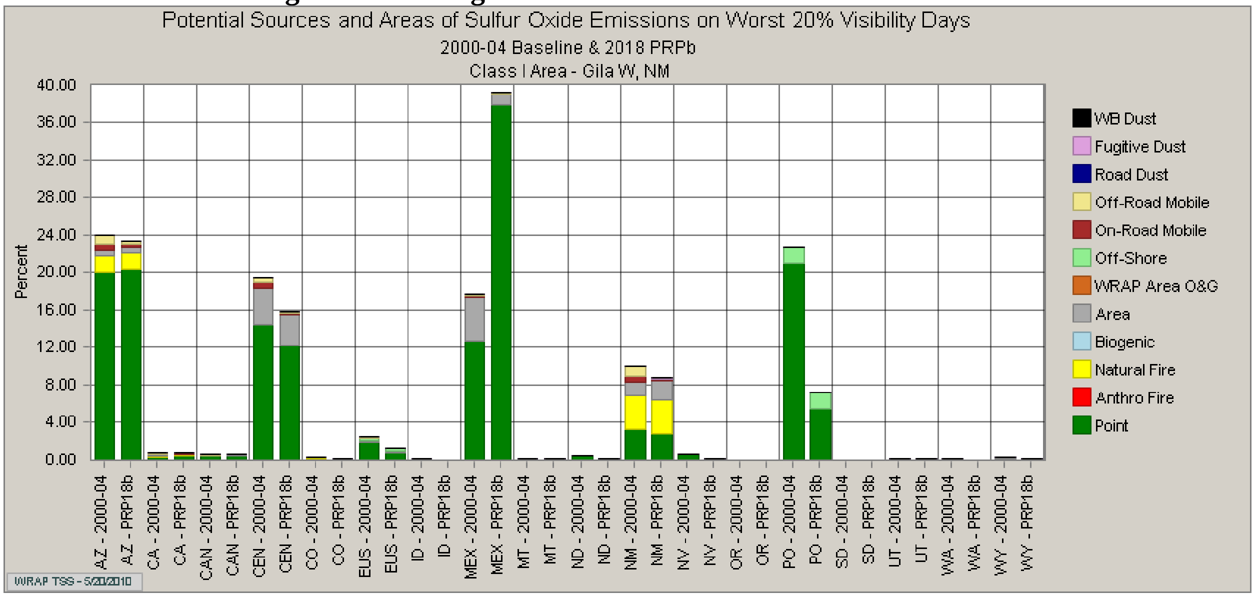
Figure 9-56: Weighted Emissions Potential – Nitrogen Oxides



Sulfur Oxides

Figure 9-57 shows that Mexico has the highest potential to contribute to sulfur oxide emissions in 2018, with Arizona being the largest contributor in the baseline period (2000-2004). Mexico's contribution from point sources more than doubles from the baseline period to 2018. Overall, Arizona's and New Mexico's contributions to sulfur oxides decrease from the baseline period to 2018.

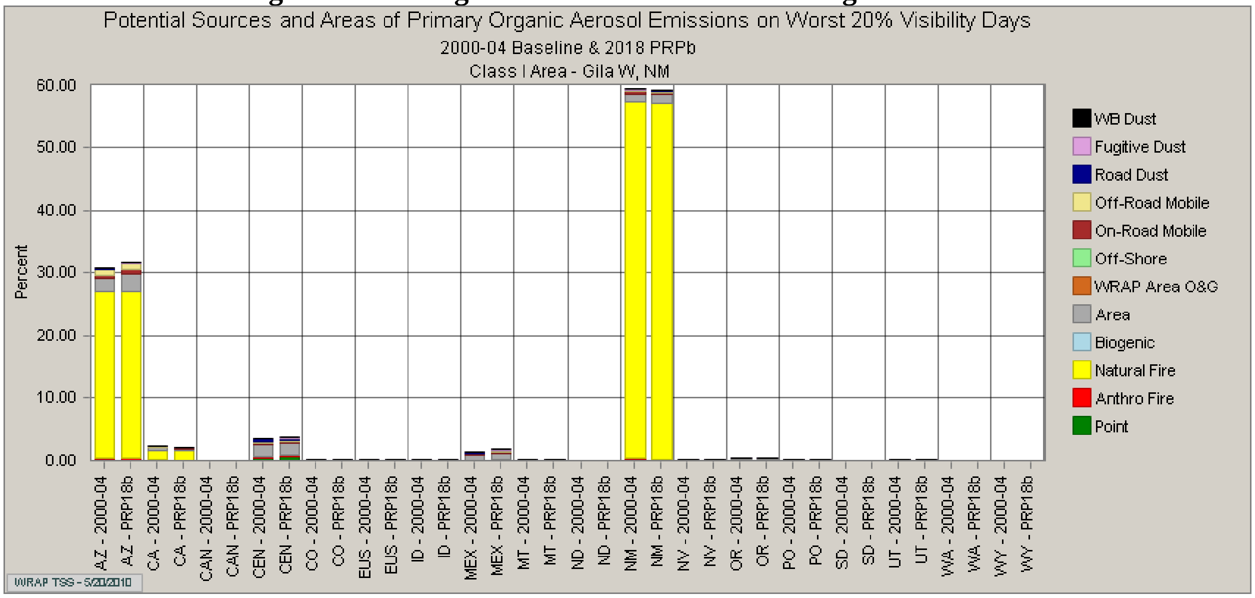
Figure 9-57: Weighted Emissions Potential – Sulfur Oxides



Organic Carbon

Figure 9-58 shows that New Mexico has the highest potential to contribute to organic carbon emissions. The source category with the greatest potential to contribute is natural fire. The other categories include area, on-road and off-road mobile, and fugitive dust sources. Total potential for Arizona sources to emit organic carbon is projected to increase in 2018, mostly from area sources. New Mexico sources decrease slightly in 2018.

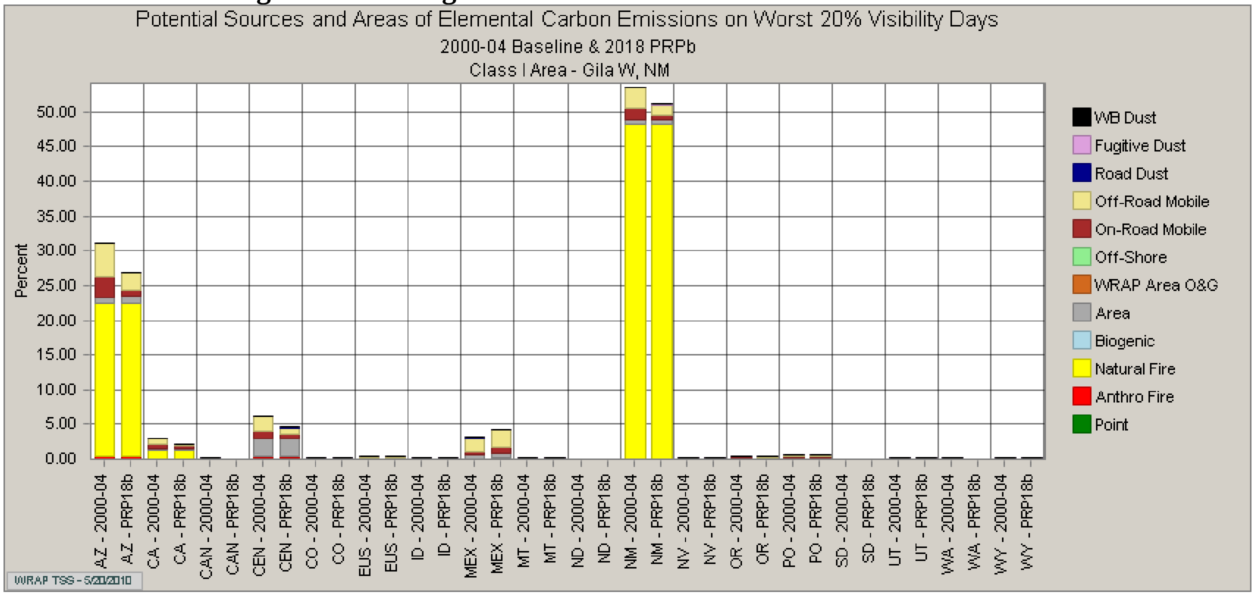
Figure 9-58: Weighted Emissions Potential – Organic Carbon



Elemental Carbon

As shown in Figure 9-59, New Mexico has the greatest potential to contribute to elemental carbon. The primary source is natural fire, followed by on- and off-road mobile sources. Arizona sources also have a significant contribution. Elemental carbon from on- and off-road mobile sources is expected to decrease by 2018.

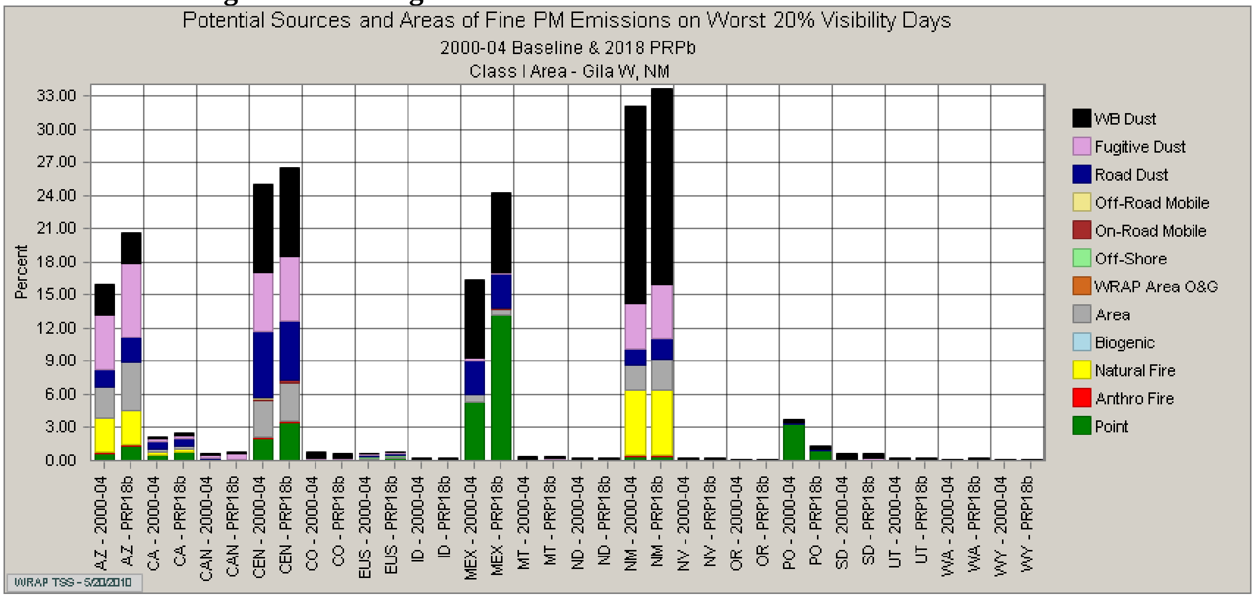
Figure 9-59: Weighted Emissions Potential – Elemental Carbon



Fine Particulate Matter

Sources of fine particulate matter from New Mexico have the greatest potential to contribute on the 20% worst days. The potential for fine PM from New Mexico, CENRAP states, Arizona and Mexico is expected to increase in 2018. The source categories in New Mexico with the greatest potential to contribute are natural fire, fugitive dust and windblown dust. Point sources in Mexico are shown to double in contribution by 2018.

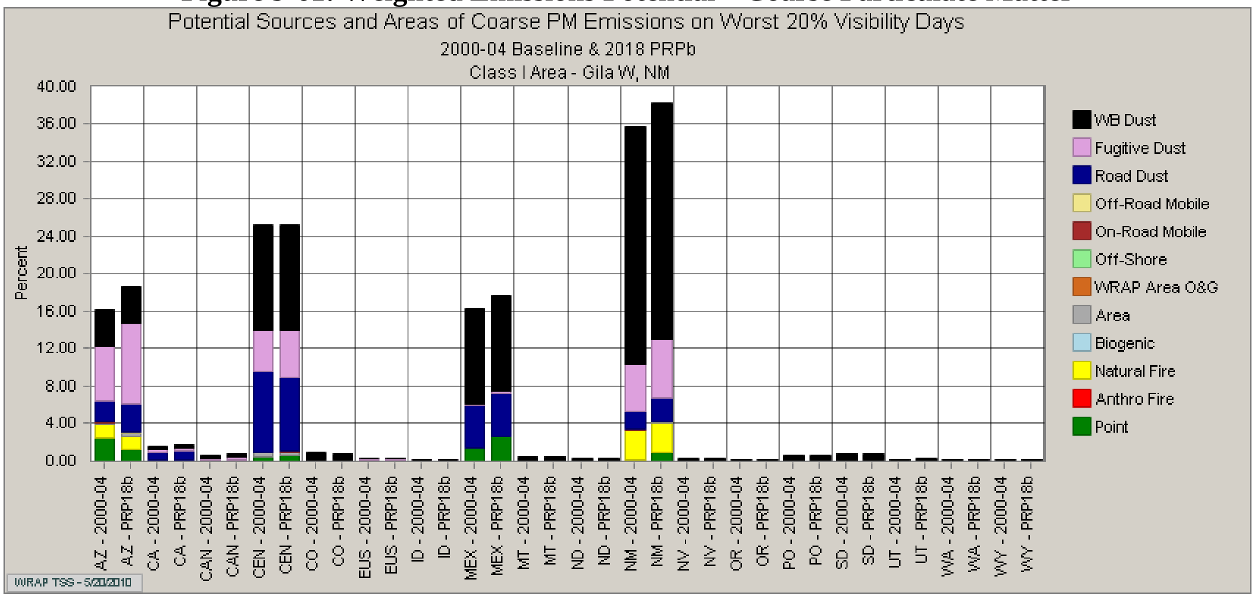
Figure 9-60: Weighted Emissions Potential – Fine Particulate Matter



Coarse Particulate Matter

Figure 9-61 shows that windblown dust from New Mexico has the greatest potential to contribute to coarse mass. Point and road dust contribution is expected to increase over the planning period. Arizona and Mexico contributions are also expected to increase over the planning period. The CENRAP region contribution is also significant.

Figure 9-61: Weighted Emissions Potential – Coarse Particulate Matter

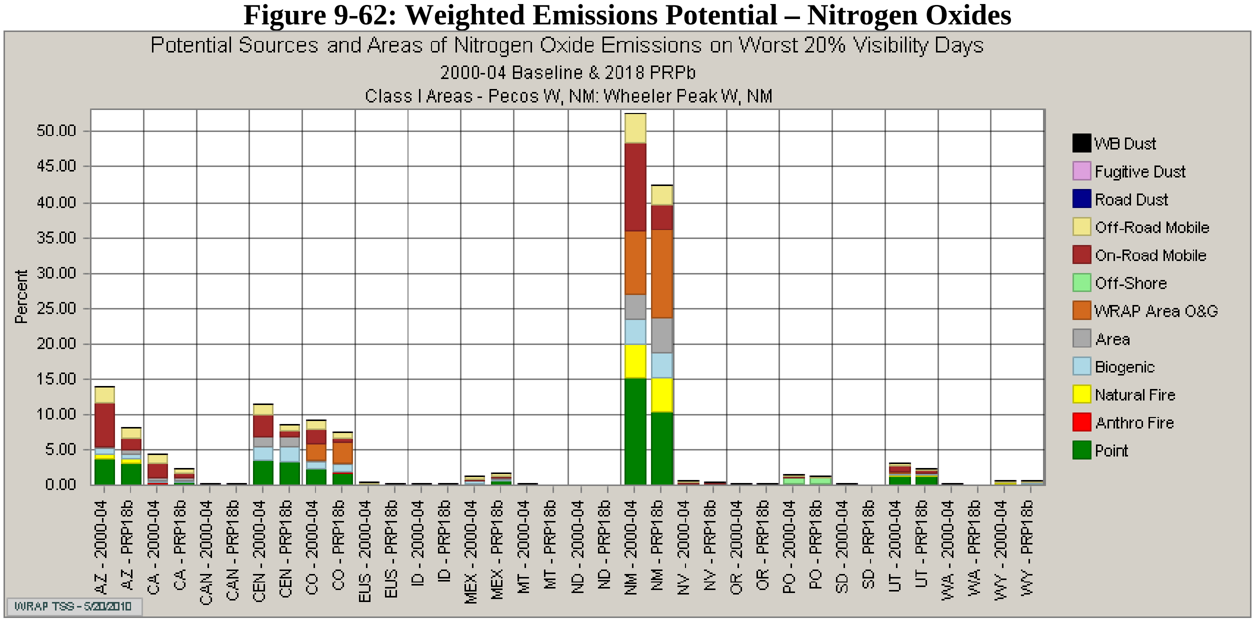


9.4.5 Pecos Wilderness, Wheeler Peak Wilderness

Nitrogen Oxides

Figure 9-62 shows that New Mexico has the highest potential to contribute to nitrogen oxide emissions. Point and on-road mobile sources decrease from the baseline (2000-2004) to 2018, with area oil and gas sources increasing. Overall, New Mexico's contributions to nitrogen oxides decrease from the baseline period to 2018.

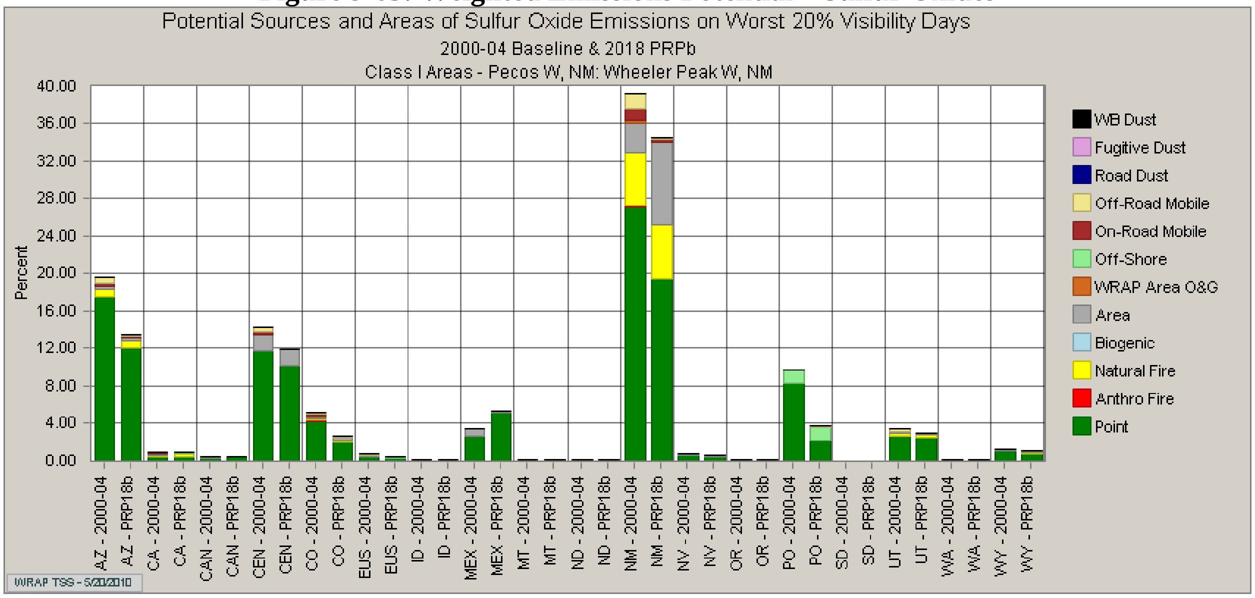
Figure 9-62: Weighted Emissions Potential – Nitrogen Oxides



Sulfur Oxides

Figure 9-63 shows that New Mexico has the highest potential to contribute to sulfur oxide emissions. Point and on- and off-road mobile sources decrease from the baseline (2000-2004) to 2018, with area sources more than doubling in contribution. Overall, New Mexico's contributions to sulfur oxides decrease from the baseline period to 2018. Contribution from Mexico increases over the planning period.

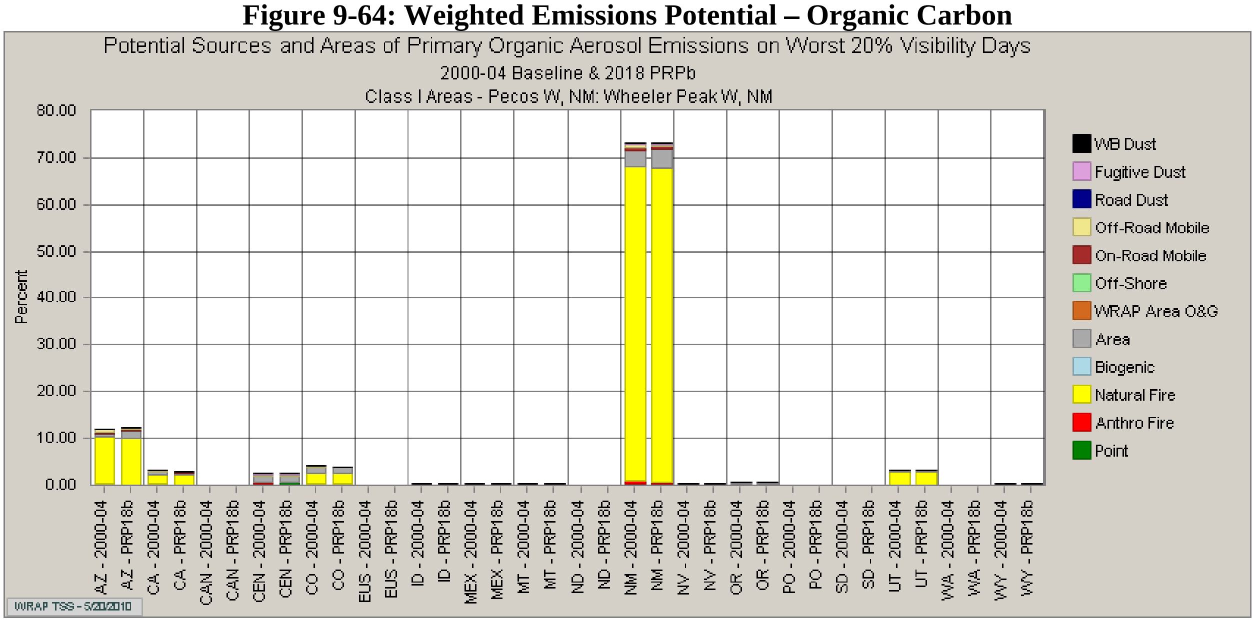
Figure 9-63: Weighted Emissions Potential – Sulfur Oxides



Organic Carbon

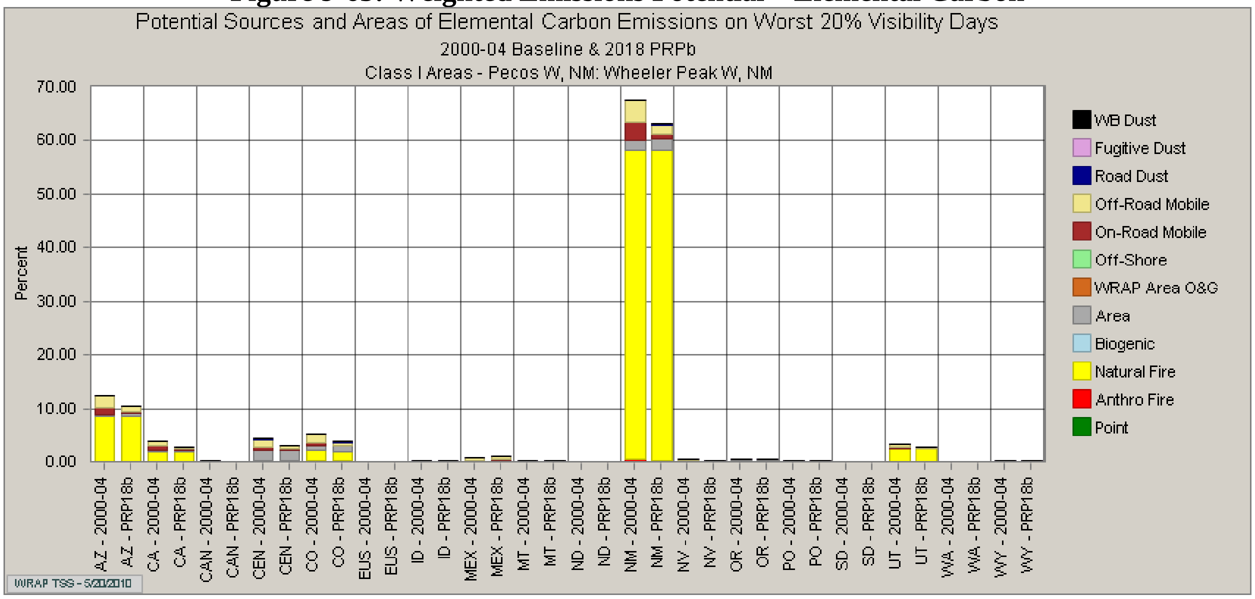
Figure 9-64 shows that New Mexico has the highest potential to contribute to organic carbon emissions. The source category with the greatest potential to contribute is natural fire. The other categories include area and on- and off-road mobile sources. Total potential for New Mexico sources to emit organic carbon is projected to either increase or decrease significantly in 2018.

Figure 9-64: Weighted Emissions Potential – Organic Carbon



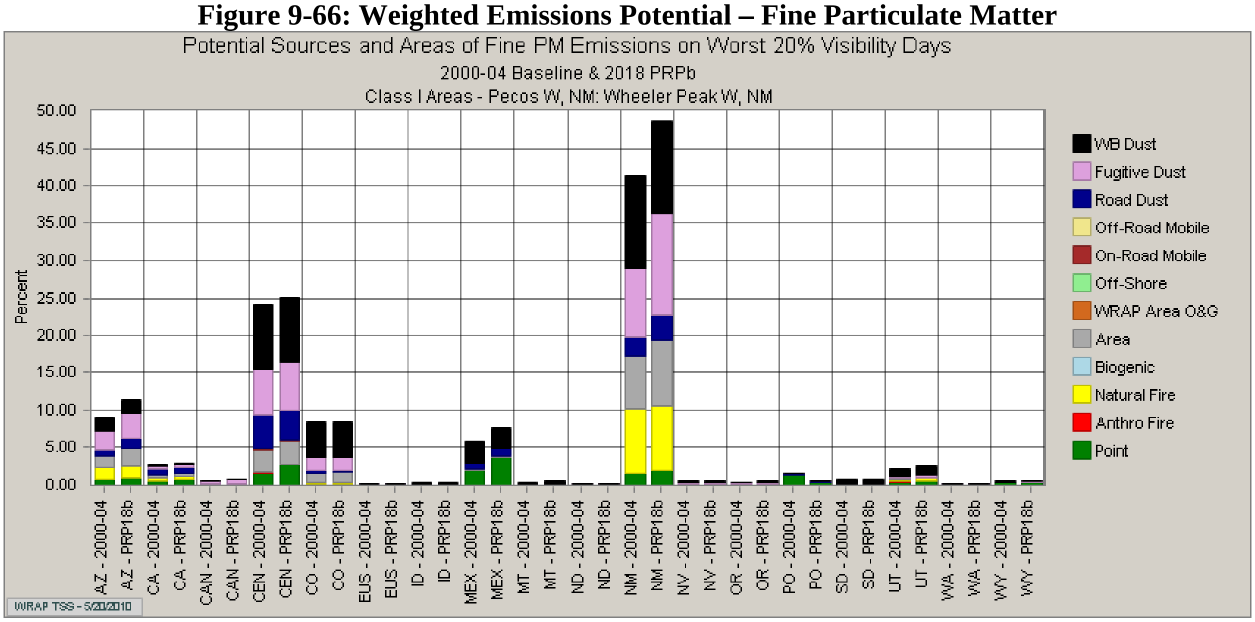
Elemental Carbon
As shown in Figure 9-65, New Mexico has the greatest potential to contribute to elemental carbon. The primary source is natural fire, followed by on- and off-road mobile sources. Elemental carbon from on- and off-road mobile sources is expected to decrease by 2018.

Figure 9-65: Weighted Emissions Potential – Elemental Carbon



Fine Particulate Matter
Sources of fine particulate matter from New Mexico have the greatest potential to contribute on the 20% worst days. The potential for fine PM from New Mexico, CENRAP states, Arizona and Mexico is expected to increase in 2018. The source categories in New Mexico with the greatest potential to contribute are area and fugitive dust.

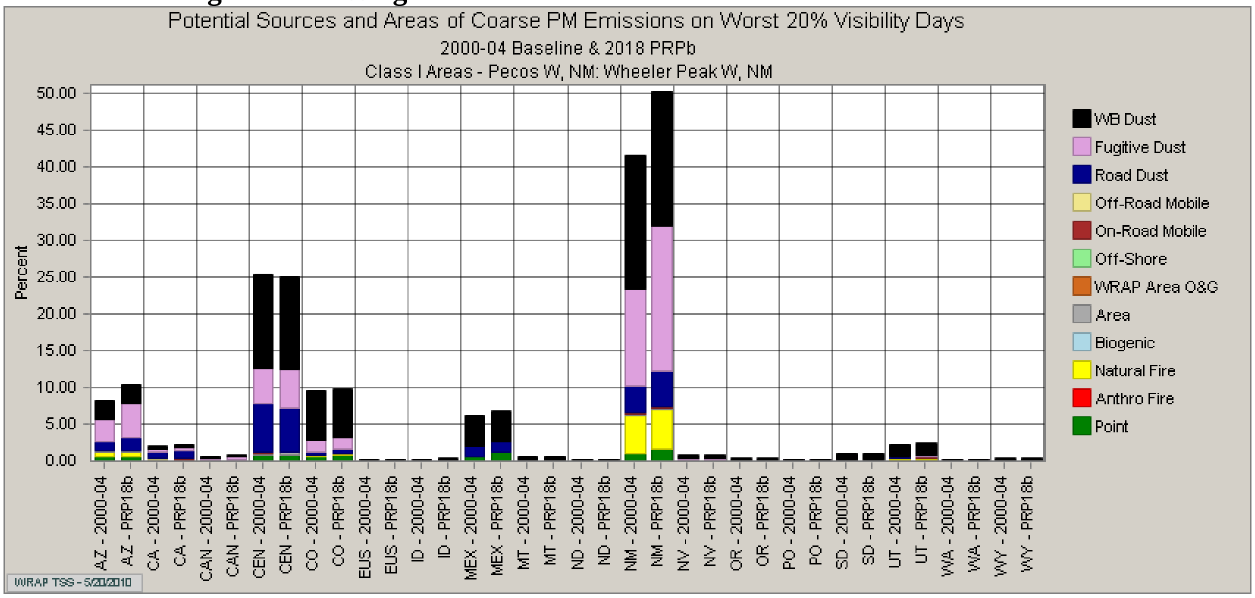
Figure 9-66: Weighted Emissions Potential – Fine Particulate Matter



Coarse Particulate Matter

Figure 9-67 shows that fugitive dust from New Mexico has the greatest potential to contribute to coarse mass in 2018. Point source and road dust contributions are also projected to increase.

Figure 9-67: Weighted Emissions Potential – Coarse Particulate Matter

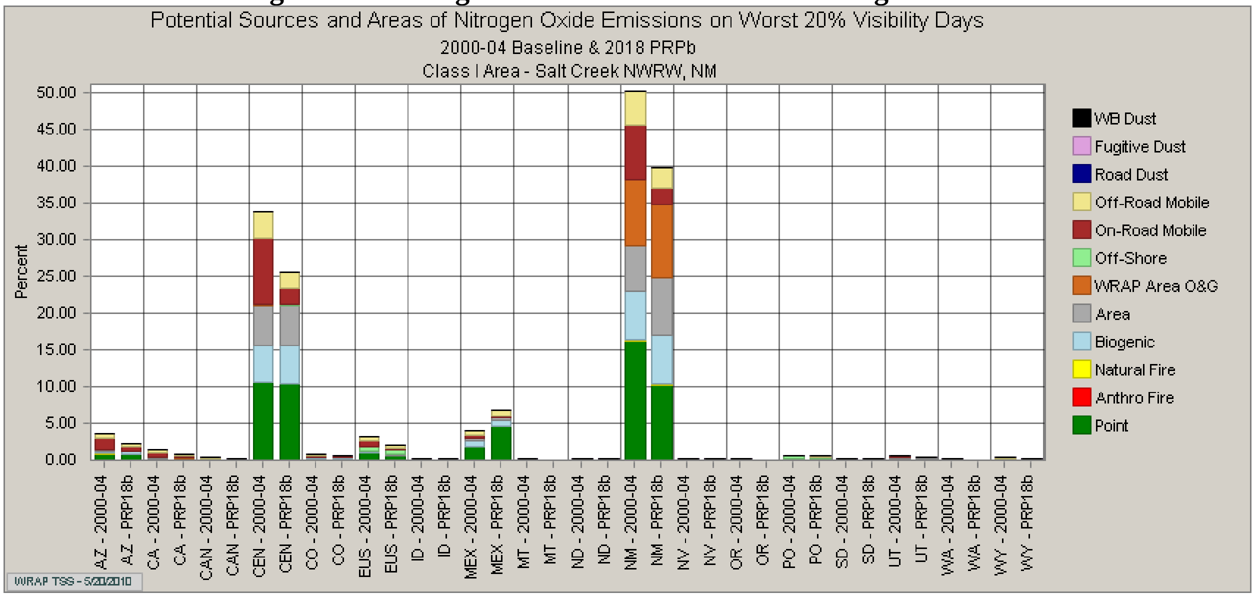


9.4.6 Salt Creek Wilderness

Nitrogen Oxides

Figure 9-68 shows that New Mexico has the highest potential to contribute to nitrogen oxide emissions. The CENRAP region also contributes significantly. Point and on-road mobile sources decrease from the baseline (2000-2004) to 2018, with the contribution from area and area oil and gas sources increasing. Overall, the CENRAP region's and New Mexico's contributions to nitrogen oxides decrease from the baseline period to 2018. Contributions from Mexico increase over the planning period.

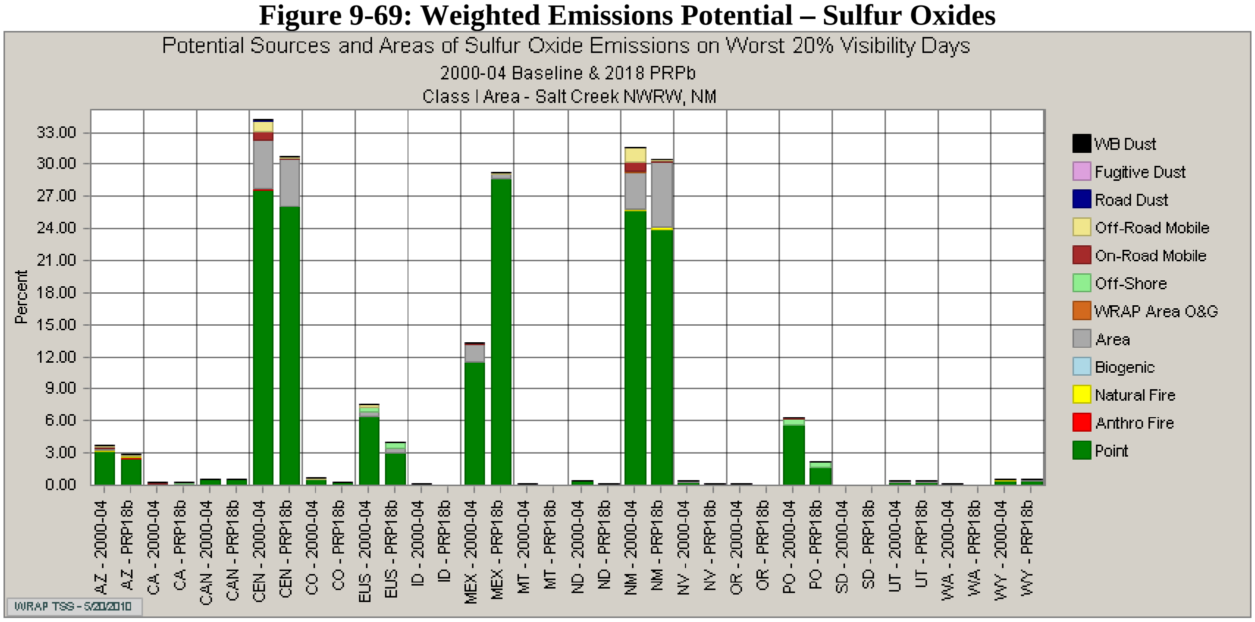
Figure 9-68: Weighted Emissions Potential – Nitrogen Oxides



Sulfur Oxides

Figure 9-69 shows that the CENRAP region has the highest contribution to sulfur oxide emissions. Contributions from point and on- and off-road sources decrease from the baseline (2000-2004) to 2018, with area sources more than doubling in contribution. Overall, New Mexico's contributions to sulfur oxides decrease from the baseline period to 2018. Contribution from Mexico increases over the planning period.

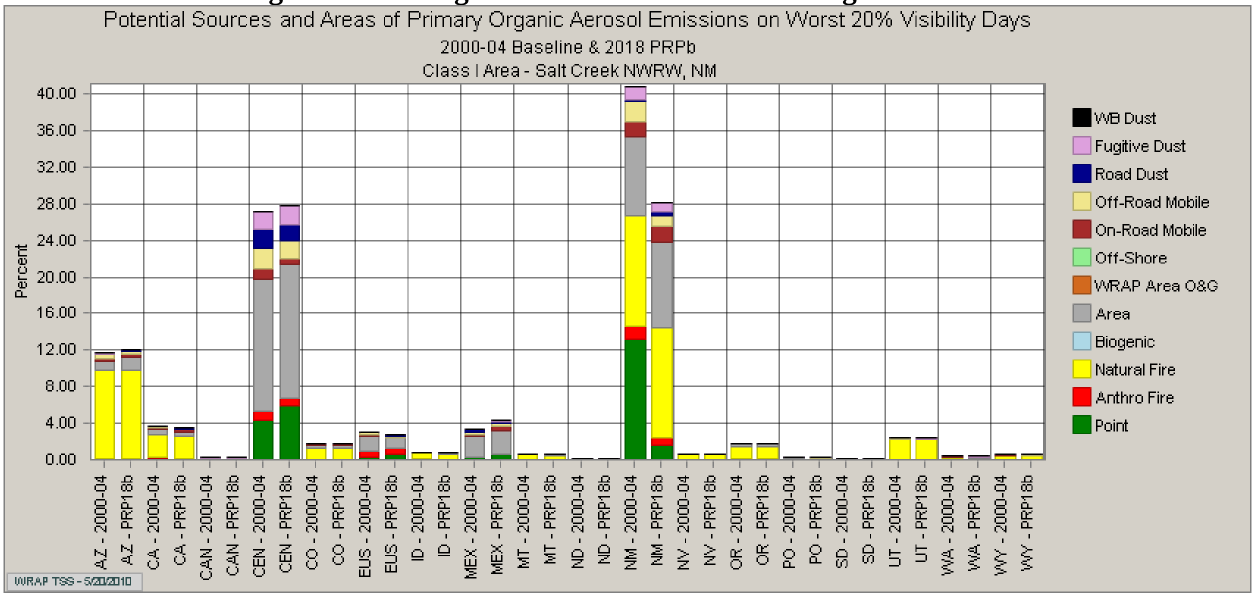
Figure 9-69: Weighted Emissions Potential – Sulfur Oxides



Organic Carbon

Figure 9-70 shows that New Mexico has the highest contribution from organic carbon emissions, with the CENRAP region also having a significant contribution. The source categories with the greatest contribution are natural fire and point sources. The other categories include area and on-road and off-road mobile sources. Total potential for New Mexico sources to emit organic carbon is projected to decrease in 2018.

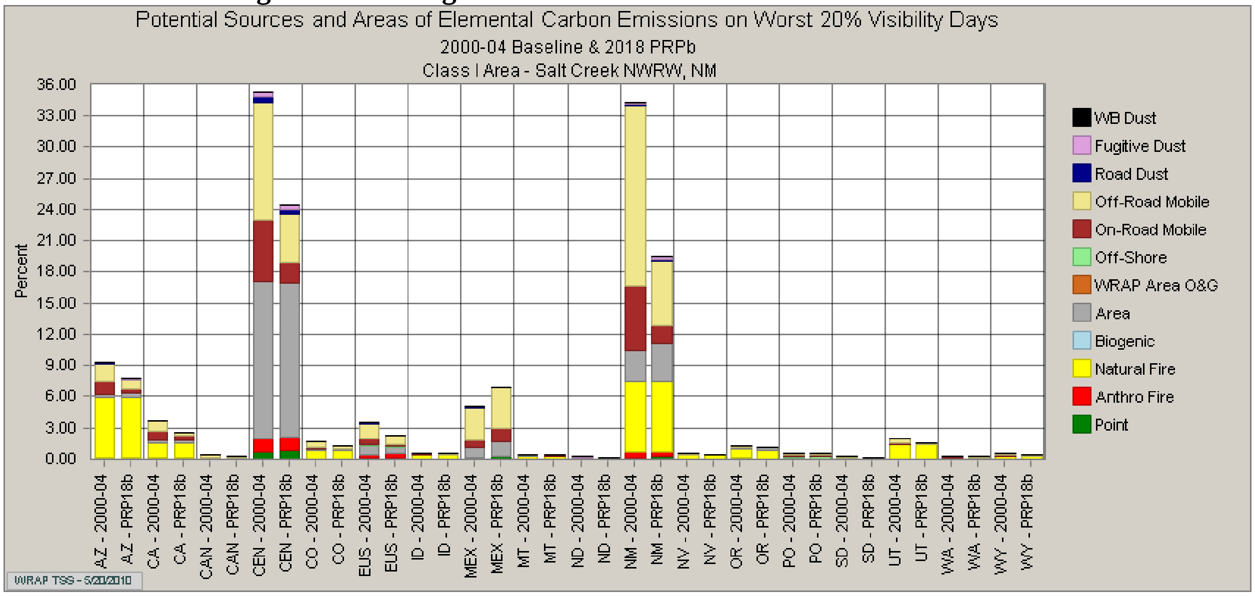
Figure 9-70: Weighted Emissions Potential – Organic Carbon



Elemental Carbon

As shown in Figure 9-71, the CENRAP region and New Mexico have the greatest contribution to elemental carbon. For CENRAP, the primary source is area, followed by on- and off-road mobile sources. Off-road mobile sources in New Mexico are the highest contribution. Elemental carbon from on- and off-road mobile sources is expected to decrease by 2018.

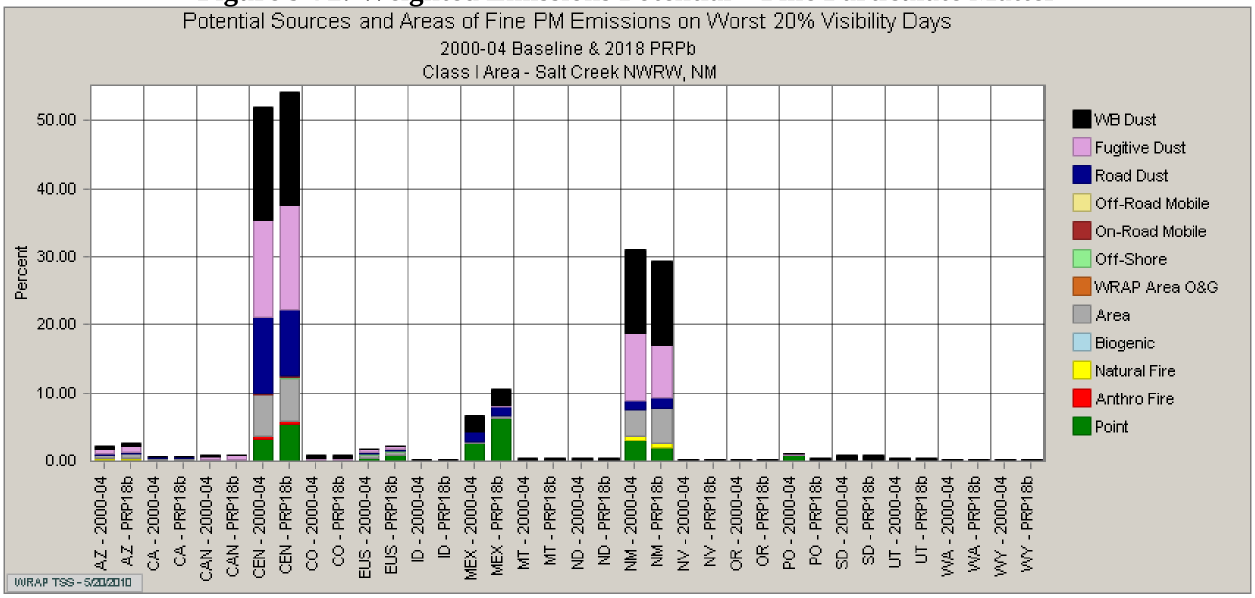
Figure 9-71: Weighted Emissions Potential – Elemental Carbon



Fine Particulate Matter

Sources of fine particulate matter from CENRAP have the greatest contribution on the 20% worst days. The contribution of fine PM from CENRAP states and Mexico is expected to increase in 2018. The source categories in New Mexico with the greatest potential to contribute are windblown and fugitive dust.

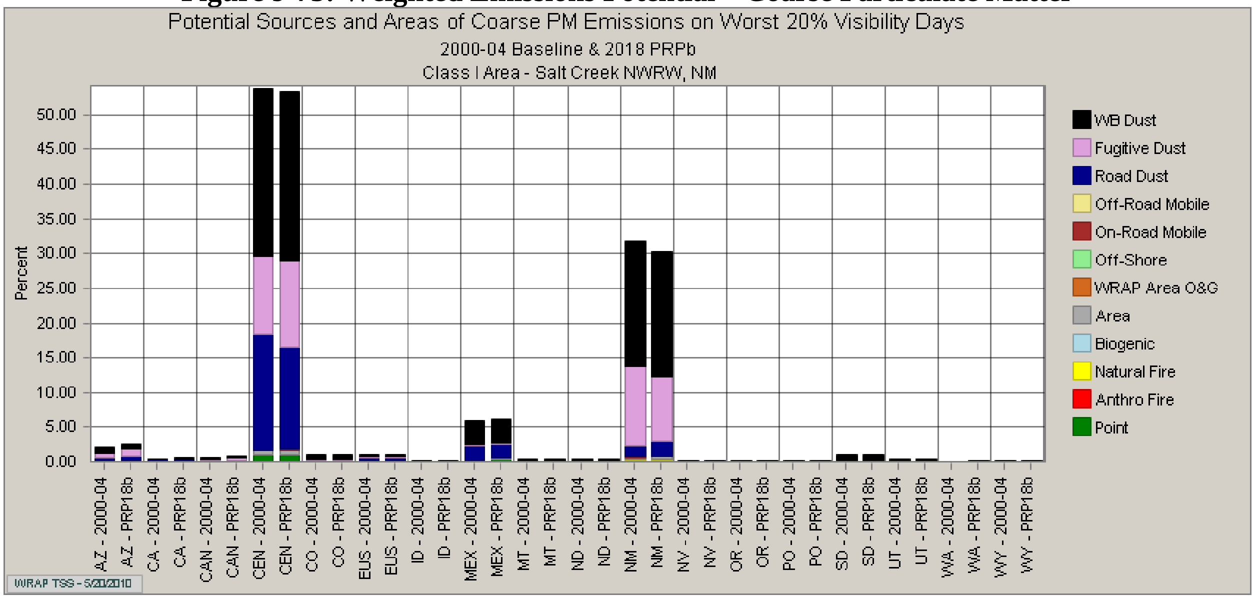
Figure 9-72: Weighted Emissions Potential – Fine Particulate Matter



Coarse Particulate Matter

Figure 9-73 shows that windblown dust from the CENRAP region has the greatest potential to contribute to coarse mass.

Figure 9-73: Weighted Emissions Potential – Coarse Particulate Matter

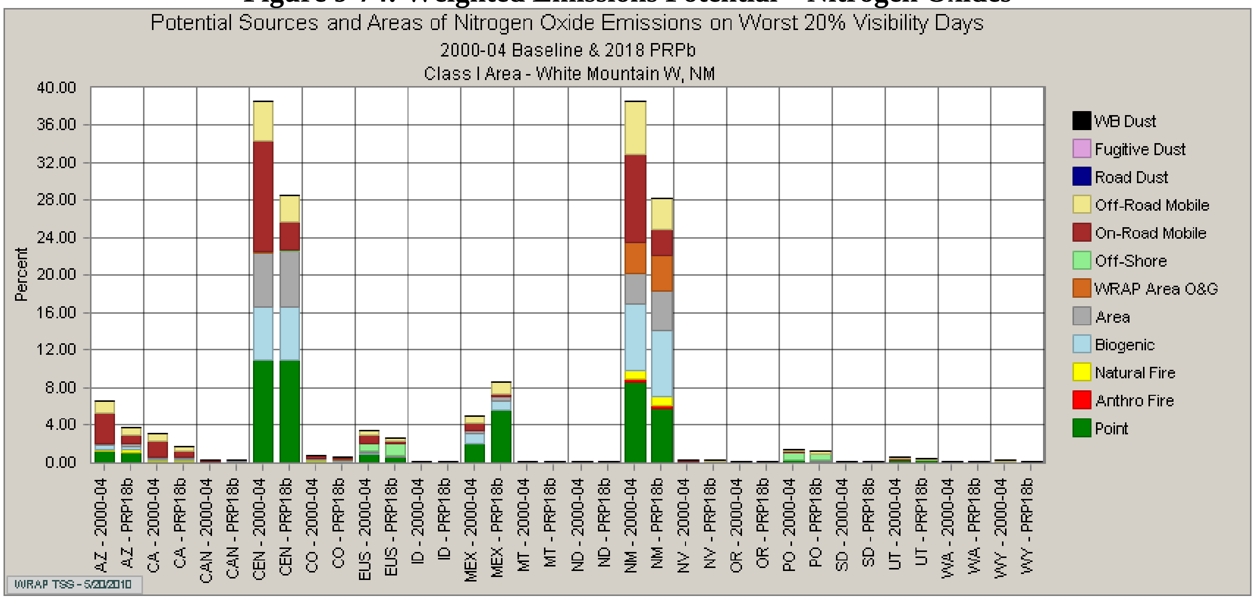


9.4.7 White Mountain Wilderness

Nitrogen Oxides

Figure 9-74 shows that CENRAP and New Mexico have the highest contribution of nitrogen oxide. On- and off-road mobile source contribution decreases from the baseline (2000-2004) to 2018. Overall, New Mexico's contributions to nitrogen oxides decrease from the baseline period to 2018. Contributions from Mexico increase over the planning period.

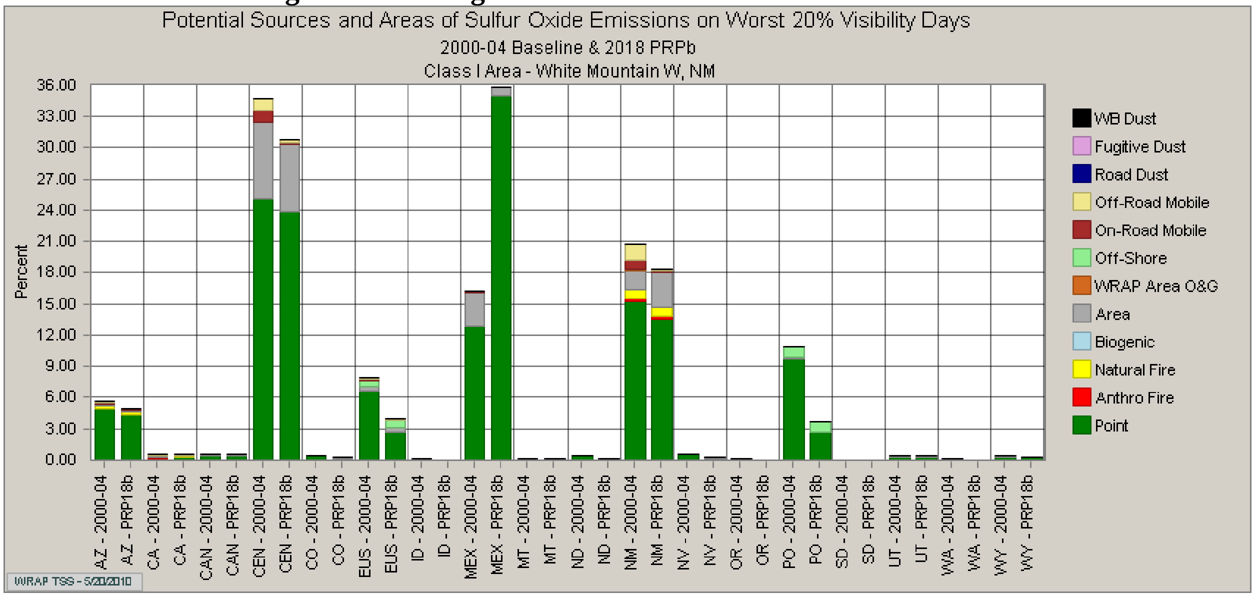
Figure 9-74: Weighted Emissions Potential – Nitrogen Oxides



Sulfur Oxides

Figure 9-75 shows that the CENRAP region has highest contribution to sulfur oxide emissions, with New Mexico also having a large contribution. Contribution from Mexico point sources increases significantly over the planning period.

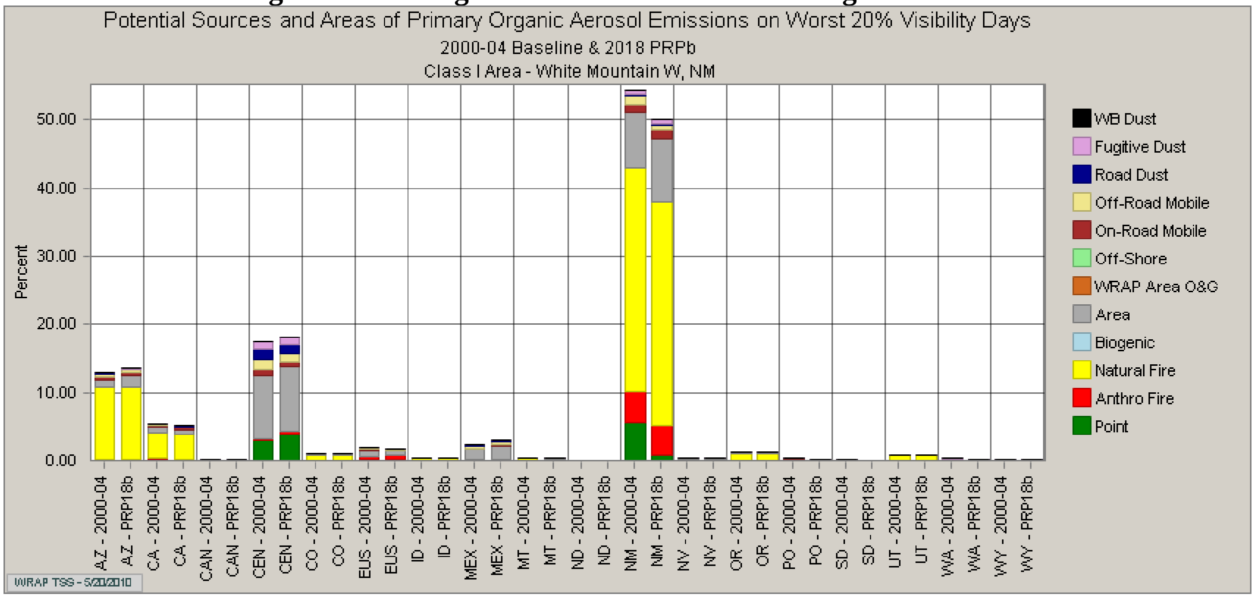
Figure 9-75: Weighted Emissions Potential – Sulfur Oxides



Organic Carbon

Figure 9-76 shows that New Mexico has the highest contribution of organic carbon emissions. The source category with the greatest contribution in New Mexico is natural fire. The other categories include area, on-road and off-road mobile, and fugitive dust sources. Contribution from the CENRAP region Arizona is projected to increase. Total potential for New Mexico sources to emit organic carbon is projected to decrease in 2018.

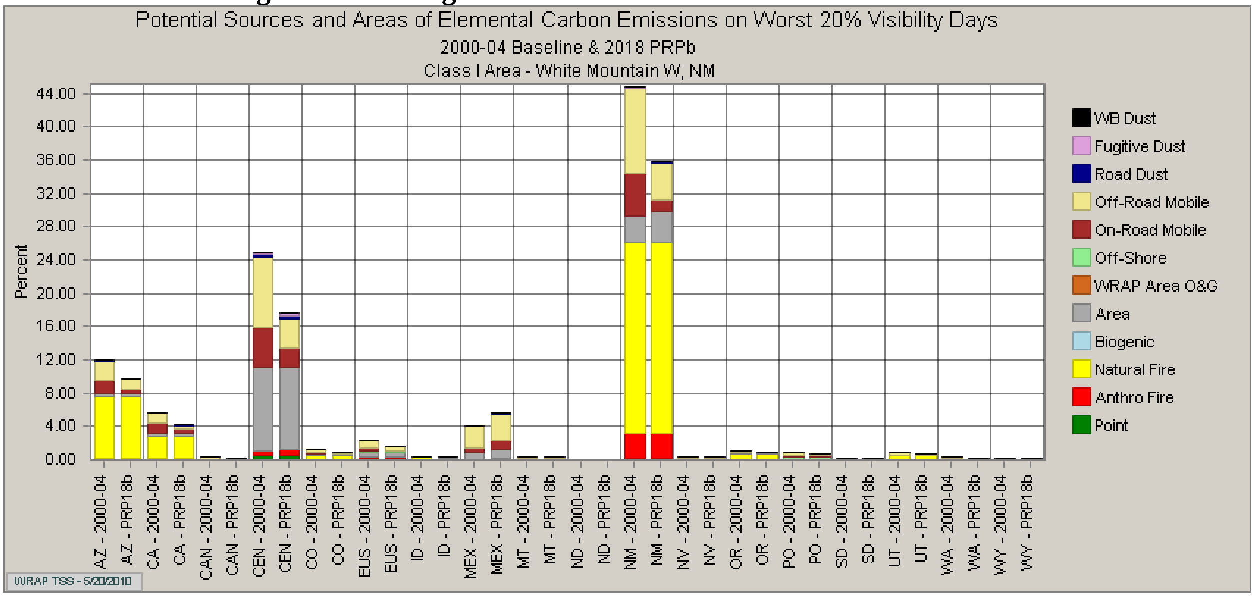
Figure 9-76: Weighted Emissions Potential – Organic Carbon



Elemental Carbon

As shown in Figure 9-77, New Mexico sources have the greatest contribution of elemental carbon. The primary source for New Mexico is fire, followed by on- and off-road mobile sources. Contribution from elemental carbon from on- and off-road mobile sources is expected to decrease by 2018.

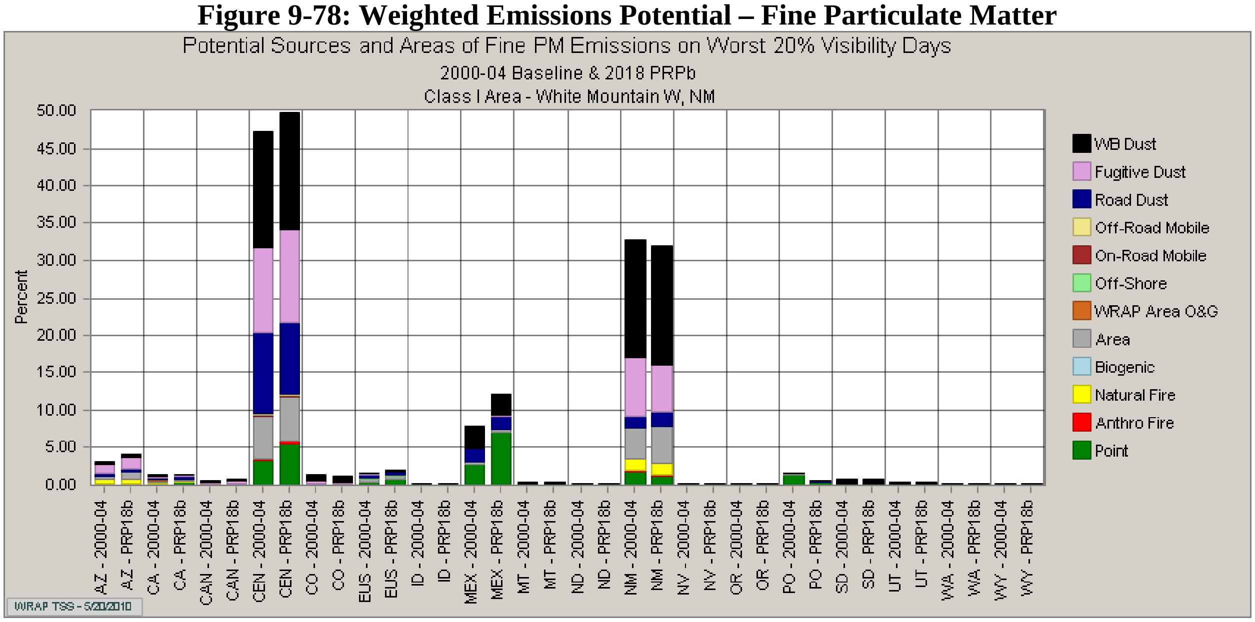
Figure 9-77: Weighted Emissions Potential – Elemental Carbon



Fine Particulate Matter

Sources of fine particulate matter from the CENRAP region have the greatest contribution on the 20% worst days. The source categories in New Mexico with the greatest potential to contribute are fugitive and windblown dust.

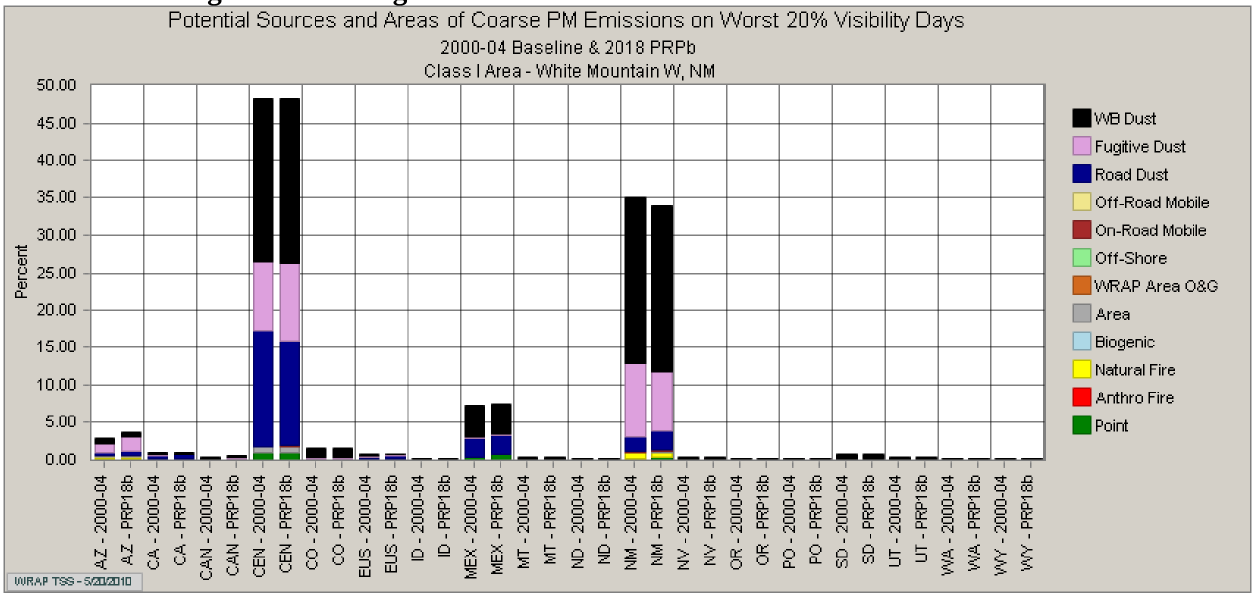
Figure 9-78: Weighted Emissions Potential – Fine Particulate Matter



Coarse Particulate Matter

Figure 9-79 shows that the CENRAP region has the greatest contribution to coarse mass. Road, fugitive, and windblown dust are large contributors in CENRAP, with fugitive and windblown dust being the largest contributors from New Mexico.

Figure 9-79: Weighted Emissions Potential – Coarse Particulate Matter



CHAPTER 10: BEST AVAILABLE RETROFIT TECHNOLOGY (BART) EVALUATION

10.1 Introduction

In 1999, the EPA published a final rule to address a type of visibility impairment known as regional haze (64 FR 35714, July 1, 1999). The regional haze rule requires States to submit state implementation plans (SIPs) to address regional haze visibility impairment in 156 Federally-protected parks and wilderness areas. The 1999 rule was issued to fulfill a long-standing EPA commitment to address regional haze under the authority and requirements of sections 169A and 169B of the Clean Air Act (CAA).[1]

As required by the CAA, the EPA included in the final regional haze rule a requirement for Best Available Retrofit Technology (BART) for certain large stationary sources. The regulatory requirements for BART were codified at 40 CFR 50.308(e) and in definitions that appear in 40 CFR 50.301.

The BART-eligible sources are those sources which have the potential to emit 250 tons per year or more of a visibility impairing air pollutant, were put in place between August 7, 1962 and August 7, 1977, and whose operations fall within one or more of 26 specifically listed source categories. Under the CAA, BART is required for any BART-eligible source which a State determines "emits any air pollutant which may reasonably be anticipated to cause or contribute to any impairment of visibility in any such area." Accordingly, for stationary sources meeting these criteria, States must address the BART requirement when they develop their regional haze SIPs.

The EPA published a second rulemaking on June 6, 2005 that made changes to the Final Rule published July 1, 1999. The second rulemaking was in response to a U.S. District Court of Appeals ruling that vacated part of the regional haze rule. The June 6, 2005 Final Rule required the BART analysis to include an analysis of the degree of visibility improvement resulting from the use of control technology at BART-subject sources; revised the BART provisions; included new BART Guidelines contained in a new Appendix Y to Part 51; and added the requirement that States use Appendix Y for determining BART at certain large electrical generating units (EGUs).

The Guidelines also contained specific presumptive limits for SO_2 and NOx for certain large EGUs based on fuel type, unit size, cost effectiveness, and presence or absence of pre-existing controls. For NOx emissions, the EPA directs states to generally require owners and operators to meet the presumptive limits at coal-fired EGUs greater than 200 MW at power plants with a total generating capacity greater than 750 MW. The presumptive limits for NOx are based on coal type, boiler type and whether SCR or SNCR are already installed at the source.

10.2 SO_2: Regional SO_2 Milestone and Backstop Trading Program

New Mexico is a §309 state participating in the Regional SO_2 Milestone and Backstop Trading Program. §308(e)(2) provides states with the option to implement or require participation in an emissions trading program or other alternative measure rather than to require sources subject to BART to install, operate, and maintain additional control technology to meet an established emission limit on a continuous basis. However, the alternate program must achieve greater reasonable progress than would be accomplished by installing BART. A demonstration that the alternate program can achieve greater reasonable progress is prescribed by §308(e)(2)(i). Since the pollutant of concern is SO_2, this demonstration has been performed under §309 as part of the State Implementation Plan. §309(d)(4)(i) requires that the SO_2 milestones established under the Plan "…must be shown to provide for greater reasonable progress than would be achieved by application of BART pursuant to §51.308(e)(2)."

New Mexico participated in creating a detailed report entitled "Demonstration that the SO_2 Milestones Provide Greater Reasonable Progress than BART" covering SO_2 emissions from all states participating in the Regional SO_2 Milestone and Backstop Trading Program. The document is included in New Mexico's §309 Regional Haze SIP submittal to EPA.

As part of the §309 program, participating states, including New Mexico, must submit an annual Regional Sulfur Dioxide Emissions and Milestone Report that compares actual emissions to pre-established milestones. Participating states have been filing these reports since 2003. Each year, states have been able to demonstrate that actual SO2 emissions are well below the milestones. The actual emissions and their respective milestones are shown in Table 10-1 below:

Table 10-1 Regional Sulfur Dioxide Emissions and Milestone Report Summary

Year	Reported SO_2 Emissions (tons)	3-year Milestone Average (tons)
2003	330,679	447,383
2004	337,970	448,259
2005	304,591	446,903
2006	279,134	420,194
2007	273,663	420,637
2008	244,189	378,398

10.3 Summary of BART Modeling Results (Visibility Impact Analysis)

After determining BART-eligibility, the State must then determine whether the air pollution emission unit is potentially-subject-to-BART. EPA finalized several options that allowed States flexibility when making the determination of whether a source "emits any pollutants which may reasonably be anticipated to cause or contribute to any visibility impairment."

Option 1: All BART-eligible sources are Subject to BART

EPA provided the States with the discretion to consider all BART-eligible sources within the State to be "reasonably anticipated to cause or contribute" to some degree of visibility impairment in a Class I area. EPA held that this option is consistent with the American Corn Growers court's decision, as it would be an impermissible constraint of State authority for the EPA to force States to conduct individualized analyses in order to determine that a BART-eligible source "emits any air pollutant which may reasonably anticipated to cause or contribute to any impairment of visibility in any [Class I] area."

Option 2: All BART-Eligible Sources Do Not Cause or Contribute to Regional Haze

EPA also provided States with the option of performing an analysis to show that the full group of BART-eligible sources in a State may not, as a whole, be reasonably anticipated to cause or contribute to any visibility impairment in Class I areas. Although the option was provided, EPA did also state that it anticipated that in most, if not all States, BART eligible-sources are likely to cause or contribute to some level of visibility impairment in at least one Class I area.

Option 3: Case-by-Case BART Analysis

The final option that was provided to the States was to consider the individual contributions of a BART-eligible source to determine whether the facility is subject-to-BART. Specifically, EPA allowed States to choose to undertake an analysis of each BART-eligible source in the State in considering whether each such source "emit[s] any air pollutant which may reasonably be anticipated to cause or contribute to any impairment of visibility in any [Class I] area." Alternatively, States may choose to presume that all BART-eligible sources within the State meet this applicability test, but provide sources with the ability to demonstrate on a case-by-case basis that this is not the case.

10.3.1 New Mexico Process

When considering the options provided by EPA, NMED determined that the third option is the most consistent with the American Corn Growers case, as this option provides a rebuttable method for the evaluation of the visibility impact from a single source. If the air dispersion modeling analysis shows that a facility causes or contributes to Regional Haze, then it is required to address BART. A State is also provided with flexibility under this option, as it may exempt from BART any source that is not reasonably anticipated to cause or contribute to visibility degradation in a Class I area.

In May 2006, the New Mexico Environment Department Air Quality Bureau (Department) conducted an internal review of sources potentially subject to the BART rule.

Section II of the Guidelines prescribes how to identify BART-eligible sources. States are required to identify those sources that satisfy the following criteria: sources that fall within the 26 listed source categories as listed in the CAA, sources that were "in existence" on August 7, 1977 but were not "in operation" before August 7, 1962, and sources that have a current potential to emit that is greater than 250 tons per year of any single visibility impairing pollutant. New Mexico identified 11 sources as BART-eligible sources as part of this review.

The Guidelines then prescribe to the states how to identify those sources that are subject to BART. At this point, states are directed to either (1) make BART determinations for all BART-eligible sources, or (2) to consider exempting some of the sources from BART because they may not reasonably be anticipated to cause or contribute to any visibility impairment in a Class I area. New Mexico opted to perform an initial screening model on the BART-eligible sources to determine whether a source did cause or contribute to any visibility impairment. The Guidelines direct States that if the analysis shows that an individual source or group of sources is not reasonably anticipated to cause or contribute to any visibility impairment in a Class I area, then the States do not need to make a BART determination for that source or group of sources.

The Western Regional Air Partnership (WRAP) performed the initial BART modeling for the state of New Mexico. The procedures used are outlined in the WRAP Regional Modeling Center (RMC) BART Modeling Protocol that is available at:

http://pah.cert.ucr.edu/aqm/308/bart/WRAP_RMC_BART_Protocol_Aug15_2006.pdf

The basic assumptions in the WRAP BART CALMET/CALPUFF modeling used for New Mexico are as follows:

- Use of three years of modeling of 2001, 2002, and 2003.
- Visibility impacts due to emissions of SO_2, NOx and primary PM emissions were calculated. PM emissions were modeled as $PM_{2.5}$.
- Visibility was calculated using the Original IMPROVE equation and Annual Average Natural Conditions.

Initial modeling was performed for the 11 source complexes in New Mexico with visibility estimated from the sources' SO_2, NOx, and PM emissions. Then for those sources whose 98th percentile visibility impacts at any Class I area due to their combined SO_2, NOx, and PM emissions exceeded the 0.5 dv significance threshold, the separate contribution to visibility at Class I areas was assessed for SO_2 alone (SO_4), NOx alone (NO_3), PM alone (PMF) and combined NOx plus PM emissions (NO_3 + PMF).

Of the 11 source complexes analyzed, only one source complex's visibility impacts at any Class I area due to combined SO_2, NOx, and PM emissions exceeded the 0.5 dv threshold (PNM San Juan Generating Station Boilers #1-4). Of the 10 other source complexes, none exceed a 0.33 dv impact. See Appendix C. Consequently, only the PNM San Juan Boilers #1-4 were subjected to a BART determination.

On November 9, 2006, the New Mexico Environment Department informed PNM that the modeling performed by the WRAP indicated the visibility impairment from the San Juan Generating Station (SJGS) was over the 0.5 dv threshold, and was therefore subject to a BART determination. In response, Black & Veatch (B&V), on behalf of PNM, submitted the BART Modeling Protocol document which described the CALPUFF modeling methodology to be used as part of the BART engineering evaluation for Units 1-4 at the SJGS. The results are presented in Table 10-2 below.

Table 10-2: Visibility Impact Analysis of PNM's San Juan Generating Station

NM SRC02 Unit # 350450902, PNM SJ #1-4: SO_2 = 35,735 TPY; NOx = 38,763 TPY; PM = 3,884 TPY
Annual Average Natural Conditions
Class I Area with at least 1 receptor within 300 km of source

Class I Area	Minimum Distance (km)	98th Percentile for Each Year			98th 3 year AVG
		2001	2002	2003	
Mesa Verde NP	40	5.54	5.34	5.30	5.40
Weminuche Wilderness	98	2.24	2.99	2.41	2.55
San Pedro Parks Wilderness	155	3.80	4.07	4.14	4.01
La Garita Wilderness	169	1.63	1.82	1.77	1.74
Canyonlands NP	170	6.21	4.33	4.44	4.99
Black Canyon Gunnison NM	203	2.38	2.27	2.43	2.36
Bandelier NM	210	2.47	2.90	3.08	2.82
Petrified Forest NP	213	1.62	1.27	1.03	1.31
West Elk Wilderness	216	2.14	1.90	2.20	2.08
Arches NP	222	4.06	3.71	3.59	3.79
Capitol Reef NP	232	4.00	2.02	2.35	2.79
Pecos Wilderness	248	2.17	2.63	2.81	2.53
Wheeler Peak Wilderness	258	1.94	1.73	1.97	1.88
Great Sand Dunes NM	269	1.47	1.59	1.74	1.60
Maroon Bells-Snowmass WA	271	1.19	1.27	1.15	1.21
Grand Canyon NP	285	2.12	1.50	1.18	1.60

NM SRC02 Unit # 350450902, PNM SJ #1-4: PM Only (PM = 3,884 TPY)
Annual Average Natural Conditions
Class I Area with at least 1 receptor within 300 km of source

Class I Area	Minimum Distance (km)	98th Percentile for Each Year 2001	2002	2003	98th 3 year AVG
Mesa Verde NP	40	0.86	0.96	1.13	0.98
Weminuche Wilderness	98	0.15	0.24	0.25	0.21
San Pedro Parks Wilderness	155	0.25	0.28	0.22	0.25
La Garita Wilderness	169	0.06	0.08	0.09	0.08
Canyonlands NP	170	0.28	0.20	0.22	0.23
Black Canyon Gunnison NM	203	0.09	0.11	0.07	0.09
Bandelier NM	210	0.13	0.19	0.17	0.16
Petrified Forest NP	213	0.05	0.03	0.05	0.05
West Elk Wilderness	216	0.07	0.09	0.07	0.08
Arches NP	222	0.19	0.19	0.15	0.17
Capitol Reef NP	232	0.12	0.07	0.09	0.09
Pecos Wilderness	248	0.08	0.10	0.10	0.09
Wheeler Peak Wilderness	258	0.07	0.06	0.07	0.06
Great Sand Dunes NM	269	0.07	0.05	0.06	0.06
Maroon Bells-Snowmass WA	271	0.04	0.04	0.03	0.04
Grand Canyon NP	285	0.08	0.04	0.05	0.05

NM SRC02 Unit # 350450902, PNM SJ #1-4: NOx Only (NOx = 38,763 TPY)
Annual Average Natural Conditions
Class I Area with at least 1 receptor within 300 km of source

Class I Area	Minimum Distance (km)	98th Percentile for Each Year 2001	2002	2003	98th 3 year AVG
Mesa Verde NP	40	3.59	3.73	3.24	3.52
Weminuche Wilderness	98	1.66	2.15	1.71	1.84
San Pedro Parks Wilderness	155	2.70	2.74	2.89	2.78
La Garita Wilderness	169	1.09	1.30	1.22	1.20
Canyonlands NP	170	4.28	3.22	2.79	3.43
Black Canyon Gunnison NM	203	1.67	1.72	1.86	1.75
Bandelier NM	210	1.69	2.13	2.23	2.02
Petrified Forest NP	213	0.80	0.70	0.30	0.60
West Elk Wilderness	216	1.22	1.44	1.60	1.42
Arches NP	222	3.22	2.50	2.40	2.71
Capitol Reef NP	232	2.89	0.92	1.45	1.75
Pecos Wilderness	248	1.49	1.72	1.94	1.72
Wheeler Peak Wilderness	258	1.15	1.09	1.36	1.20
Great Sand Dunes NM	269	1.09	1.00	1.10	1.07
Maroon Bells-Snowmass WA	271	0.76	0.88	0.88	0.84
Grand Canyon NP	285	1.56	0.80	0.44	0.93

NM SRC02 Unit # 350450902, PNM SJ #1-4: SO_2 Only (SO_2 = 35,735 TPY)
Annual Average Natural Conditions
Class I Area with at least 1 receptor within 300 km of source

Class I Area	Minimum Distance (km)	98th Percentile for Each Year 2001	2002	2003	98th 3 year AVG
Mesa Verde NP	40	2.78	3.17	3.14	3.03
Weminuche Wilderness	98	1.28	1.23	0.89	1.13
San Pedro Parks Wilderness	155	1.77	2.13	1.72	1.87
La Garita Wilderness	169	0.81	0.89	0.70	0.80
Canyonlands NP	170	2.65	1.79	2.06	2.17
Black Canyon Gunnison NM	203	0.92	1.03	0.89	0.95
Bandelier NM	210	1.17	1.62	1.24	1.34
Petrified Forest NP	213	0.94	0.83	0.94	0.91
West Elk Wilderness	216	0.75	0.79	0.59	0.71
Arches NP	222	1.74	1.22	1.33	1.43
Capitol Reef NP	232	1.68	1.47	1.32	1.49
Pecos Wilderness	248	1.09	1.16	1.24	1.16
Wheeler Peak Wilderness	258	1.00	0.86	1.06	0.97
Great Sand Dunes NM	269	0.64	0.69	0.68	0.67
Maroon Bells-Snowmass WA	271	0.54	0.62	0.36	0.51
Grand Canyon NP	285	1.18	0.78	0.73	0.90

NM SRC02 Unit # 350450902, PNM SJ #1-4: PM plus NOx (NOx = 38,763 TPY; PM = 3,884 TPY)
Annual Average Natural Conditions
Class I Area with at least 1 receptor within 300 km of source

Class I Area	Minimum Distance (km)	98th Percentile for Each Year 2001	2002	2003	98th 3 year AVG
Mesa Verde NP	40	4.27	4.06	3.46	3.93
Weminuche Wilderness	98	1.74	2.28	1.76	1.93
San Pedro Parks Wilderness	155	2.85	2.87	3.07	2.93
La Garita Wilderness	169	1.15	1.36	1.30	1.27
Canyonlands NP	170	4.39	3.33	2.91	3.54
Black Canyon Gunnison NM	203	1.73	1.84	1.90	1.82
Bandelier NM	210	1.77	2.29	2.31	2.12
Petrified Forest NP	213	0.83	0.72	0.31	0.62
West Elk Wilderness	216	1.26	1.50	1.64	1.47
Arches NP	222	3.30	2.65	2.50	2.82
Capitol Reef NP	232	3.06	0.95	1.50	1.83
Pecos Wilderness	248	1.55	1.77	2.04	1.79
Wheeler Peak Wilderness	258	1.20	1.12	1.40	1.24
Great Sand Dunes NM	269	1.14	1.05	1.15	1.11
Maroon Bells-Snowmass WA	271	0.78	0.91	0.91	0.87
Grand Canyon NP	285	1.60	0.82	0.45	0.96

10.3.2 Subject-to-BART Determination

Once the "universe" of potentially-BART-eligible sources has been set, the State must make a determination about which of these sources are truly subject-to-BART. In order for a source to be subject-to-BART, a State must conclude that emissions of visibility impairing pollution from a BART-eligible source may reasonably be anticipated to cause or contribute to any visibility impairment in a mandatory Class I area.

As noted in Section 10.3.1 above, NMED's process resulted in the determination that San Juan Generating Station is subject-to-BART.

10.3.3 Determining BART

Clean Air Act § 169A(g)(7) directs States to consider five factors in making BART determinations. The regional haze rule codified these factors in 40 CFR § 51.308(e)(1)(ii)(B), which directs States to identify the "best system of continuous emissions control technology" taking into account "the technology available, the costs of compliance, the energy and non-air quality environmental impacts of compliance, any pollution control equipment in use at the source, and the remaining useful life of the source."

The BART regulations define BART as meaning "…an emission limitation based on the degree of reduction achievable through the application of the best system of continuous emission reduction for each pollutant which is emitted by … [a BART-eligible source]. In its guidance, EPA was clear that each State must determine the appropriate level of BART control for each source that is determined to be subject-to-BART. In making a BART determination, a State must consider the following factors:

(1) The costs of compliance;
(2) The energy and non-air quality environmental impacts of compliance;
(3) Any existing pollution control technology in use at the source;
(4) The remaining useful life of the source; and
(5) The degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology.

To consider these factors, New Mexico applied the following 5 step processs as specified in the BART Guidelines at Appendix Y to 40 CFR Part 51:

Step 1 – Identify All Available Retrofit Control Technologies
Step 2 – Eliminate Technically Infeasible Options
Step 3 – Evaluate Control Effectiveness of Remaining Control Technologies
Step 4 – Evaluate Impacts and Document the Results
    a) Costs of Compliance
    b) Energy Impacts
    c) Air quality environmental impacts
    d) Non-air environmental impacts
    e) Remaining useful life
Step 5 – Evaluate Visibility Impacts

10.4 Summary of BART Control Analysis for PNM San Juan

Based on the five factor analysis, the Department has determined that BART for Units 1-4 for PM is existing pulse jet fabric filter control technology and an existing emission rate of 0.015 lb/MMbtu. The Department's determination of BART was based on the following results of the full five factor analysis:

1. Each of Units 1-4 is equipped with a pulse jet fabric filter (PJFF) and is subject to a federally-enforceable emission limit of 0.015 lb PM/MMbtu.

2. The Department reviewed both the cost-effectiveness and incremental cost-effectiveness of additional control technology (WESP) and found these costs to be excessive.

3. There are no non-air impacts associated with the WESP technology.

4. There are additional energy impacts associated with the WESP technology and the Department considers these costs to be reasonable.

5. The Department reviewed the visibility improvement that resulted from the installation of the consent decree technology (PJFF and LNB/OFA) and that would result from the addition of WESP technology. The Department determined that on a facility-wide basis the visibility improved by 1.06 deciviews (dv) from the installation of the consent decree technology at Mesa Verde National Park (Mesa Verde). The installation of WESP would result in a facility-wide improvement of 0.62 dv at Mesa Verde.

Based on the five factor analysis, the Department has determined that BART for Units 1-4 for NOx is SNCR technology and an emission rate of 0.23 lb/MMbtu on a 30-day rolling average. The Department's determination of BART was based on the following results of the five factor analysis:

1. SNCR technology is considered cost-effective at an average cost of $3,494 dollars per ton of NOx removed. SNCR technology will reduce the facility annual NOx emissions by 4,900 tons.

2. The SNCR technology will result in additional energy impacts and non-air impacts. The SNCR technology will require a new reagent system and a reagent storage system. The Department considered these additional costs in the review of the overall cost-effectiveness of SNCR and found these costs to be reasonable.

3. The Department reviewed the visibility improvement that resulted from the installation of the SNCR technology. The Department determined that on a facility-wide basis the visibility improved by 0.25 dv at San Pedro Parks, 0.22 dv at Mesa Verde, and 0.21 at Bandelier.

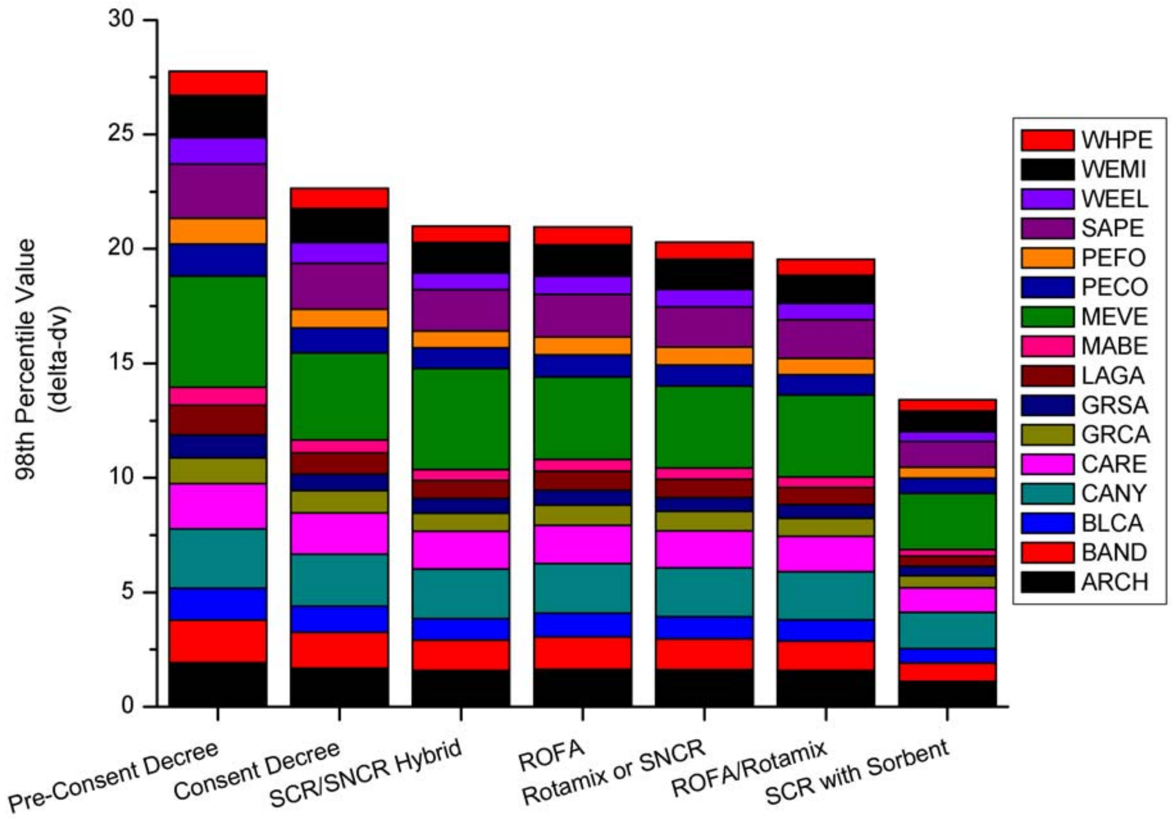
4. An emission limit of 0.23 lb NOx/MMbtu at each of Units 1-4 equals the EPA's established presumptive limit for dry-bottom, wall-fired boilers burning sub-bituminous coal.

5. The Department reviewed additional economic information provided by PNM that analyzed the economic impact to ratepayers in New Mexico. PNM estimates indicate the cost of control technology beyond SNCR would be financially burdensome and cause economic hardship to low-income New Mexicans. According to the U.S. Census Bureau, as of 2009, 18 percent of New Mexicans were living below the poverty line, as defined by the federal poverty standards. PNM estimates a rate increase of $11.50 per year per residential ratepayer from the installation of SNCR versus an estimated rate increase of $82.00 per year from the installation of SCR.

10.5 Visibility Improvement Resulting from BART Evaluation in New Mexico

The visibility improvement resulting from the installation of BART that will be achieved in each Class I area as a result of the emission reduction achievable from San Juan Generating Station is shown in Figure 10-1. The BART determination, including visibility modeling analysis, is included as Appendix D.

Figure 10-1: Visibility Improvement from BART Controls at San Juan Generating Station



<u>10.6 BART Implementation</u>

<u>In accordance with 40 CFR 51.308(e)(1)(iv), the Department determines that SNCR shall be installed on each of the four units as expeditiously as practicable, but in no event later than 5 years after approval by the EPA of this implementation plan revision.</u>

CHAPTER 11: REASONABLE PROGRESS GOAL DEMONSTRATION

11.1 Reasonable Progress Requirements

Several steps for establishing reasonable progress goals were outlined in the RHR and are discussed in the following subsections.

Calculate/Estimate Baseline and Natural Visibility Conditions

Baseline visibility conditions were determined by the Western Regional Air Partnership (WRAP) Technical Support System (TSS) using the Interagency Monitoring of Protected Visual Environments (IMPROVE) algorithm. The IMPROVE algorithm followed the established guidelines presented in the RHR. To determine baseline visibility conditions, the average degree of visibility (expressed as dv) for the 20% least impaired days and the 20% worst impaired days was calculated, using IMPROVE air quality monitoring data, for each calendar year from 2000 to 2004. The IMPROVE monitoring program collects speciated $PM_{2.5}$, and $PM_{2.5}$ and PM_{10} mass. IMPROVE is a nationwide network which began in 1988 and expanded significantly in 2000 in response to the EPA's Regional Haze Rule (RHR). The Regional Haze Rule specifically requires data from this program to be used by states and tribes to track progress in reducing haze. The annual values were then averaged over five years to determine the baseline visibility condition values. Baseline visibility is discussed in detail in Chapter 7.

Natural conditions are an estimate of the amount of visibility impairment that would occur if no human-caused visibility impairment existed. Natural conditions were determined by the WRAP through the Natural Haze Levels II Committee for the 20% worst visibility days and the 20% best visibility days using available monitoring data and the IMPROVE algorithm. The Natural Haze Levels II Committee was established in 2006 to review and refine the default approach. The committee included representatives from NOAA, NPS, Cooperative Institute for Research in the Atmosphere (CIRA), Regional Planning Organizations (RPOs) and industry representatives, and other participants. The final report of the committee can be found at:
http://wrapair.org/forums/aoh/meetings/060726den/NaturalHazeLevelsIIReport.pdf.

Additional information about the baseline and natural visibility impairment calculations can be found in Chapter 6.

Determine the Uniform Rate of Progress (URP)

The URP (also known as the glide slope), which was determined by the State of New Mexico for all mandatory Class I areas within the state, is the rate of visibility change necessary to achieve natural visibility conditions by the year 2064. The URP represents the slope between baseline visibility conditions in 2004 and natural visibility conditions in 2064. Using interpolation, the improvement necessary by 2018 to achieve natural visibility conditions in 2064 can be calculated. The URP is discussed in greater detail in Chapters 6 and 9.

Table 11-1: 20% Best and Worst Days Baseline, Natural Conditions, and Uniform Rate of Progress Goal for New Mexico Class I Areas

IMPROVE Monitor Name	New Mexico Class I Area	20% Worst Days				20% Best Days	
		2000-04 Baseline (dv)	2018 URP Goal (dv)	2018 Reduction Needed	2064 Natural Conditions (dv)	2000-04 Baseline (dv)	2064 Natural Conditions (dv)
BAND1	Bandelier Wilderness	12.22	10.83	1.39	6.26	4.95	1.28
BOAP1	Bosque del Apache National Wildlife Refuge	13.8	12.15	1.65	6.73	6.28	2.15
GUMO1	Carlsbad Caverns National Park	17.19	14.73	2.46	6.65	5.95	0.99
GILA1	Gila Wilderness	13.11	11.61	1.50	6.66	3.31	0.52
WHPE1	Pecos/Wheeler Peak Wilderness	10.41	9.40	1.01	6.08	1.22	-0.56
SACR1	Salt Creek Wilderness	18.03	15.41	2.62	6.81	7.84	2.12
WHIT1	White Mountain Wilderness	13.7	12.09	1.61	6.8	3.55	0.66

Four Factor Analysis

In an effort to reduce visibility impairing air pollutants, emission control measures had to be evaluated. The four factor analysis process was established in the RHR and is discussed in detail in Section 11.2 of this chapter. Each emission control strategy, as required by the four factor analysis guidelines, was evaluated based on 1) the cost of compliance, 2) time necessary for compliance, 3) the energy and non-air quality environmental impacts of compliance, and 4) the remaining useful life of any existing source subject to such emission controls.

Consultation With Other States

According to the RHR, the State of New Mexico must consult with other states that may cause or contribute to visibility impairment in New Mexico Class I areas. For the State of New Mexico, consultations with other states contributing to visibility impairment in Class I areas were conducted through the WRAP. Additional information on the state consultations can be found in Chapter 2.

Determination of Reasonable Progress Goals

Reasonable progress goals, when established, demonstrate the amount of visibility improvement the State of New Mexico believes to be feasible, based on the four factor analysis and Clean Air Act (CAA) requirements, during the first planning period. The reasonable progress goal may be the same, less stringent, or more stringent than the visibility improvement based on the URP. The reasonable progress goals, and the logic used to determine the goals, are discussed in Section 11.3 of this chapter.

11.2 Four Factor Analysis Performed for New Mexico Sources

The four factor analysis, which is provided in the RHR, is a method for evaluating potential control strategies for facilities that are not eligible for Best Available Retrofit Technology (BART). The analysis considers 1) the cost of compliance, 2) the time necessary for compliance, 3) environmental impacts of compliance, and 4) the remaining useful life of the facility.

The WRAP hired EC/R Incorporated (EC/R), headquartered in Chapel Hill, North Carolina, to complete the four factor analysis for specific source types throughout the WRAP region (Appendix E). In addition, EC/R completed a four factor analysis for specific sources in New Mexico (Appendix F). Control measures for SO_2 and NOx were evaluated for selected sources in New Mexico. Data on emissions of volatile organic compounds (VOC) were also collected. In addition, although VOC emission control measures were not explicitly evaluated in the four factor analysis study by EC/R, the impacts of NOx and SO_2 controls on VOC were calculated where co-control benefits would occur.

11.2.1 Detailed Description of the Four Factors

Cost of Compliance
Both control costs and net annual costs were analyzed for all control measures identified by EC/R. Control costs cover direct and indirect capital costs. Examples of direct capital expenses includes the costs associated with purchased equipment, construction, installation, instrumentation and process controls, ductwork and piping, electrical components, and structural and foundation components. Indirect capital expenses include costs such as engineering and design, contractor fees, startup and performance testing, contingency costs, and process modifications.

Net annual costs include the expenses associated with the typical operation of the control equipment over a year. Annual costs include items such as the utility expenses, labor, waste disposal expenses, and amortized costs of the capital investment. All cost estimates calculated by EC/R were updated to 2007 dollars using the Marshall and Swift Equipment Cost Index or the Chemical Engineering Plant Cost Index, which are both published in the journal Chemical Engineering.

Time Necessary for Compliance
The time necessary for compliance includes the time needed for the State of New Mexico to develop and implement regulations for emissions controls, as well as the time the sources require to procure the capital to purchase the emission control equipment, design and fabricate the equipment, and to install the emission controls.

Energy and Other Non-Air Quality Environmental Impacts
Emission control devices often require some form of energy input to operate. To determine the energy requirements for a particular control device, the electricity needs, steam requirements, increased fuel requirements, and any additional energy inputs required were quantified. Only the direct energy requirements were considered; indirect energy needs, such as the amount of energy required to produce the fuel for the control device, were not analyzed. In addition, any impacts the control technologies had on other source processes, such as boiler efficiency, were not evaluated.

Remaining Equipment Life at Source
The remaining equipment life of the source will impact the cost of emission control technologies if the expected life of the source is less than the lifetime of the pollution control device being considered. Therefore, if the remaining equipment life is less than the lifetime of the pollution control device, the capital cost of the pollution control device is amortized for the remaining life of the emission source. The ages of major pieces of equipment were determined where possible, and compared with the service life of pollution control equipment. The impact of a limited useful life on the amortization period for control equipment was then evaluated, along with the impact on annualized cost-effectiveness.

11.2.2 Source Selection Process for Four Factor Analysis

To select the sources that would undergo the required four factor analysis, emission data for sources in New Mexico had to first be collected. Emissions assessments were initially based on 2002 emissions inventory in the WRAP Emissions Data Management System (EDMS) which consists of data submitted by the WRAP states in 2004. New Mexico then reviewed the emissions data and parameters from the EDMS used for this analysis and provided updated data when applicable. In some cases, detailed data on PM_{10} and $PM_{2.5}$ emissions were not available from the WRAP inventory. Therefore, PM_{10} and $PM_{2.5}$ data from the U.S. Environmental Protection Agency's (EPA) 2002 National Emissions Inventory (NEI) were used to supplement the WRAP inventory where necessary.

Once the important emission sources were identified within a given emission source category, a list of potential additional control technologies was compiled from a variety of sources, including control techniques guidelines published by the EPA, emission control cost models such as AirControlNET and CUECost, Best Available Retrofit Technology (BART) analyses, White Papers prepared by the Midwest Regional Planning Organization (MRPO), and a menu of control options developed by the National Association of Clean Air Agencies (NACAA). The options for each source category were then narrowed to a set of technologies that would achieve the emission reduction target under consideration.

From this evaluation the following sources were identified as major emission sources for the WRAP states:

- Reciprocal Internal Combustion Engines and Turbines;
- Oil and Gas Exploration and Production Field Operations;
- Natural Gas Processing Operations;
- Industrial Boilers;
- Cement Kilns;
- Sulfuric Acid Manufacturing Plants;
- Pulp and Paper Lime Kilns; and
- Oil Refineries.

Information regarding each of these sources is outlined in ER/C's analysis report, *Supplementary Information for Four Factor Analyses by WRAP States* in Appendix E.

11.2.3 Four Factor Analyses for New Mexico

A separate four-factor analysis was conducted by ER/C for selected emission sources at three New Mexico petroleum refineries (Appendix F). New Mexico determined that these refineries should be evaluated independently of the WRAP states analysis in order to determine whether these specific sources should be considered for additional emission reductions. The following facilities and emission sources were evaluated:

- Navajo Refining Co., Artesia Refinery – Fluid Catalytic Cracking Unit (FCCU) #1, catalyst regeneration and process heater;
- Western Refining Southwest, Bloomfield Refinery – FCCU #1, catalyst regeneration and process heater; and
- Western Refining Southwest, Gallup Refinery – CO Boiler Unit #1

Navajo Refining Co., Artesia Refinery

One unit, the Fluid Catalytic Cracking Unit (FCCU) #1, catalyst regeneration and process heater, at the Navajo Refining Co. was selected for the four factor analysis in New Mexico. The Navajo Artesia refinery FCCU has a capacity of 27,000 barrels per day (bbl/day). In catalytic cracking, the heavier fractions of crude petroleum are treated with a catalyst which breaks the petroleum molecules into lighter compounds. The catalyst is continuously cycled between the cracking and a separate regeneration reactor in order to burn off coke build-up.

Six possible emission control devices were identified and analyzed for the FCCU regenerator and heater using the four factor analysis process: optimization of NOx reduction catalyst, selective catalytic reduction (SCR), low NOx burners (LNB), selective non-catalytic reduction (SNCR), flue gas recirculation (FGR), and ultra low NOx burners (ULNB). LNB technology reduces the amount of NOx produced by reducing the flame temperature. The flame temperature is reduced by controlling the fuel and air mixing, which creates a larger, branched flame. FRG entails re-circulating a portion of relatively cool exhaust gases back into the combustion process in order to lower the flame temperature and reduce NOx formation. With SNCR, an aqueous reagent, typically either ammonia or urea, is injected into the hot flue gas. The reagent reacts with the NOx in the gas to form N_2 and water vapor. Similar to the SNCR technology, SCR technology uses ammonia to reduce NOx to N_2 and H_2O. However, with SCR the NOx in the flue gas reacts with the ammonia within a catalyst bed. The optimization of NOx reduction catalyst has already been completed and analyzed for the Navajo Refinery.

Cost

The estimated capital costs, annual costs, and the cost effectiveness for the possible emission control devices at the Navajo Refinery are shown in Table 11-2. For each option, the table gives an estimate of the capital cost to install the necessary equipment, and the total annual cost of control, including the amortized cost associated with the capital equipment cost. The table also shows the estimated cost effectiveness for each control measure, in terms of the cost per ton of emission reduction. While SCR is expected to be far more efficient in controlling NOx emissions than LNB or LNB and FRG, the estimated capital and annual costs are far higher than the costs associated with LNB or LNB and FRG. As shown in Table 11-2, NOx reductions using LNB or LNB and FRG technology are far more cost effective than the SNCR and SCR technologies.

Table 11-2: Estimated Costs of Potential Emission Control Devices for FCCU #1 at Navajo Refining Co., Artesia Refinery

		Cost Estimates				
Unit	Control Technology	Pollutant Controlled	Estimated Control Efficiency (%)	Estimate Capital Cost ($1000)	Annual Cost ($1000/year)	Cost Efficiency ($/ton)
FCCU Regenerator #22	Optimization NOx reduction catalyst	NOx	47-59			
	SCR	NOx	67-84	Not Available	260-320	2,500
FCCU Heater	LNB	NOx	40	76	8.1	5,100
	ULNB	NOx	75-85	131	13	3,800-4,400
	LNB and FGR	NOx	48	161	17	9,000
	SNCR	NOx	60	221	24	10,100
	SCR	NOx	70-90	483	56	15,600-20,100
	LNB and SCR	NOx	70-90	553	63	17,600-22,600

Time Necessary for Compliance

EC/R estimated that it would take nearly 6½ years for reduction strategies to become effective. It was determined that up to 2 years will be needed for the state to develop the necessary rules to implement the strategy. EC/R estimated that sources may then require up to a year to procure the necessary capital to purchase control equipment. The Institute of Clean Air Companies (ICAC) has estimated that approximately 13 months is required to design, fabricate, and install SCR or SNCR technology for NOx control. However, the time necessary will depend on the type and size of the unit being controlled. For instance, state regulators' experience indicates that closer to 18 months is required to install this technology. In the CAIR analysis, EPA estimated that approximately 30 months is required to design, build, and install SO_2 scrubbing technology for a single emission source. The analysis by EC/R also estimated that up to an additional 12 months may be required for staging the installation process if multiple sources are to be controlled at a single facility.

Energy and Non-Air Quality Environmental Impacts

The energy required to operate the emission control devices, including additional fuel, electricity and steam, and the waste produced by the emission control devices, such as solid waste and wastewater, are shown in Table 11-3. As illustrated by the values in Table 11-2, none of the six technologies are expected to produce a significant amount of solid waste or any wastewater. The solid waste produced by the SCR technology would occur when the catalyst is changed. None of the technologies are expected to increase fuel consumption, though LNB may reduce the fuel consumption due to optimized fuel combustion.

Table 11-3: Estimated Energy and Non-Air Environmental Impacts of Potential Emission Control Devices for FCCU #1 at Navajo Refining Co.

		Energy and Non-Air Pollution Impacts				
Unit	Control Technology	Pollutant Controlled	Potential Emission Reduction (tons/year)	Electricity Requirement (kW)	Solid Waste Generated (ton/hr)	Waste Water Produced (gal/min)
FCCU Regenerator #21	optimization NOx reduction catalyst	NOx	72-90		~0.03	
	SCR	NOx	103-129	8,400	0.073	
FCCU Heater	LNB	NOx	1.6			
	ULNB	NOx	3-3.4			
	LNB and FGR	NOx	1.9	3,300		
	SNCR	NOx	2.4	460		
	SCR	NOx	2.8-3.6	8,400	0.073	
	LNB and SCR	NOx	2.8-3.6	8,400	0.073	

A blank indicts that no impact is expected

Remaining Equipment Life

Information was not available on the age of the FCCU processes at the time of EC/R's analysis. However, industrial processes are often refurbished to extend their lifetimes. Therefore, the remaining lifetime of most equipment is expected to be longer than the projected lifetime of pollution control technologies which have been analyzed for these sources.

Navajo Refining Co., Artesia Refinery FCCU #1 Four Factor Analysis Conclusion

The process heater at Artesia Refinery is rated at 35 MMBtu/hr, has no controls, limits of SO_2 - 2.2 tpy; NOx - 20.2 tpy; CO - 13.9 tpy; PM - 1.3 tpy. The FCCU Regenerator #21 exhaust is controlled by a wet scrubber to control SO_2 and PM. Controls currently operated include Tertiary Cyclones & Caustic Scrubber, EMTROL CYTROL, and Monsanto Dynawave® Scrubber. After control emissions vented to atmosphere from FCCU-REGEN are: SO_2 - 61.0 tpy; NOx - 101.9 tpy; CO - 106.8 tpy; PM - 109.5 tpy. Based on these relatively low levels of emissions and the factors discussed above, NMED considers additional controls on the Artesia Refinery to be unnecessary at this time for the purposes of the visibility program.

<u>Western Refining Southwest, Bloomfield Refinery</u>

One unit, the Fluid Catalytic Cracking Unit (FCCU) #1 catalyst regeneration and process heater at the Western Refining Southwest, Bloomfield Refinery was selected for the four factor analysis in New Mexico. Western Refining Southwest Bloomfield refinery FCCU has a capacity of 7,200 bbl/day.

The Western Refining Bloomfield refinery FCCU regenerator is well controlled for particulate matter, with an electrostatic precipitation (ESP). No baseline controls have been identified for NOx or SO_2 from the regenerator vent. As discussed above, a number of options are available for reducing NOx and SO_2. Ten possible emission control devices for SO_2 and NOx were identified and analyzed for the FCCU regenerator and heater using the four factor analysis process: catalyst additives for NOx reduction, low temperature oxidation technology (LoTOx™), SCR, SNCR, catalyst additives for SO_2 absorption, desulfurization of catalytic cracker feed, and wet scrubbing. Information regarding SCR, SNCR, LNB, ULNB, and FGR are discussed above.

The LoTOxTM process has been developed to control NOx emissions in the catalytic cracking regenerator offgas. In this system, ozone is injected into the offgas to convert the nitrogen oxide (NO) and nitrogen dioxide (NO_2) which comprise NOx into more highly oxidized forms of nitrogen such as dinitrogen pentoxide (N_2O_5). These more highly oxygenated compounds are more soluble in water, and are removed from the offgas stream in a wet scrubber. SO_2 catalyst additives adsorb sulfur oxide compounds produced in the catalyst regenerator. These compounds are then converted to H_2S in the catalytic cracking reactor, and exit this reactor with the cracked hydrocarbon stream. The H_2S is eventually removed from the hydrocarbon stream in an amine treatment process, and then recovered in the sulfur recovery process. NOx catalyst additives promote the reduction of NOx formed to nitrogen and water. These catalysts promote the reduction reaction between carbon or carbon monoxide and nitrogen oxides inside the regenerator. Wet scrubbing brings polluted gas stream into contact with a scrubbing liquid, by spraying it with the liquid, by forcing it through a pool of liquid, or by some other contact method, so as to remove the pollutants.

Cost

The estimated capital costs, annual costs, and the cost effectiveness for the possible emission control devices at the Bloomfield Refinery are shown in Table 11-4. For each option, the table gives an estimate of the capital cost to install the necessary equipment, and the total annual cost of control, including the amortized cost associated with the capital equipment cost. The table also shows the estimated cost effectiveness for each control measure, in terms of the cost per ton of emission reduction.

Table 11-4: Estimated Costs of Potential Emission Control Devices for FCCU at Western Refining Southwest, Bloomfield Refinery

		Cost Estimates				
Unit	Control Technology	Pollutant Controlled	Estimated Control Efficiency (%)	Estimate Capital Cost ($1000)	Annual Cost ($1000/ year)	Cost Efficiency ($/ton)
FCCU Regenerator A-201	Catalyst additives for NOx reductions	NOx	75-81	Not Available	Not Available	Not Available
	LoTOx™	NOx	85	Not Available	80-100	1,700-2,000
	SNCR	NOx	40-80	Not Available	60-120	2,500
	SCR	NOx	85-92	Not Available	120-130	2,500
	Catalyst additives for SO_2 absorption	SO_2	98	Not Available	Not Available	Not Available
	Desulfurization of catalytic cracker feed	SO_2	98	Not Available	Not Available	Not Available
	Wet scrubbing	SO_2	98	Not Available	180-660	1,500-1,800
FCCU Heater	LNB	NOx	40	117	12	5,200
	ULNB	NOx	75-85	199	20	3,800-4,300
	LNB and FGR	NOx	48	245	26	9,000
	SNCR	NOx	60	337	37	9,900
	SCR	NOx	70-90	736	86	15,600-20,000
	LNB and SCR	NOx	70-90	843	97	17,600-22,500

Time Necessary for Compliance

As with Navajo Refinery, EC/R estimated that it would take nearly 6½ years for reduction strategies to become effective. This includes 2 years for regulatory development, 1 year for capital acquisition, and 2½ years for designing, building and installing a scrubber, if this option is selected. If catalyst additives are used, time will be required to select and test the appropriate additives, and to determine the optimum feed rate for the additive.

Energy and Non-Air Quality Environmental Impacts

The energy required to operate the emission control devices, including additional fuel, electricity and steam, and the waste produced by the emission control devices, such as solid waste and wastewater, are shown in Table 11-5.

The use of catalyst additives for the FCCU or desulfurization of the FCCU feed stream involve process modifications which are tailored to each specific refinery. Therefore, it was not possible to quantify the energy and non-air pollution impacts of these modifications within the time limitations of this project. However, process modifications to desulfurize the FCCU feed stream would generally require increases in catalytic hydrotreatment processing. These modifications may increase the generation of spent catalyst, which would need to be treated as a solid waste or a hazardous waste. Catalyst additives for reducing NOx and SO_2 emissions from fluid catalytic cracking units are likely to result in increased generation of spent catalyst, which would have to be disposed as hazardous waste. These catalyst additives may also result in increases in fuel consumption.

A LoTOx™ scrubbing system or wet scrubbing system applied to the fluidized catalytic cracking unit would require electricity to operate fans and other auxiliary equipment, and would produce a wastewater stream which would require treatment. In addition, sludge from the scrubber would require disposal as solid waste. As stated earlier SCR and SNCR systems would also require electricity for fans, and SCR systems would produce additional solid waste because of spent catalyst disposal.

Table 11-5: Estimated Energy and Non-Air Environmental Impacts of Potential Emission Control Devices for FCCU #1 at Western Refining Southwest, Bloomfield Refinery

		Energy and Non-Air Pollution Impacts				
Unit	Control Technology	Pollutant Controlled	Potential Emission Reduction (tons/year)	Electricity Requirement (kW)	Solid Waste Generated (ton/hr)	Waste Water Produced (gal/min)
FCCU Regenerator #21	Catalyst additives for NOx reductions	NOx	43-46		~0.03	
	LoTOx™	NOx	49	1,100	1.9	3.7
	SNCR	NOx	23-46	460		
	SCR	NOx	49-53	8,400	0.073	
	Catalyst additives for SO_2 absorption	SO_2	364		0.03 <0.03	
	Desulfurization of catalytic cracker feed	SO_2	364			
	Wet scrubbing	SO_2	364	1,100		3.7
FCCU Heater	LNB	NOx	2.4			
	ULNB	NOx	4.6-5.2			
	LNB and FGR	NOx	2.9	3,300		
	SNCR	NOx	3.7	460		
	SCR	NOx	4.3-5.5	8,400	0.073	
	LNB and SCR	NOx	4.3-5.5	8,400	0.073	

A blank indicts that no impact is expected

Remaining Equipment Life

Information was not available on the age of the FCCU processes at the time of EC/R's analysis. However, industrial processes often refurbished to extend their lifetimes. Therefore, the remaining lifetime of most equipment is expected to be longer than the projected lifetime of pollution control technologies which have been analyzed for these sources.

Western Refining Southwest, Bloomfield Refinery FCCU #1 Four Factor Analysis Conclusion
Bloomfield Refinery has been in "suspended operations" since November 2009. The FCCU is subject to NOx and SO_2 reductions according to the Catalyst Additive Program required by an Amended Stipulation and Final Order (AFSO) as the result of an enforcement action. The Order requires that Bloomfield Refinery decrease FCCU NOx down to 20 ppmvd and SO_2 down to 25 ppmvd (both at 0% O_2) by December 31, 2010. If these emissions limits are not met, the ASFO has complex emissions offset requirements. NMED has determined that additional controls for regional haze are not required.

<u>Western Refining Southwest, Gallup Refinery</u>
One unit, CO Boiler Unit #1, at the Western Refining Southwest, Gallup Refinery was selected for the four factor analysis in New Mexico. The Western Refining Gallup refinery FCCU has a capacity of 8,500 bbl/day.

The Gallup Refinery uses a CO boiler to combust CO and volatile organic compound (VOC) off-gases produced by the refinery. The steam generated by the boiler is used as process steam at the refinery. The CO boiler is uncontrolled. Eight possible emission control devices for SO_2 and NOx were identified and analyzed for the CO boiler using the four factor analysis process: LNB with overfire air (OFA); LNB, OFA, and FGR; SCR; SNCR; dust sorbent injection (DSI), spry dryer absorber (SDA); and flue gas desulfurization.

NOx emissions from a CO boiler can be controlled using a variety of combustion modifications including overfire air (OFA), LNB, FGR, and combinations of these technologies. Add-on control systems such as SCR and SNCR can also be used to reduce NOx emissions from boilers. In SCR, the flue gas is treated with a small quantity of ammonia (NH_3) in a catalyst bed. The ammonia reacts with NOx to produce nitrogen gas (N_2). Alternatively, urea [(NH3)2CO] can be added instead of ammonia. In this case, the urea decomposes to produce ammonia, which reacts with NOx. SNCR also involves the addition of ammonia or urea to reduce NOx, but without a catalyst. SNCR is less efficient at reducing NOx than SCR, but is also generally less expensive. SNCR can also be used in situations where flue gas contaminants would poison the SCR catalyst.

It should be noted that SCR and SNCR for controlling NOx require injection of ammonia (NH_3), urea [$(NH_3)_2CO$], or other nitrogen compounds into the exhaust stream. These chemicals react with NOx to chemically convert the pollutant to elemental nitrogen (N_2). However, the use of these chemicals generally results in ammonia emissions, termed ammonia slip.

Emissions of SO_2 can be reduced by using DSI, spray dryer absorber SDA, or flue gas desulfurization FGD. DSI uses dry limestone to react with the SO_2 in the flue gas. The reacted limestone is then collected in a particulate control device, The SDA process is similar to the DSI process, except that a limestone slurry is injected into the flue gas where it reacts with the SO_2 and is removed in a particulate control device. FGD involves the flue being passed through a vessel where it is contacted with an alkaline solution which reacts with the flue gas SO_2 to form a sulfate particulate. The sulfate particulate is removed in the system and the used alkaline solution is recycled through the process.

Cost
The estimated capital costs, annual costs, and the cost effectiveness for the possible emission control devices at the Bloomfield Refinery are shown in Table 11-6. For each option, the table gives an estimate of the capital cost to install the necessary equipment, and the total annual cost of control, including the amortized cost associated with the capital equipment cost. The table also shows the estimated cost effectiveness for each control measure, in terms of the cost per ton of emission reduction.

Table 11-6: Estimated Costs of Potential Emission Control Devices for CO Boiler at Western Refining Southwest, Gallup Refinery

		Cost Estimates				
Unit	Control Technology	Pollutant Controlled	Estimated Control Efficiency (%)	Estimate Capital Cost ($1000)	Annual Cost ($1000/ year)	Cost Efficiency ($/ton)
CO Boiler Unit 10	LNB with OFA	NOx	30-50	0.5-0.7	80-110	2,500-5,600
	LNB, OFA, and FGR	NOx	30-50	0.8-1.0	125-170	3,800-8,700
	SNCR	NOx	30-75	0.5-0.7	320-440	6,600-22,500
	SCR	NOx	40-90	1.5-2.0	400-600	6,800-10,200
	DSI	SO_2	50-90	1.5-2.0	720-970	1,100-3,400
	SDA	SO_2	80-90	1.5-2.0	1,380-1,860	2,200-3,300
	FGD	SO_2	80-90	1.5-2.0	1,150-1,560	1,800-2,800

Time Necessary for Compliance
EC/R estimated that it would take nearly 5 1/2 years to achieve emission reductions for the CO boiler at the Western Refinery in Gallup. This includes 2 years for regulatory development, 1 year for capital acquisition, and 1½ years for designing, building and installing NOx controls.

Energy and Non-Air Quality Environmental Impacts
The energy required to operate the emission control devices, including additional fuel, electricity and steam, and the waste produced by the emission control devices, such as solid waste and wastewater, are shown in Table 11-7 below.

Table 11-7: Estimated Energy and Non-Air Environmental Impacts of Potential Emission Control Devices for CO Boiler at Western Refining Southwest, Gallup Refinery

		Energy and Non-Air Pollution Impacts				
Unit	Control Technology	Pollutant Controlled	Potential Emission Reduction (tons/year)	Electricity Requirement (kW)	Solid Waste Generated (ton/hr)	Waste Water Produced (gal/min)
FCCU Regenerator #21	LNB with OFA	NOx	20-33			
	LNB, OFA, and FGR	NOx	20-33	3,300		
	SNCR	NOx	20-49	460		3.7
	SCR	NOx	26-59	8,400	0.073	
	DSI	SO_2	352-633	1,207	6.7	84
	SDA	SO_2	563-633	836	8.0	67
	FGD	SO_2	563-633	2,387	7.0	148

A blank indicts that no impact is expected

Remaining Equipment Life
Information was not available on the age of the CO boiler at the time of EC/R's analysis. However, industrial processes often refurbished to extend their lifetimes. Therefore, the remaining lifetime of most equipment is expected to be longer than the projected lifetime of pollution control technologies which have been analyzed for these sources.

Western Refining Southwest, Gallup Refinery CO Boiler #1 Four Factor Analysis Conclusion
The Gallup FCCU is a "partial-burn" type, in which high-CO offgas is fed to a CO Boiler. The CO Boiler was recently chosen as one Western wishes to use to demonstrate compliance with the Covered Heaters and Boilers NOx Reduction requirement of the ASFO, dated January 22, 2009. After modifications (which will include low-NOx burners, increase in capacity from 50 MMBtu/hr to 70 MMBtu/hr, and addition of water tempering), the new NOx emission rate will be 0.040 lb/MMBtu. The CO Boiler is otherwise uncontrolled.

The FCCU is subject to NOx and SO_2 reductions according to the Catalyst Additive Program required by the ASFO. The Order requires that Gallup decrease FCCU NOx to 20 ppmvd and SO_2 to 25 ppmvd (both at 0% O_2) by December 31, 2010. If these emissions limits are not met, the ASFO has complex emissions offset requirements. NMED has determined that additional controls for the visibility program are not required.

11.3 Setting Reasonable Progress Goals

Under Section 308(d)(1) of the Regional Haze Rule, states must "establish goals (expressed in deciviews) that provide for reasonable progress towards achieving natural visibility conditions" for each Class I area of the state. These RPGs must provide for an improvement in visibility for the most impaired visibility days, and ensure no degradation for the least impaired visibility days over the same period. The RPGs are interim goals that represent incremental visibility improvement over time, in this case out to the year 2018, to be compared to the 2018 Uniform Rate of Progress (URP) glide slope. Based on the steps outlined in Section 11.1 and the Four-Factor Analysis in Section 11.2, NMED has established RPGs for each of New Mexico's seven Class I areas, as described below. These RPGs are based primarily on results of the CMAQ modeling described in Section 9.2, and on the four-factor analysis on major source categories.

Table 11-8 shows that for the 20% best days, the RPGs show an improvement over baseline conditions for most of New Mexico's Class I areas. For the 20% worst days, the RPGs are short of the 2018 URP, but are justified based on the demonstration provided below.

Table 11-8: Reasonable Progress Goals for 20% Worst Days and 20% Best Days for New Mexico Class I Areas

	20% Worst Days			20% Best Days	
New Mexico Class I Areas	Baseline Condition (dv)	2018 Uniform Progress Goal (dv)	2018 Reasonable Progress Goal (dv)	Baseline Conditions (dv)	2018 Reasonable Progress Goal (dv)
Bandelier Wilderness	12.22	10.83	11.9	4.95	4.89
Bosque del Apache National Wildlife Refuge	13.8	12.15	13.59	6.28	6.1
Carlsbad Caverns National Park	17.19	14.73	16.92	5.95	6.12
Gila Wilderness	13.11	11.61	12.99 [15.14]	3.31	3.2 [3.44]
Salt Creek Wilderness	18.03	15.41	17.07	7.84	7.43
White Mountain Wilderness	13.7	12.09	13.26	3.55	3.41
Wheeler Peak Wilderness	10.41	9.40	10.23	1.22	1.12

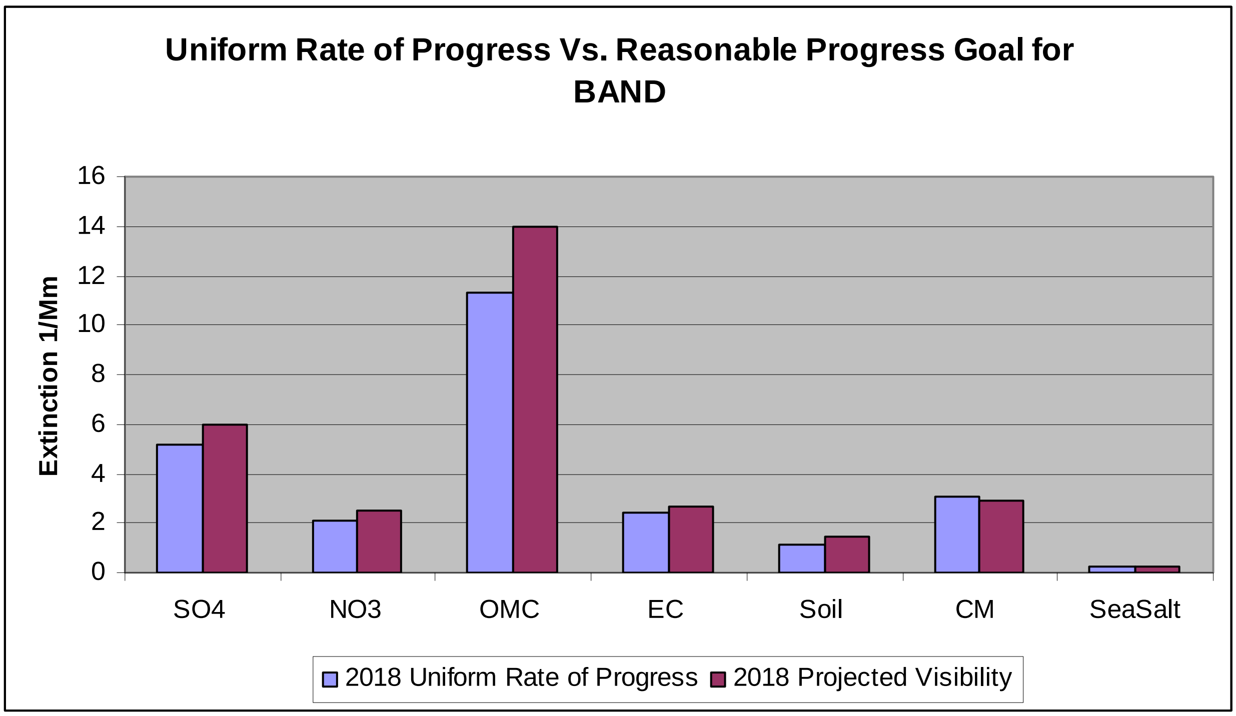
Demonstration That the RPGs for 20 Percent Best and Worst Days are Reasonable

EPA guidance indicates that "States may establish an RPG that provides for greater, lesser or equivalent visibility improvement as that described by the glidepath." The 2018 RPGs identified in Figure 11-7 for 20 percent worst days show an improvement in visibility, although less than the 2018 URP. NMED believes that RPGs are reasonable for all seven of the New Mexico's mandatory Class I areas, as follows.

11.3.1 Bandelier Wilderness Area

There is an improvement in visibility for Bandelier from baseline conditions to the modeled projected visibility in 2018. This improvement is less than the URG for Bandelier, but this is primarily due to OMC (Figure 11-1). As Figure 9-40 shows, this high level of OMC for BAND is primarily due to natural fires locally and regionally. Emissions from natural sources greatly affect the State's ability to meet the 2018 deciview URP goal. The State has little or no control over OC, EC, and $PM_{2.5}$ associated with natural fire. Prolonged droughts in the West have resulted in extensive wildfires. The idea of setting deciview URP goals was developed before the causes of haze in the West were well understood. The extensive technical analysis of the causes of haze conducted by the WRAP has led to a better understanding of the role of wildfire. As long as there are wildfires in the Western United States, there will be significant impact to visibility in Class I areas and there is little states can do about it.

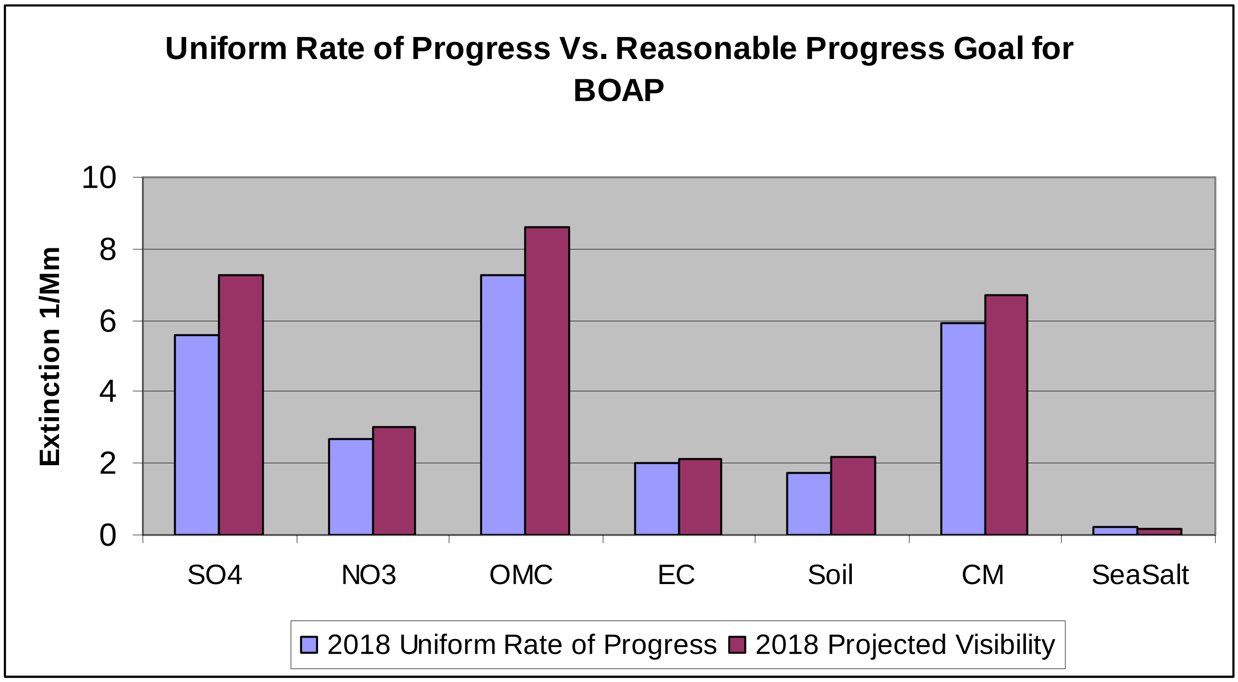
Figure 11-1: Uniform Rate of Progress Comparison to Reasonable Progress Goals for Bandelier



11.3.2 Bosque del Apache National Wildlife Refuge

There is some improvement in visibility from baseline to 2018 projected for BOAP. Although less than URP, the State believes this lesser improvement is once again due to natural sources. Two of the primary sources of emissions at BOAP are OMC and CM. Wildfires in this region are common, causing increases in OMC. High winds are also very common across the state particularly during the spring months (March-May) increasing CM and SOIL emissions. Due to the limited amount of control that the State has over these natural occurrences, the State believes that the progress projected for BOAP is reasonable. Sulfate is also a factor in visibility impairment in BOAP.

Figure 11-2: Uniform Rate of Progress Comparison to Reasonable Progress Goals for Bosque del Apache



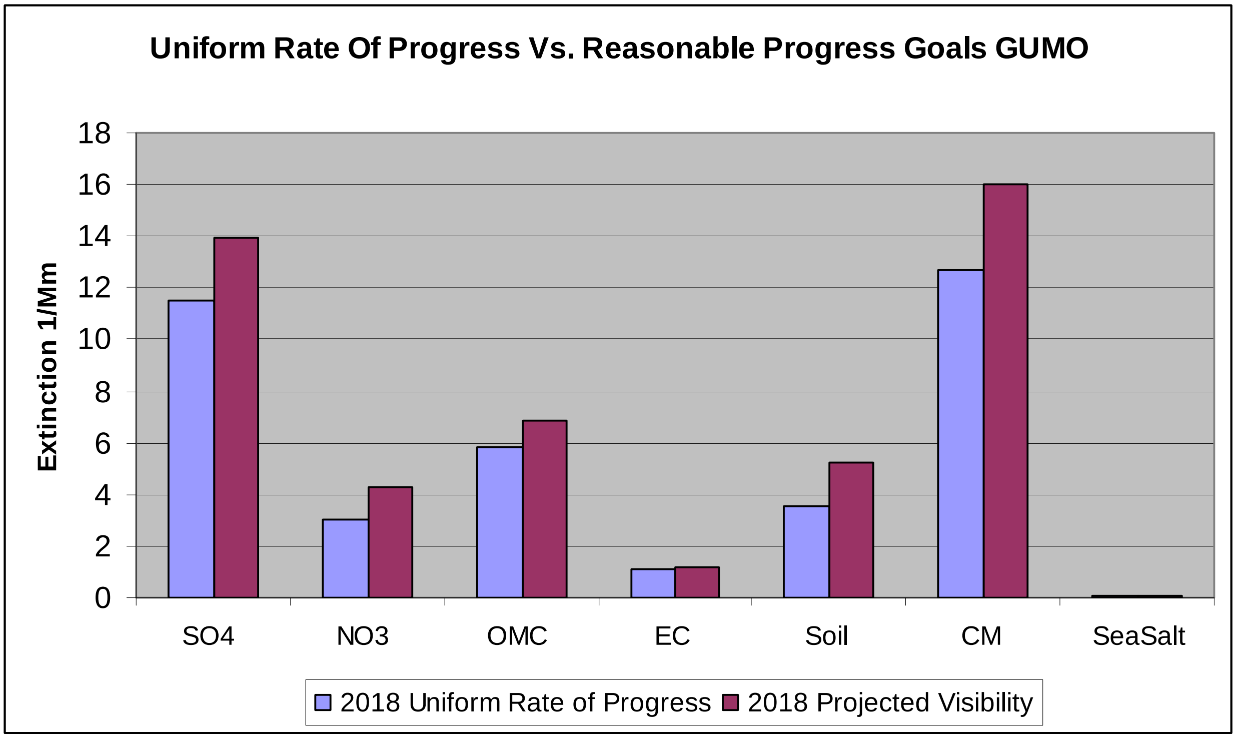
11.3.3 Carlsbad Caverns National Park

The monitor for Carlsbad Caverns National Park is the closest one to Mexico in the IMPROVE network for New Mexico's Class I areas. New Mexico has historically received pollution from international sources affecting air quality as well as visibility in the state. GUMO is showing some improvement in visibility from baseline to 2018 projected for the worst days, but is hindered by international and interstate contributions. As Section 9.4.3 shows, international and interstate emissions are a significant contributor to SO_4, CM, and OMC in New Mexico.

Although the model predictions are that nitrates, organic carbon and fine soil will degrade visibility by 2018, 2005 through 2009 observations suggest that all three of these visibility impairing pollutants are decreasing at Carlsbad Caverns as show in Figure 9-4.

Although New Mexico continues to work with Mexico and Texas on air quality issues within the southern region of the state, New Mexico has no control or jurisdiction over emissions coming from Mexico or Texas. Future work is needed on the federal level to determine the extent of emission contributions from Mexico on bordering states for regional haze and the National Ambient Air Quality Standards. Due to the lack of information available on emissions from Mexico and the jurisdiction to control a majority of the emissions affecting GUMO, New Mexico believes the improvement projected for 2018 is reasonable.

Figure 11-3: Uniform Rate of Progress Comparison to Reasonable Progress Goals for Carlsbad Caverns



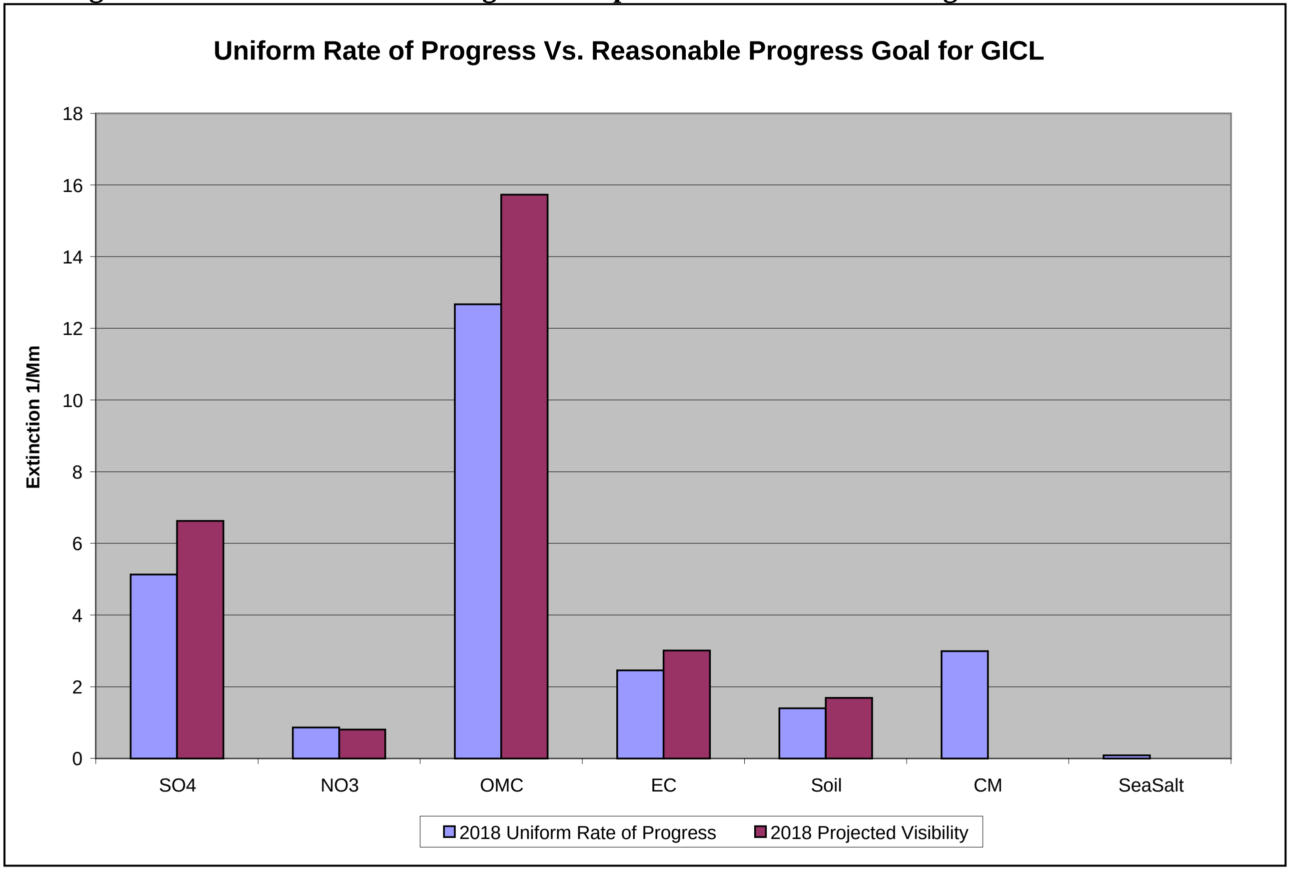
11.3.4 Gila Wilderness

The Gila Wilderness is [~~the only Class I area in New Mexico that showed an increase in visibility impairment from baseline to 2018 projected rather than a decrease~~] located in the southwest area of New Mexico. As Figure 11-4 below shows, organic matter is the primary source of visibility impairment within GILA, but the area is also affected by SO_4 and EC emissions. Contributions of OMC and EC, as shown in Section 9.4.4, to visibility impairment in GILA are primarily from wildfires both locally and regionally. Controlled burns conducted under New Mexico's Smoke Management Program are often used as a forest management tool in this area, but the emissions from wildfires affecting visibility in GILA are more than ten times greater than the emissions from controlled burns. Wildfires are a common occurrence throughout the state and regardless of where they occur, New Mexico has little to no control over the emissions that are generated from them.

Modeled projections in Table 9-5 show increased impairment from [~~sulfate, organic carbon, elemental carbon and~~] fine soil at Gila Wilderness. Figure 9-6 illustrates the actual decrease in visibility impairment in deciviews from 2005-2009 based on monitoring data. In addition, impairment from [~~organic carbon, elemental carbon, and~~] fine soil has decreased. Sulfate impairment increased in this time period. Decreases from sulfate due to BART application in Arizona should result in decreased impairment at Gila. This should result in decreased SO_4 impact compared to what is shown in Figure 11-4 for 2018. [~~In addition, there appears to be a data error in wildfire worst days in Plan 02d that resulted in increased wildfire emissions instead of wildfire remaining constant over the planning period. This would account for the increases in OMC and EC shown in Figure 11-4.~~]

Gila Wilderness is affected by SO_2 emissions from New Mexico as well as interstate and international source, as shown in Section 9.4.4. Participation in the SO_2 Backstop Trading Program will assist in reducing SO_2 emissions generated in New Mexico, but will not have any affect on interstate or international sources of SO_2. Area source and point source emissions within New Mexico are unlikely to grow as projected for 2018 due to the continuing recession. Due to the limited control that New Mexico has for a majority of these emissions, New Mexico believes that the progress projected for GILA is reasonable.

Figure 11-4: Uniform Rate of Progress Comparison to Reasonable Progress Goals for Gila

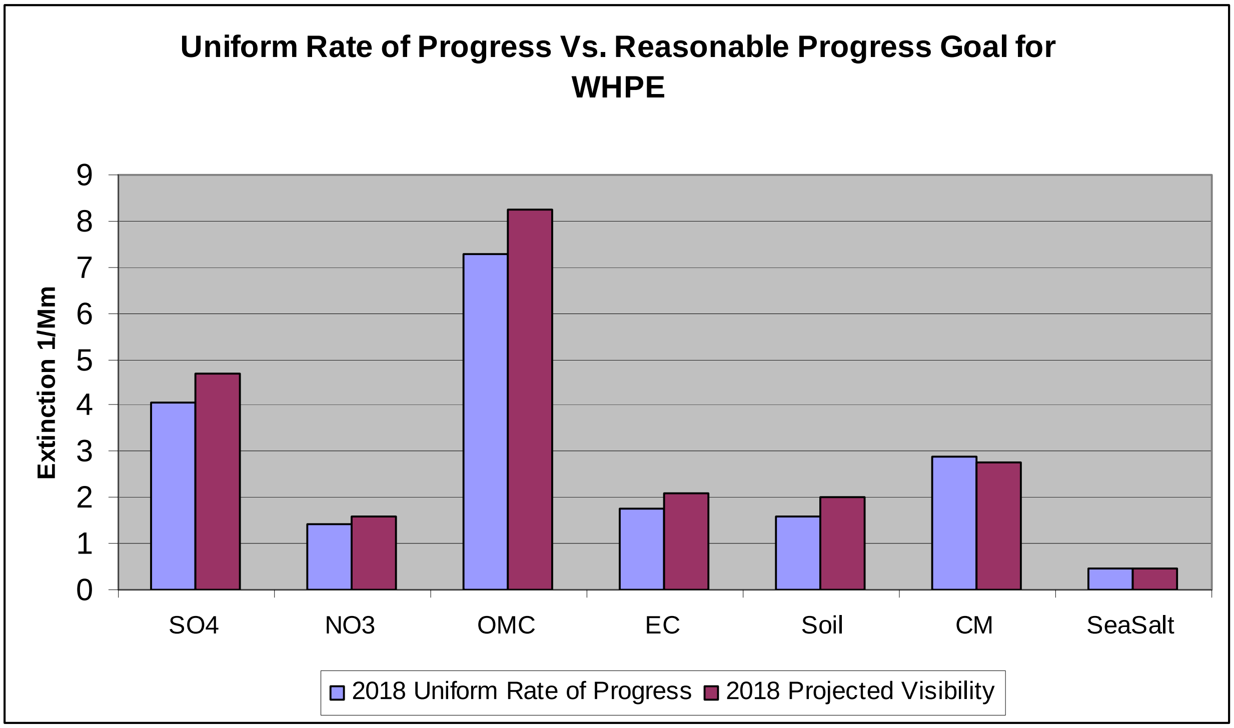


11.3.5 Pecos / Wheeler Peak Wilderness Areas

Wheeler Peak is located in the northern region of the state near the San Juan Basin. As with San Pedro Parks, the Class I area's close proximity to two major point sources as well as extensive oil and gas development is potentially the cause of limited visibility improvement at WHPE. New Mexico has initiated several different programs in the north eastern region of the state to control SO_2 and NOx emissions. In 2003, New Mexico developed an Ozone Early Action Compact (EAC) for San Juan County. As part of the EAC, New Mexico developed a voluntary emission reduction programs called VISTAS (Voluntary Innovated Strategies for Today's Air Standards). The purpose of VISTAS is to identify, promote, and implement cost-effective technologies and Best Management Practices to reduce air pollution affecting northwestern New Mexico, including ozone, haze, and greenhouse gases. San Juan VISTAS is open to industries, municipalities, and other organizations in San Juan, Rio Arriba, and Sandoval Counties.

The Consent Decree with San Juan Generating Station will also benefit visibility at Wheeler Peak. The reductions required by the Consent Decree outlined above, will assist in reducing SO_2 and NOx emissions within the region. As discussed in Chapter 10, the Department subsequently determined that additional controls for NOx are required to satisfy BART requirements, and EPA is in the process of promulgating a federal implementation plan for BART. Because the BART determination was made after the WRAP's CMAQ analysis was completed, the additional improvements in visibility in 2018 expected from these controls are not reflected in this modeling. Most of the initiatives put in place by New Mexico for emission reductions in this region of the state are fairly new and will take some time to show their full benefits. Therefore, the state believes that the projected 2018 visibility improvements for WHPE are reasonable.

Figure 11-5: Uniform Rate of Progress Comparison to Reasonable Progress Goals for Wheeler Peak

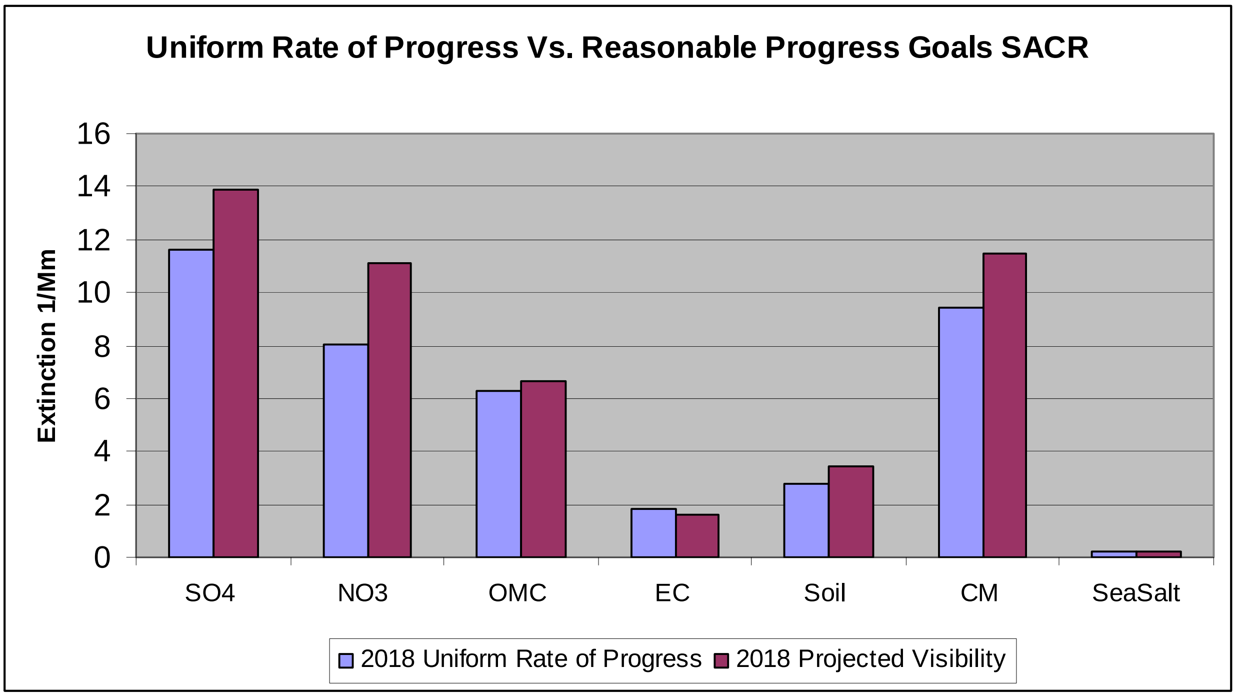


11.3.6 Salt Creek Wilderness Area

The Salt Creek Wilderness area is located in Chavez County in the southeastern region of the state on the Permian Basin. The Permian Basin is 250 miles (mi) wide and 300 mi long and stretches from southeastern New Mexico into western Texas. In 2006, there were a total of 6,054 oil and gas wells in Chavez County alone. The State believes that the level of local and regional oil and gas development and wind blown dust from high wind exceptional events are the primary factors in the limited visibility improvement from baseline to 2018 projected for SACR. The second largest category of stationary sources in the West is oil and gas development and production. Increased oil and gas development is expected in many areas of the West, due in large part to increased leasing to oil and gas operators on Federal land. The WRAP has developed the first comprehensive oil and gas inventory in the Western United States, and many states are moving forward with evaluating control options. New Mexico is evaluating and testing control strategies, but the specific strategies are not ready for incorporation into this first round of regional haze SIPs. Control options for ozone are being evaluated simultaneously and the State believes that many co-benefits from controlling emissions for ozone will supplement the regional haze program. Numerous additional emission reductions from oil and gas are expected over the next ten-year period.

In 2005, New Mexico was awarded grant funding from WRAP to develop a State SIP Pilot Study on visibility impairment caused by dust in one of New Mexico's Class I areas. The area chosen for the pilot study was SACR. The New Mexico Dust SIP Pilot for the Salt Creek Wilderness Area determined that CM and SOIL emissions affecting SACR were local, interstate and international in nature as shown in WEP Section 9.4.6. Many of the local emissions were caused by wind-blown dust from high wind exceptional events. Based the state's limited ability to control CM emissions affecting SACR and the anticipate reduction in the oil and gas emissions, New Mexico believes that the projected visibility improvement is reasonable.

Figure 11-6: Uniform Rate of Progress Comparison to Reasonable Progress Goals for Salt Creek

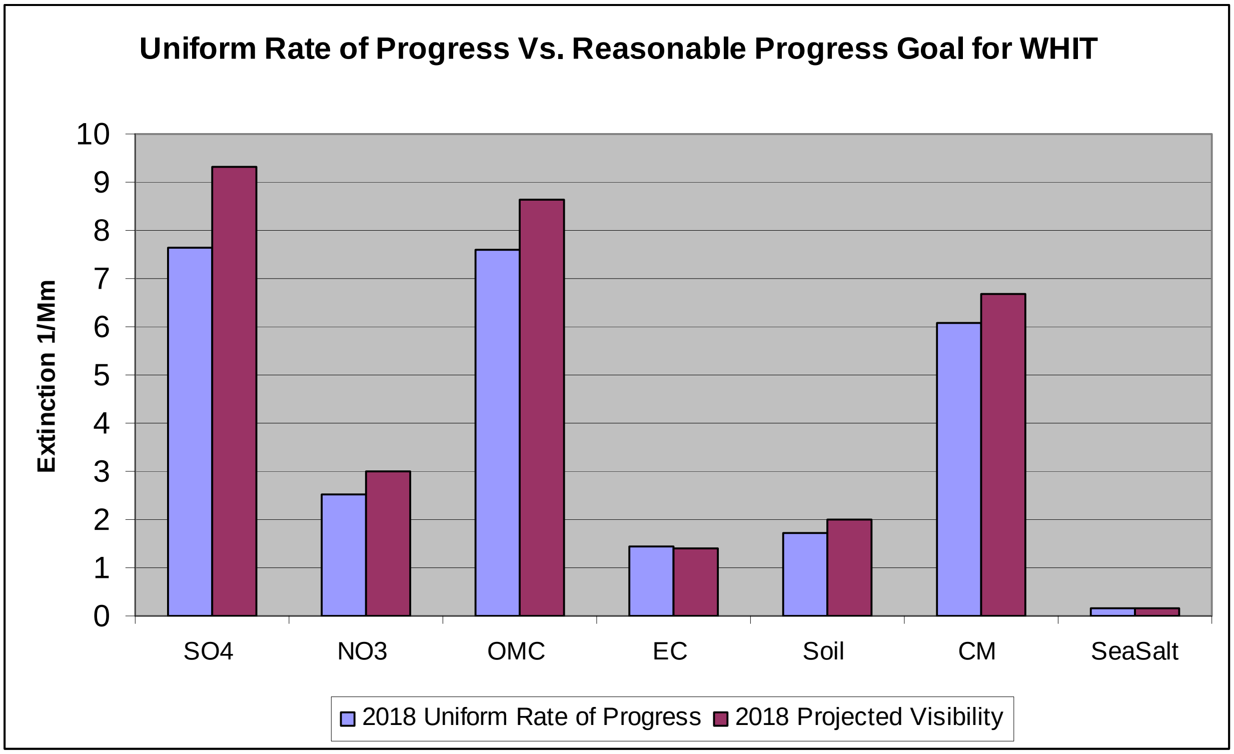


11.3.7 White Mountain Wilderness Area

There is some improvement in visibility from baseline to 2018 projected for WHIT. The primary emissions affecting visibility in WHIT are SO_4, OMC, and CM. The White Mountain Wilderness area is within close proximity to the Permian Basin and is thus potentially impacted by oil and gas development in the region. This area is also affected by natural emissions from wild fires and wind blown dust from high wind exceptional events. A WRAP study conducted in 2006 by the Desert Research Institute (DRI) for the *New Mexico Dust SIP Pilot for the Salt Creek Wilderness Area* determined that CM emissions affecting WHIT are from local and international sources. White Mountain is located just to the east of White Sands National Monument, which includes 275 square mi of gypsum sand dunes. The study developed by DRI indicates that White Sands is one of the major sources of CM emissions affecting WHIT, particularly during high wind events. The area is also heavily affected by CM emissions from interstate sources (see Section 9.4.8).

The high level of OMC at WHIT is primarily due to local wildfires and interstate emissions. SO_4 levels at WHIT are affected heavily by international emissions, as shown in Section 9.4.8. The SO_2 cap and trade program initiate by New Mexico under the 309 program will assist in reducing SO_2 emissions generated in New Mexico, but will not have any affect on international sources of SO_2. Due to the limited control that New Mexico has over a majority of these emissions, New Mexico believes that the progress projected for WHIT is reasonable.

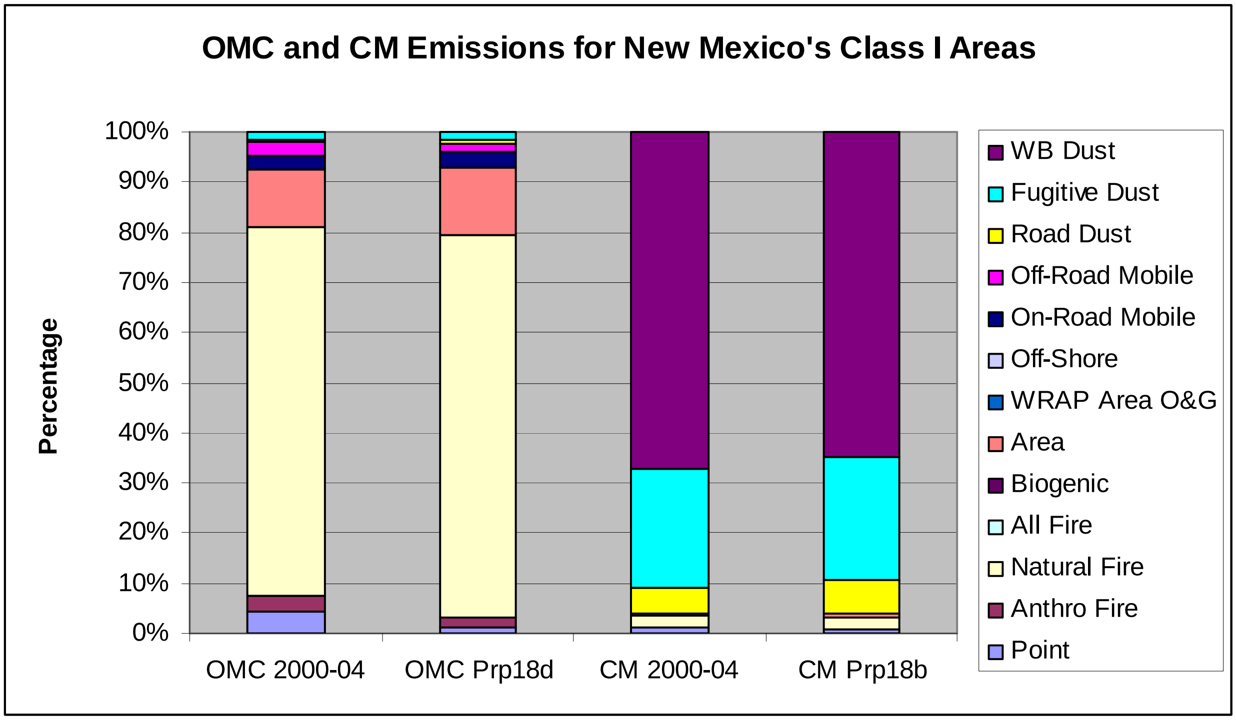
Figure 11-7: Uniform Rate of Progress Comparison to Reasonable Progress Goals for White Mountain



11.4 Conclusions for State-Wide Reasonable Progress

Overall for New Mexico the predominate pollutants affecting the state's ability to meet URP goals at our Class I areas are OMC, CM and SO_4. Much if not all of the source contributions for OMC and CM are natural. Much of the west is affected by wildfire and windblown dust from high wind exceptional events, particularly during droughts. These naturally occurring events are prevalent throughout the state and affect all of the Class I areas in New Mexico. The State has developed a Smoke Management Program for controlled burns and Natural Event Action Plans for anthropogenic sources of windblown dust, but the effect that these types of emissions have on visibility in New Mexico's Class I area is minimal compared to the naturally generated emissions. As Figure 11-8 below shows, over 70 percent of OMC emissions that affect New Mexico's Class I areas are due to wildfires and over 65% of CM emissions are from wind-blown dust. At present, the State has initiated programs to control sources of these pollutants where they are controllable; unfortunately the state has no control now or in the future over natural events that may affect visibility impairment within the State's Class I areas.

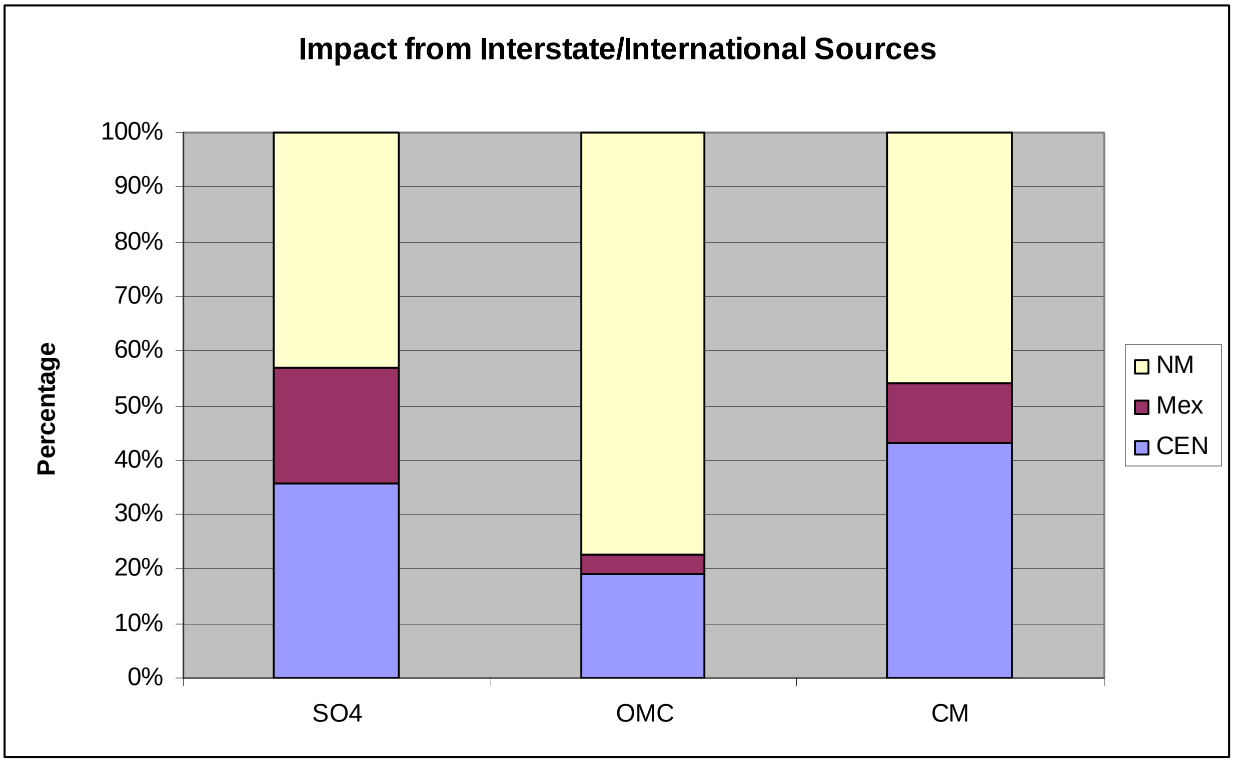
Figure 11-8: OMC and EC Emissions Affecting New Mexico's Class I Areas



Emissions from sources outside the WRAP modeling domain (CENRAP and international emissions) also affect the State's ability to meet the 2018 URP goal. The analysis in Chapter 9 of this Plan containing the weighted emission potential results show the emissions from interstate and international sources are a significant contributor to sulfate and coarse mass concentrations at the monitors in New Mexico's Class I areas. As Figure 11-9 below shows, sources outside of the WRAP contribute to more than 50% of the SO_4 and CM emissions affecting New Mexico's Class I areas. Contributions from outside of the WRAP also affect OMC emissions in New Mexico, but to a lesser degree.

New Mexico is currently a member of the Paso del Norte Joint Advisory Committee (JAC). The Joint Advisory Committee includes the communities of Ciudad Juárez, Chihuahua, El Paso, Texas, and Doña Ana County, New Mexico. The JAC is a binational committee made up of private citizens, private sector representatives, university officials, federal, state, and local government officials, and non-governmental environmental and public health organizations. Although New Mexico has been an active participant in the JAC and has worked with the committee to assist in decreasing emissions within the Paso del Norte Airshed, this work only covers a small portion of New Mexico, Texas, and Mexico. Although New Mexico has no control over international emissions, the state strongly believes that unless future work is conducted by the federal government to determine the extent of international emissions affecting areas with the United States, improvements in visibility and general air quality will continue to elude states.

Figure 11-9: Impacts from Sources Outside of WRAP on New Mexico



CHAPTER 12: LONG-TERM STRATEGY (LTS)

12.1 Overview

The Regional Haze Rule requires states to submit a 10-15 year long-term strategy (LTS) to address regional haze visibility impairment in each Class I area in the state, and for each Class I area outside the state which may be affected by emissions from the state. The LTS must include enforceable measures necessary to achieve reasonable progress goals, and identify all anthropogenic sources of visibility impairment considered by the state in developing the long-term strategy. Where the state contributes to Class I visibility impairment in other states it must consult with those states and develop coordinated emission management strategies, and demonstrate it has included all measures necessary to obtain its share of the emission reductions. If the state has participated in a regional planning process, the state must include measures needed to achieve its obligations agreed upon through that process.

Summary of all Anthropogenic Sources of Visibility Impairment Considered in Developing the Long-Term Strategy

Section 51.308(d)(3)(iv) of the Regional Haze Rule requires the identification of "all anthropogenic sources of visibility impairment considered by the State when developing its long-term strategy." Chapter 8 of this Plan describes New Mexico's statewide emissions, including projections of emissions reductions from anthropogenic sources from 2002 to 2018. Section 9.3 of this Plan provides source apportionment results, including projected reductions from anthropogenic sources during the same period. Chapter 9 addresses anthropogenic sources from all potential sources in the world. Together, these chapters show the major anthropogenic sources affecting regional haze in New Mexico and in the West. Chapter 11 further describes the major anthropogenic source categories evaluated through the four-factor analysis.

Summary of Interstate Transport and Contribution

Sections 51.308(d)(3)(i) and (ii) of the Regional Haze Rule requires that the Long-Term Strategy address the contribution of interstate transport of haze pollutants between states. Chapter 8 of this Plan illustrated New Mexico's statewide emissions, while Chapter 9 identified interstate transport of pollutants from larger source categories based on source apportionment results.

12.2 Other States' Class I Areas Affected by New Mexico Emissions

New Mexico used baseline period visibility data from the IMPROVE monitors along with the WRAP baseline modeling results to estimate New Mexico's emissions impact on neighboring states' Class I areas (see Figure 12-1 through Figure 12-12). New Mexico focused on anthropogenic emissions transported to other states, primarily sulfates and nitrates.

The charts and tables below show the contribution of particle mass calculated from the modeled concentrations of nitrates and sulfates for the baseline years. The charts and tables illustrate the probable share of New Mexico's emissions contributing to the pollutant species in surrounding states.

12.2.1 Nitrate Contributions from New Mexico on Surrounding States' Class I Areas

New Mexico's NOx emissions contribute up to 24% percent of the nitrate concentrations at some neighboring states on the worst 20% days according to modeling. As shown in the table below, however, nitrate contributes only up to 19 percent of the visibility impairment in neighboring states. By 2018, NOx emissions from New Mexico are projected by the WRAP to decrease by 57,975 tons, which will help reduce New Mexico's impact to out of state Class I areas. Actual decreases are expected to be higher due to additional NOx reductions at the San Juan Generating Station under EPA's BART determination.

Table 12-1: Nitrate Contribution to Haze in Baseline Years for Worst 20% Days

State	2000-2004 Average Annual Nitrate Share of Particle Light Extinction (measured values)	2000-2004 New Mexico's Average Annual Share of Nitrate Concentration (based on modeling)
Arizona	13.5%	2.7%
Colorado	10.0%	24.7%
Nevada	19.1%	0.1%
Utah	15.9%	6.0%
Texas	6.0%	11.2%
Wyoming	9.9%	0.3%

Figure 12-1: Nitrate Contributions from New Mexico on Arizona Class I Areas

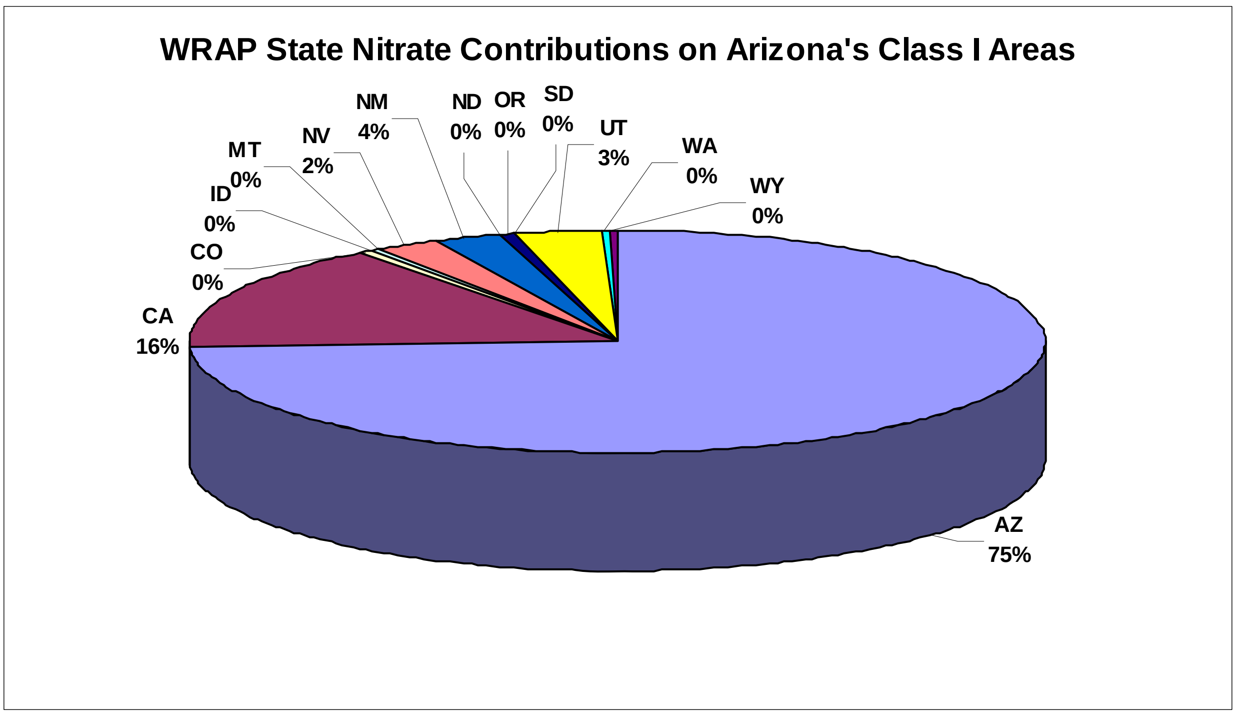


Figure 12-2: Nitrate Contributions from New Mexico on Colorado Class I Areas

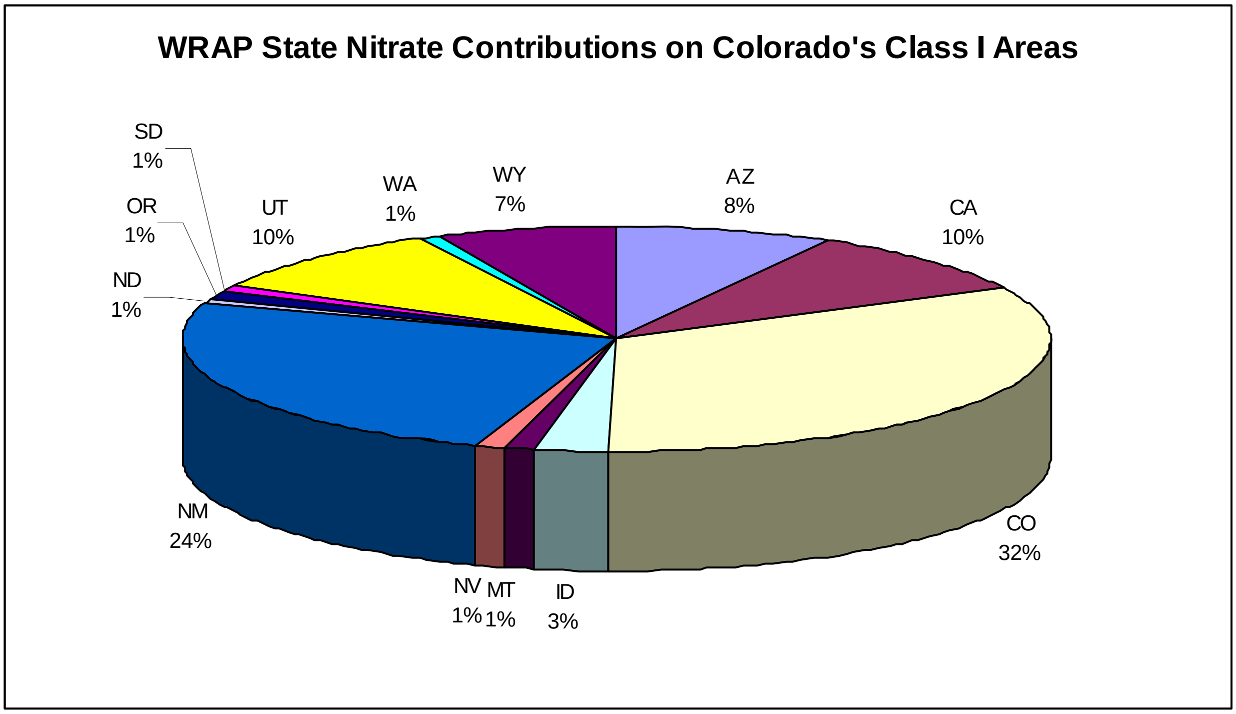


Figure 12-3: Nitrate Contributions from New Mexico on Nevada Class I Areas

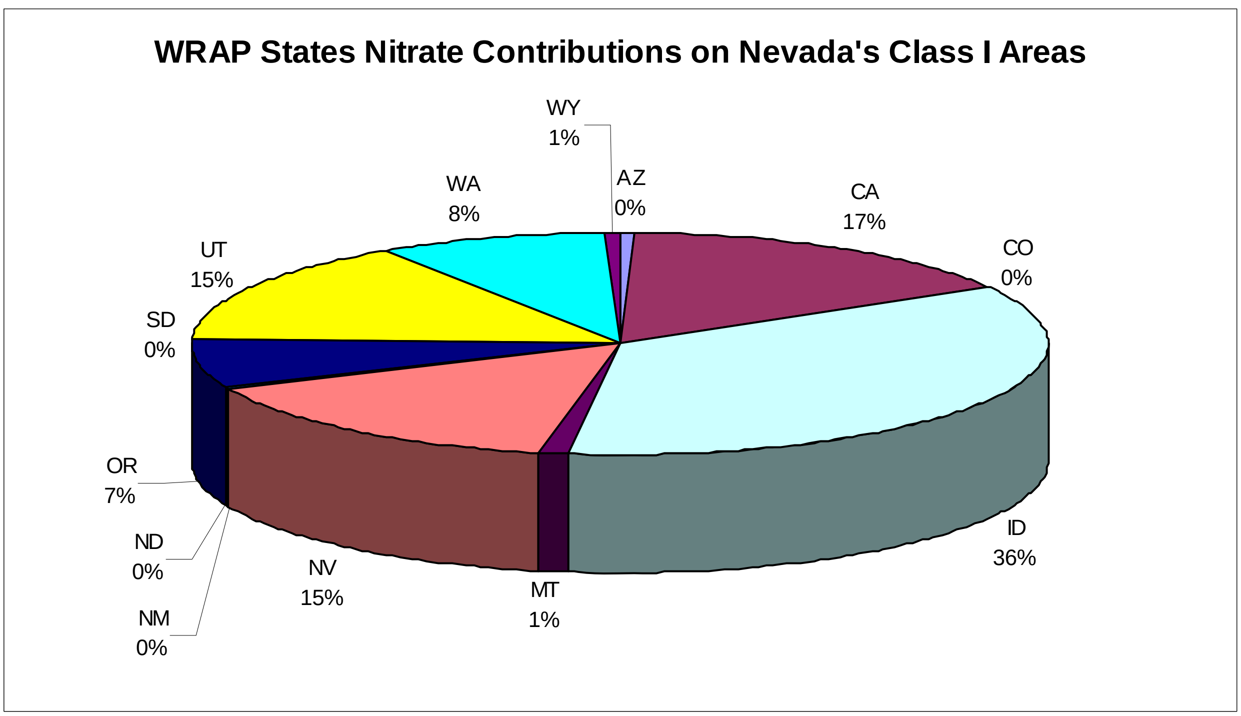


Figure 12-4: Nitrate Contributions from New Mexico on Utah Class I Areas

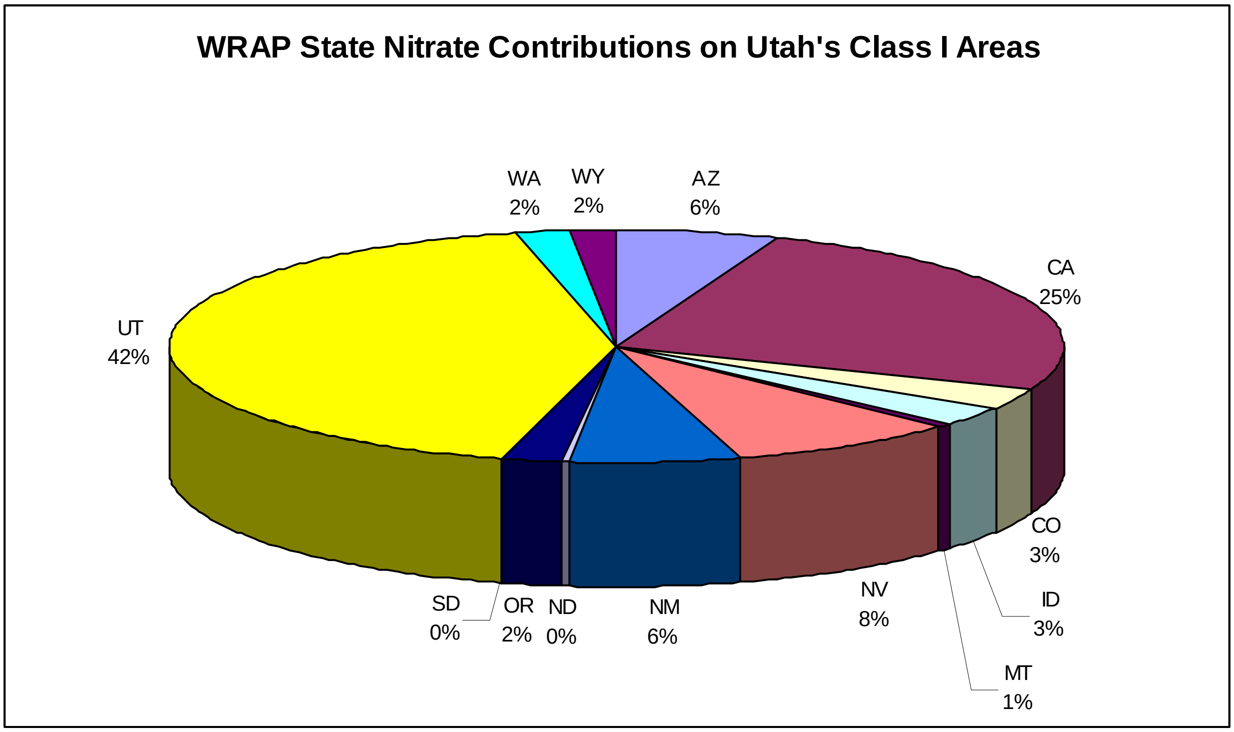


Figure 12-5: Nitrate Contributions from New Mexico on Texas Class I Areas

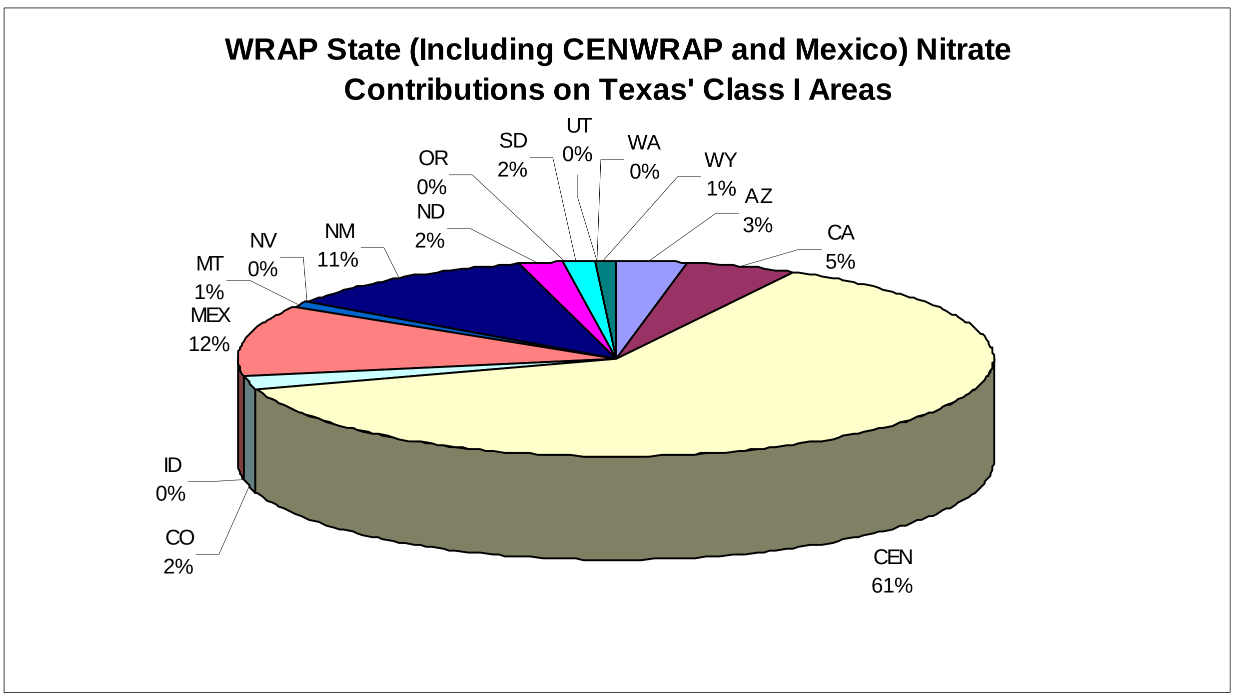
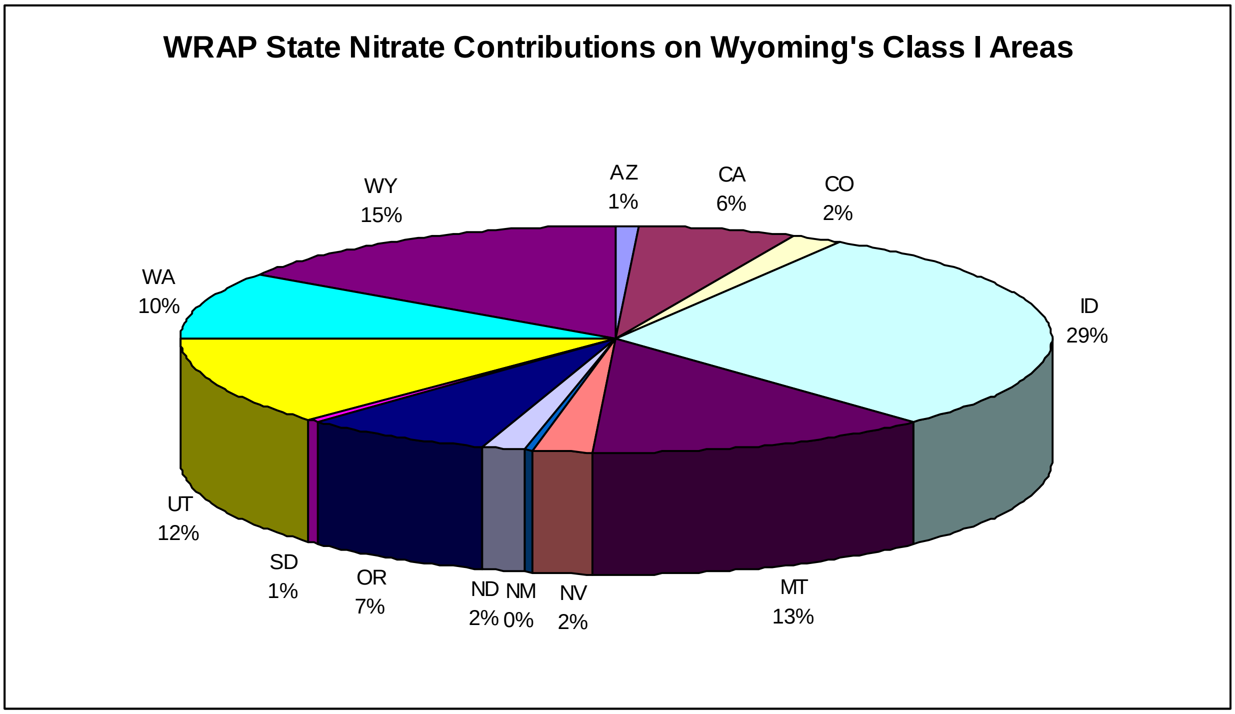


Figure 12-6: Nitrate Contributions from New Mexico on Wyoming Class I Areas



12.2.2 Sulfate Contributions from New Mexico on Surrounding State's Class I Areas

According to modeling, New Mexico sulfate emissions contribute up to 16.9 percent of the sulfate concentrations at some neighboring states on the worst 20% days. As shown in Table 12-2 below, sulfate contributes up to 44 percent of the visibility impairment at the nearest Class I areas in neighboring states. By 2018, SO_2 emissions from New Mexico are projected by the WRAP to decrease by 10,457 tons, which will help reduce New Mexico's impact on out of state Class I areas.

Table 12-2: Sulfate Contribution to Haze in Baseline Years for Worst 20% Days

State	2000-2004 Average Annual Sulfate Share of Particle Light Extinction (measured values)	2000-2004 New Mexico's Average Annual Share of Sulfate Concentration (based on modeling)
Arizona	18.9%	6.7%
Colorado	21.7%	16.9%
Nevada	17.1%	1.7%
Utah	23.3%	6.9%
Texas	44.0%	1.9%
Wyoming	23.3%	2.5%

Figure 12-7: Sulfate Contributions from New Mexico on Arizona Class I Areas

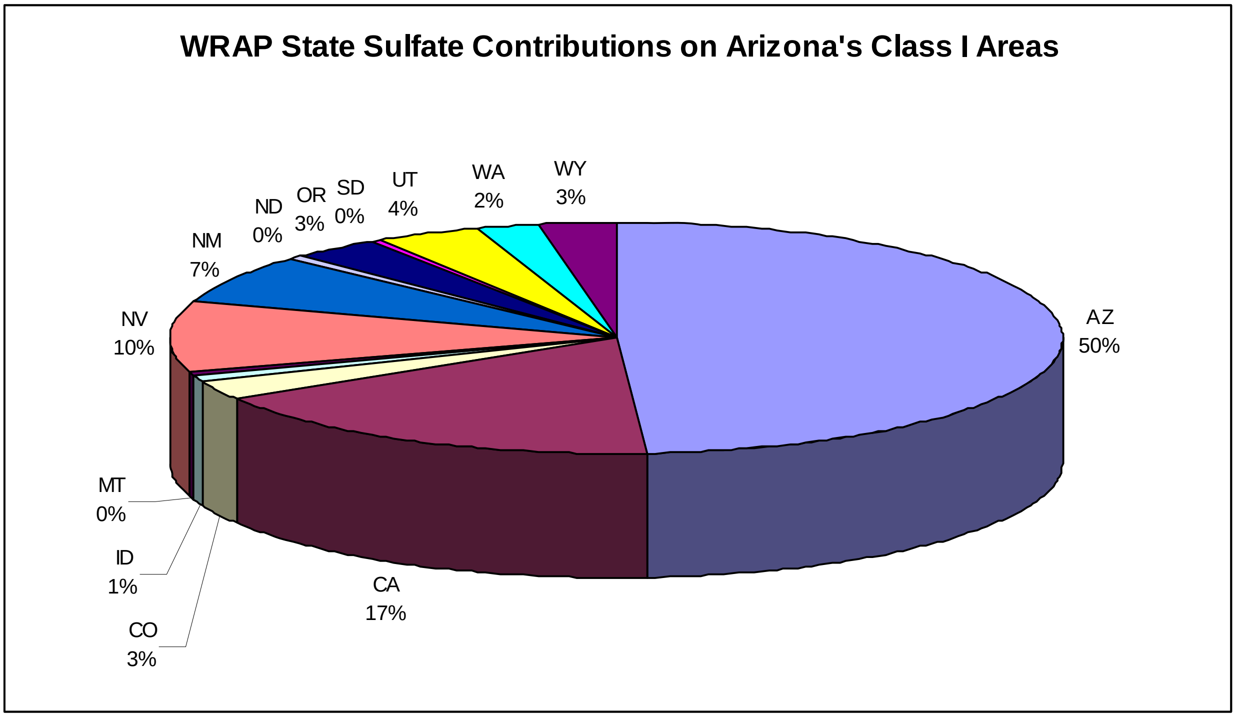


Figure 12-8: Sulfate Contributions from New Mexico on Colorado Class I Areas

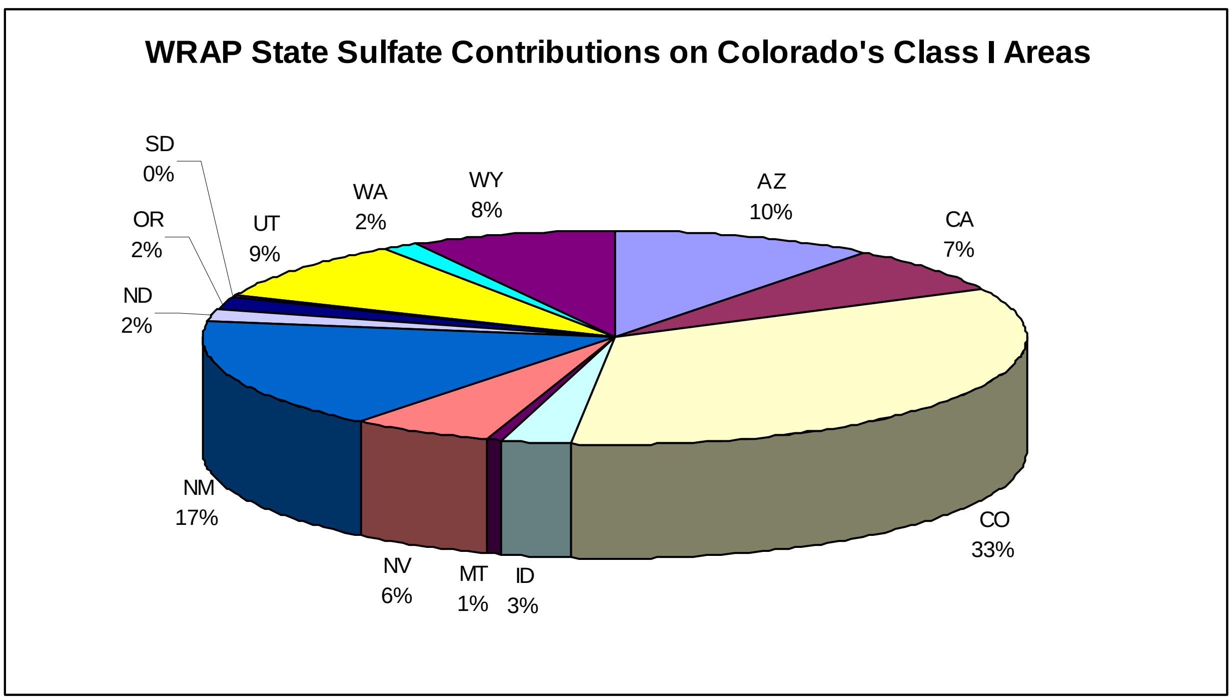


Figure 12-9: Sulfate Contributions from New Mexico on Nevada Class I Areas

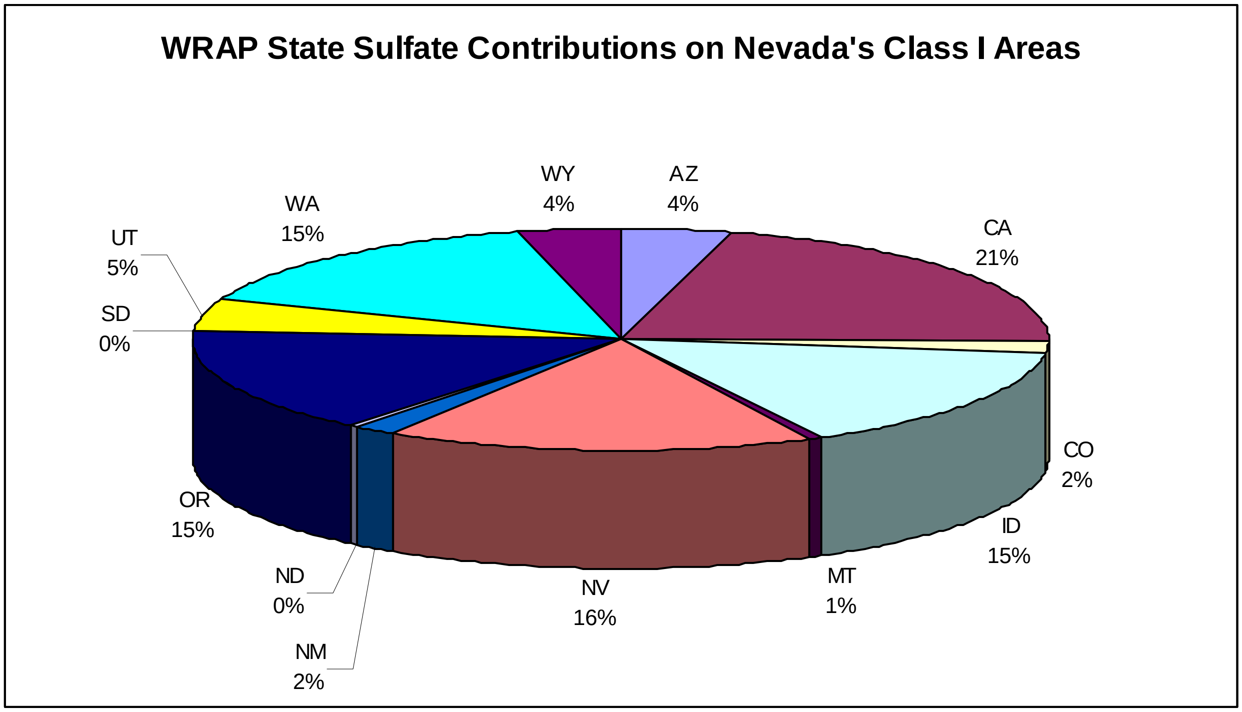


Figure 12-10: Sulfate Contributions from New Mexico on Utah Class I Areas

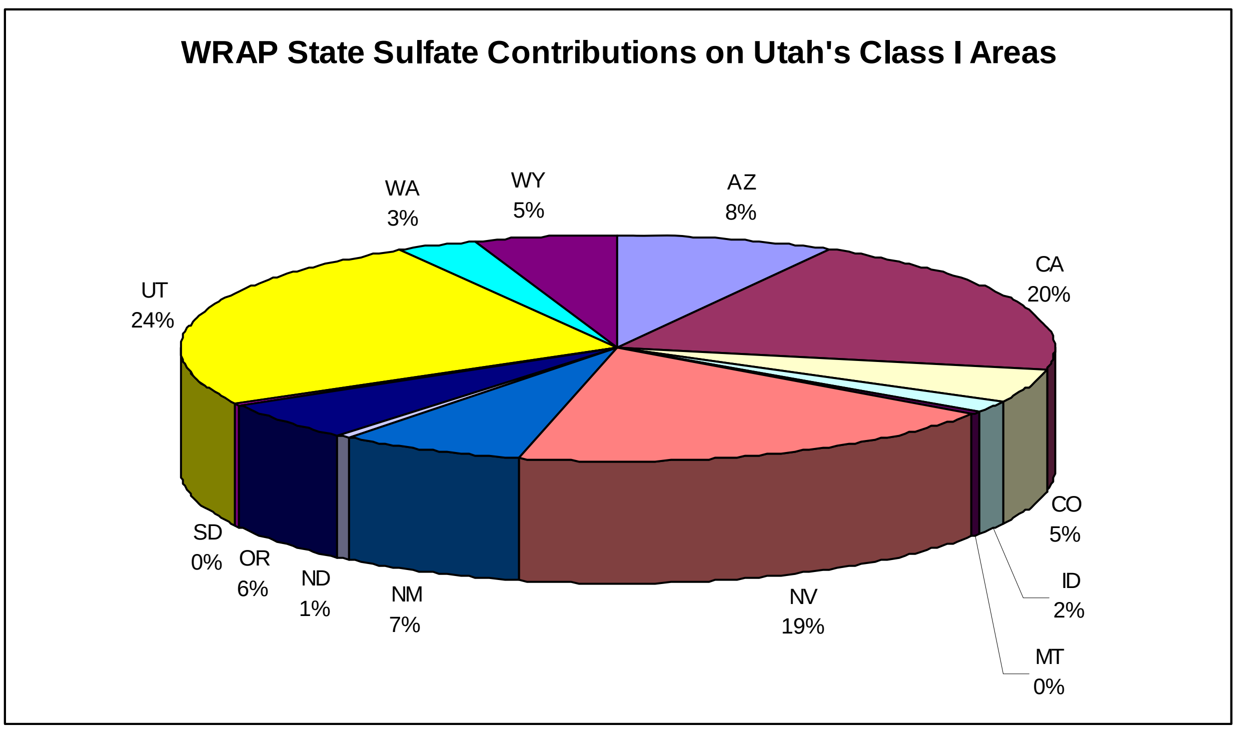


Figure 12-11: Sulfate Contributions from New Mexico on Texas Class I Areas

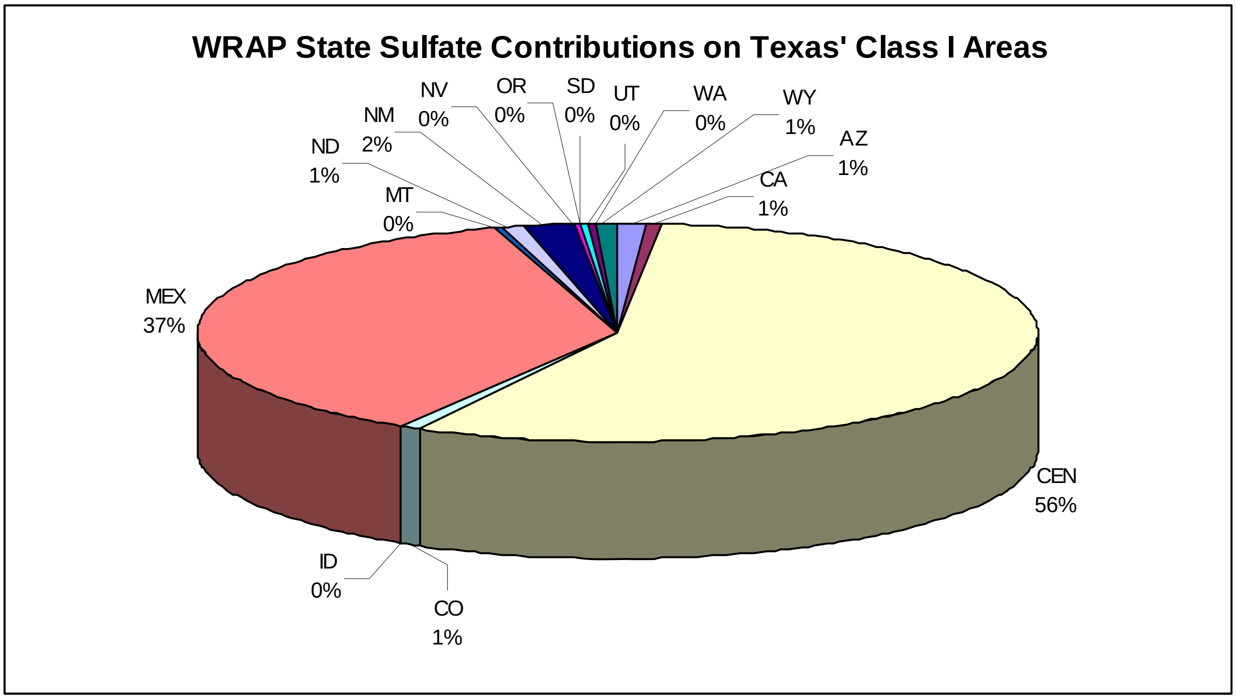
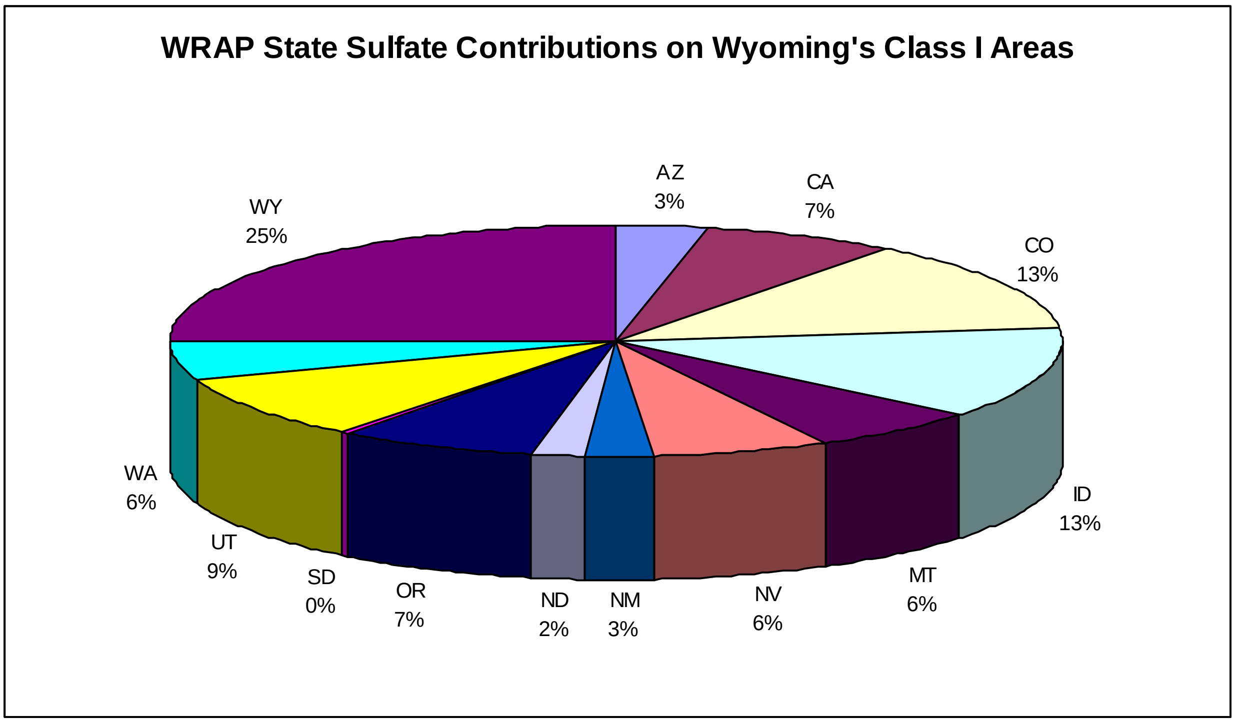


Figure 12-12: Sulfate Contributions from New Mexico on Wyoming Class I Areas



12.3 New Mexico Class I Areas Affected by Other States, Nations and Areas of the World

The contribution of WRAP, CENRAP, Canada, Eastern U.S., Mexico, Pacific Offshore, and areas Outside of Domain to New Mexico Class I areas were examined to determine where significant emissions of nitrates and sulfates might be coming from. The results are shown below in Table 12-3 through Table 12-6. This review focused on nitrates and sulfates since those emissions tend to indicate anthropogenic sources. Data for this impact analysis comes from the PSAT runs performed by the WRAP and documented in the TSS.

12.3.1 Nitrate Emissions

For nitrates on the worst 20% days in the baseline years, the most significant impacts on New Mexico Class I areas came from sources within WRAP, CENRAP and outside the modeling domain. With respect to emissions within the WRAP region, the sources within New Mexico, Arizona, California, and Colorado had the most significant impact on New Mexico Class I areas. New Mexico has worked with Arizona, California and Colorado through the WRAP process and believes all three states are working to reduce nitrate impacts to New Mexico's Class I areas. Arizona is projected by the WRAP to reduce nitrate causing emissions by 242,136 tons by 2018; California is projected to reduce nitrates by 661,661 tons by 2018; and Colorado is project to reduce emissions by 215,036 tons by 2018. New Mexico is committed to reducing projected WRAP emissions of at least 57,975 tons by 2018.

Table 12-3: Nitrate Contribution to New Mexico Haze in Baseline Years for 20% Worst Days

NM Class I Area	WRAP	Canada	Eastern U.S.	Mexico	Pacific Offshore	Outside of Domain	CENRAP
Bandelier	17%	2%	0%	1%	1%	15%	10%
Bosque del Apache	61%	3%	0%	1%	1%	8%	26%
Carlsbad	30%	5%	0%	5%	2%	14%	44%
Gila	58%	0%	0%	2%	5%	33%	2%
Salt Creek	61%	0%	0%	2%	0%	11%	26%
Pecos / Wheeler Peak	57%	3%	2%	1%	1%	8%	28%
White Mountain	40%	4%	0%	2%	2%	16%	36%

Table 12-4: WRAP Nitrate Contribution to New Mexico Haze Baseline Years for Worst 20% Days

NM Class I Area	AZ	CA	CO	ID	MT	NV	NM	ND	OR	SD	UT	WA	WY
Bandelier	13%	9%	6%	0%	1%	2%	58%	1%	0%	1%	8%	0%	1%
Bosque del Apache	15%	5%	7%	0%	1%	1%	61%	2%	0%	2%	3%	0%	3%
Carlsbad	12%	19%	7%	0%	3%	1%	42%	6%	0%	5%	1%	1%	3%
Gila	38%	51%	0%	0%	0%	7%	3%	0%	0%	0%	1%	0%	0%
Salt Creek	9%	2%	7%	0%	0%	1%	75%	0%	0%	0%	5%	0%	1%
Pecos / Wheeler Peak	13%	7%	6%	0%	1%	1%	64%	2%	0%	2%	3%	0%	1%
White Mountain	14%	17%	13%	1%	2%	1%	38%	3%	0%	3%	2%	1%	5%

12.3.2 Sulfate Emissions

For the 20% worst days in the baseline years, New Mexico's Class I areas are predominately impacted by sulfate emissions from WRAP, CENRAP, Eastern U.S., and sources outside of the modeling domain. Within WRAP, the largest contributions of sulfates come from New Mexico, Arizona, California, and Colorado, contributing up to 88 percent of the sulfate emissions in the baseline years from the WRAP region. New Mexico has worked with Arizona, California and Colorado through the WRAP process and believes all three states are working to reduce sulfate impacts to New Mexico's Class I areas. Arizona is projected by the WRAP to reduce sulfate causing emissions by 33,475 tons by 2018; California is projected to reduce sulfate by 5,340 tons by 2018; and Colorado is project to reduce emissions by 59,442 tons by 2018. New Mexico is committed to reducing projected WRAP emissions of at least 10,457 tons by 2018.

Table 12-5: Sulfate Contribution to New Mexico Haze in Baseline Years for Worst 20% Days

NM Class I Area	WRAP	Canada	Eastern U.S.	Mexico	Pacific Offshore	Outside Domain	CENRAP
Bandelier	32%	1%	12%	9%	3%	27%	16%
Bosque del Apache	21%	1%	20%	14%	2%	19%	23%
Carlsbad	5%	2%	43%	10%	1%	11%	28%
Gila	18%	1%	18%	20%	4%	20%	19%
Salt Creek	12%	2%	31%	10%	1%	15%	29%
Pecos / Wheeler Peak	34%	2%	6%	10%	4%	27%	17%
White Mountain	11%	2%	34%	10%	1%	12%	30%

Table 12-6: WRAP Sulfate Contribution to New Mexico Haze Baseline Years for Worst 20% Days

NM Class I Area	AZ	CA	CO	ID	MT	NV	NM	ND	OR	SD	UT	WA	WY
Bandelier	25%	7%	4%	1%	0%	5%	48%	1%	0%	0%	5%	1%	2%
Bosque del Apache	29%	7%	8%	1%	1%	6%	32%	2%	1%	0%	6%	1%	6%
Carlsbad	15%	7%	10%	2%	3%	4%	29%	10%	2%	2%	4%	2%	10%
Gila	36%	12%	6%	1%	1%	9%	23%	1%	2%	0%	4%	1%	4%
Salt Creek	17%	3%	5%	1%	1%	3%	54%	5%	1%	1%	4%	1%	4%
Pecos / Wheeler Peak	12%	7%	9%	1%	1%	5%	42%	2%	1%	1%	5%	1%	4%
White Mountain	26%	5%	10%	1%	1%	4%	33%	7%	1%	1%	4%	1%	6%

12.4 Summary of Interstate Consultation

In addition to evaluating interstate transport, the affected states are required to consult with each other under Section 51.308(d)(3)(i), in order to develop coordinated emission management strategies. See Chapter 2 for information on the state-to-state consultation process.

12.5 Estimated Contributions from CENRAP and Eastern U.S.

As shown above in Table 12-4 and Table 12-6, many of New Mexico's Class I areas are affected by sulfate emissions from the eastern region of the U.S and sulfate and nitrate emissions from CENRAP. New Mexico has no regulatory authority for emissions outside of our jurisdiction, so we are depending on current and future federal standards to assist in reducing the extent that New Mexico's Class I areas are affected by sulfate and nitrate emissions from the eastern portion of the U.S. and CENRAP. Some of these federal programs include:

- Regional Haze/BART;
- 2010 Final Primary National Ambient Air Quality Standard for Sulfur Dioxide;
- 2010 Final Primary National Ambient Air Quality Standard for Oxides of Nitrogen;
- 2010 Final Primary National Ambient Air Quality Standard for Ozone;
- Clean Air Interstate Replacement Rule/Transport Rule;
- MACT Standards for Industrial, Commercial & Institutional (ICI) Boilers - Phase I & II;
- NSPS and MACT Standards for Cement Kilns - Phase I & II; and
- MACT Standards for Electric Generating Units (Utility MACT).

12.6 Estimated International Contribution to New Mexico's Class I Areas

Although not specifically addressed under the Regional Haze Rule in terms of interstate transport, it is important to identify the contribution to visibility impairment in New Mexico from international sources, such as Mexico. The PSAT and WEP results in Chapter 9 describe the amount of contribution to visibility impairment in New Mexico from sources in Mexico. New Mexico has historically been affected by international emissions from Mexico. As Table 12-5 above shows, Mexico is a major contributor to sulfate emissions at many of New Mexico's Class I areas.

New Mexico has been an active member of the Paso del Norte Joint Advisory Committee (JAC). The JAC was established in 1996 for the improvement of air quality in the Paso del Norte region, that includes the communities of Ciudad Juárez, Chihuahua, El Paso, Texas, and Doña Ana County, New Mexico. The JAC is a bi-national committee made up of private citizens, private sector representatives, university officials, federal, state, and local government officials, and non-governmental environmental and public health organizations. The JAC is charged with the development and recommendation of air quality improvement projects and programs to the Air Work Group established under the 1983 U.S.- Mexico La Paz Agreement.

As a long term strategy for international emissions, New Mexico will continue to be an active member on the JAC. Unfortunately, the Paso del Norte covers only a small area of the Mexico/New Mexico borders region. Current emission inventories and modeling of Mexico sources are needed by states to help differentiate between local and international contributions for regional haze and general air quality planning purposes. Until these types of resources are available, particularly for border states, it will be difficult to meet regional haze progress goals. Because the State of New Mexico does not have any authority over any international sources, the state is not pursuing any new strategy for haze impacts due to these sources.

12.7 Required Factors for the Long-Term Strategy

As required in Section 51.308(d)(3)(v) of the Regional Haze Rule, the State must consider, at a minimum, the following factors: 1) emission reductions due to ongoing air pollution control programs; 2) measures to mitigate the impacts of construction activities; 3) emission limitations and schedules for compliance; 4) source retirement and replacement schedules; 5) smoke management techniques for agricultural and forestry burning; 6) the enforceability of emission limitations and control measures; and 7) the anticipated net effect on visibility over the period of the long-term strategy. These factors are discussed in the following pages along with all measures to mitigate the impacts of anthropogenic sources. The seventh factor is discussed at the end of the Long-Term Strategy Chapter.

12.7.1 Emission Reductions Due to Ongoing Air Pollution Control Programs

The following summary describes ongoing programs and regulations in New Mexico that directly protect visibility, or can be expected to improve visibility in New Mexico Class I areas, by reducing emissions in general. This summary does not attempt to estimate the actual improvements in visibility that will occur, as many of the benefits are secondary to the primary air pollution objective of these programs/rules, and consequently would be extremely difficult to quantify due to the technical complexity and limitations in current assessment techniques.

12.7.2 New Source Review Program

The New Source Review (NSR) Program is a permit program for the construction of new sources and modification of existing sources as established by 20.2.72 NMAC - *Construction Permits* and 20.2.74 NMAC - *Permits - Prevention of Significant Deterioration*. The primary purpose of the NSR Program is to assure compliance with ambient standards set to protect public health, assure that Best Available Control Technology (BACT) is utilized to reduce and eliminate air pollution emissions, and to prevent deterioration of clean air areas. Any amount of air contaminant emissions from a facility subjects it to New Mexico's NSR Program.

12.7.3 Prevention of Significant Deterioration (PSD) Program

New Mexico considers its Prevention of Significant Deterioration (PSD) program as being protective of visibility impairment from proposed major stationary sources or major modifications to existing facilities. New Mexico has a fully-approved PSD program, and has successfully implemented this program for many years. The Department is considering a revision to the PSD program to allow for review of PSD permitting actions for sources which are further than 100 kilometers from a Class I Area on a case-by-case basis if requested to do so by either the EPA Administrator or a Federal Land Manager. An analysis of this revision will be included in our 2013 SIP submittal.

12.7.4 Title V Operating Permit Program

As required by Title V of the Clean Air Act Amendments of 1990 and the implementing regulations in 40 CFR part 70, New Mexico established an Operating Permit Program under 20.2.70 NMAC - *Operating Permits*. A Title V Operating Permit consolidates all air quality regulatory requirements in a single document, so a permittee can clearly determine compliance with the air quality requirements applicable to its operation. The Title V Operating Permit also establishes appropriate compliance assurance monitoring on a pollutant-by-pollutant basis for large emission sources with add-on pollution control equipment, and establishes periodic monitoring for other regulated pollutants. The process of issuing the Operating Permit is designed to allow participation by the public, the EPA and nearby states to avoid misinterpretation of air quality regulatory requirements. This permitting is done to enhance enforceability by clearly defining the playing field for all concerned parties, so that all regulated industry is governed by the same rules. These permits are issued for a term of five years and must be renewed and updated to incorporate current regulatory requirements. Nationally, this program is intended to set minimum standards for all states to implement, in an attempt to foster consistency in air quality permitting from state to state. The Operating Permit Program is intended to be self supporting, and states are required under the Clean Air Act to charge regulated industry fees based upon their actual air pollutant emissions on an annual basis; thus, Title V permittees pay for the operation of the regulating program.

The Operating Permit Program affects only major sources of air pollution operating in the State. A major source is defined as a source which emits, or has the potential to emit, 100 tons per year of an air pollutant, or any source which emits, or has the potential to emit, 10 tons per year of an individual hazardous air pollutant (or 25 tons per year of any combination of hazardous air pollutants) which has been listed pursuant to section 112(b) of the Clean Air Act. The number of Title V sources within the State is variable but has typically ranged from 150 to 160 sources at any given time.

12.7.5 New Source Performance Standards (NSPS)

NMED periodically incorporates by reference the Federal New Source Performance Standards (NSPS). These standards were first incorporated into New Mexico Administrative Code under 20.2.77 NMAC - *New Source Performance Standards* in July 1985, with the latest revision becoming effective in August 2009.

12.7.6 National Emission Standards for Hazardous Air Pollutants

The New Mexico Environment Department periodically incorporates by reference the Federal National Emission Standards for Hazardous Air Pollutants (NESHAPs). To the extent that NESHAPs regulate visibility impairing pollutants through surrogates, these programs may prove helpful in reducing visibility impairment. These standards are incorporated under 20.2.78 NMAC - *Emission Standards for Hazardous Air Pollutants*. 20.2.78 NMAC first became an effective State rule in July 1984, with the latest revision becoming effective in August 2009.

The New Mexico Environment Department determines case-by-case MACT determinations under 20.2.82 NMAC - *Maximum Achievable Control Technology Standards for Source Categories of Hazardous Air Pollutants*.

12.7.7 New Mexico Reasonably Attributable Visibility Impairment Rules

In response to EPA's Phase I visibility rules, New Mexico adopted the New Mexico Visibility Protection Plan for Phase I in August of 1986. It was approved by the U.S. EPA by notice in the Federal Register on January 27, 2006. A revision to the 1986 Phase I SIP was submitted to EPA in August of 1992. This revision was also approved by EPA in January of 2006. This visibility rule contains short and long-term strategies for making reasonable progress toward the national goal, related to addressing reasonably attributable impairment in the State's Class I areas through visibility monitoring and control strategies. This rule incorporates PSD requirements for visibility protection from new or modified major stationary sources, and if necessary applying BART to existing stationary sources if certified as causing reasonably attributable visibility impairment.

12.7.8 Ongoing Implementation of Federal Mobile Source Regulations

The Federal Motor Vehicle Control Program (FMVCP) has produced and is continuing to produce large reductions in motor vehicle emissions of NOx, PM, and VOCs. Beginning in 2006, EPA mandated new standards for on-road (highway) diesel fuel, known as ultra-low sulfur diesel (ULSD). This regulation dropped the sulfur content of diesel fuel from 500 ppm to 15 ppm. ULSD fuel enables the use of cleaner technology diesel engines and vehicles with advanced emissions control devices, resulting in significantly lower emissions. Diesel fuel intended for locomotive, marine and non-road (farming and construction) engines and equipment was required to meet the low sulfur diesel fuel maximum specification of 500 ppm sulfur in 2007 (down from 5,000 ppm). By 2010, the ULSD fuel standard of 15-ppm sulfur will apply to all non-road diesel fuel. Locomotive and marine diesel fuel will be required to meet the ULSD standard beginning in 2012, resulting in further reductions of diesel emissions. These rules not only reduce SO_2 emissions, but also NOx and PM emissions.

In addition to the ULSD standard, listed below are several other significant Federal programs.
Federal On-Road Measures:

- Tier 2 vehicle emission standards and Federal low-sulfur gasoline
- National low emissions vehicle standards (NLEV)
- Heavy-duty diesel standards

Federal Non-Road Measures:

- Lawn and garden equipment
- Tier 2 heavy-duty diesel equipment
- Locomotive engine standards
- Compression ignition standards for vehicles and equipment
- Recreational marine engine standards

In addition, the *Renewable Fuel Standard Under Section 211(o) of the Clean Air Act as Amended by the Energy Policy Act of 2005*, is determined annually (must be published in the Federal Register by November 30 of each year) by EPA and is applicable to refiners, importers and blenders of gasoline.

12.7.9 Ongoing Implementation of State Mobile Source Regulations

In December of 2007, the New Mexico Environment Department adopted 20.2.88 NMAC - *Emission Standards for New Motor Vehicles*, which established emissions standards for new passenger cars, light duty trucks, and medium duty vehicles sold in New Mexico beginning with model year 2011. These standards, commonly known as "clean car standards" or "California standards", actually consist of three separate sets of standards: (1) standards applicable to air pollutants, including non-methane organic gases, known as phase two of the Low Emission Vehicle program, or "LEV II"; (2) standards requiring a percentage of total sales for each manufacturer to consist of zero emission vehicles, or "ZEV"; and (3) standards for carbon dioxide, measured in grams per mile, or "greenhouse gas standards".

The standards strengthen the emission standards for conventional air pollutants, including non-methane organic gases ("NMOG"), carbon monoxide, oxides of nitrogen, formaldehyde, and particulates. These pollutants aggravate asthma and contribute to lung diseases, cancer, and heart disease. NOx and particulate emissions contribute to regional haze as well. Based on an analysis of States that already have the LEV II standards on the books, the LEV II standards are expected to reduce VOCs by five (5) percent over federal standards and NOx by eleven (11) percent.

12.7.10 Ongoing Implementation of Programs to Meet PM_{10} NAAQS

Currently, only one community in New Mexico, Anthony, is designated as a nonattainment area under the PM_{10} National Ambient Air Quality Standard (NAAQS). Anthony is located in the southern region of Doña Ana County. This area was designated nonattainment for PM_{10} in 1991. Anthony was designated nonattainment due to wind blown dust from high wind exceptional events.

Natural Events

On May 30, 1996, EPA issued a Natural Events Policy (NEP) which recognized that certain uncontrollable natural events, such as high winds, wildland fires, and volcanic/seismic activity can result in adverse consequences for the National Ambient Air Quality Standard (NAAQS). The NEP set forth procedures for protecting public health through the development of a Natural Events Action Plan (NEAP) which implements Best Available Control Measures (BACM) for human-generated particulate emissions in areas where the PM_{10} standard may be violated due to these uncontrolled natural events. The NEP also provides that if an approved NEAP is implemented, future air quality exceedances due to uncontrollable natural events may be flagged, and, if demonstrated to be a natural event, not be considered when determining the region's air quality designation if BACM measures are being implemented.

In 2000, a Natural Events Action Plan was submitted for Doña Ana County, which included the Anthony PM_{10} Nonattainment area was submitted to EPA. Doña Ana County is 3,804-square-miles in the south-central section of New Mexico with a population of 174,682. Doña Ana County borders El Paso, Texas and Ciudad Juarez, Mexico. This area is considered part of the Paso del Norte air shed, which includes El Paso County, Texas and Ciudad Juarez, Mexico. This region of the state has historically had air quality problems, including particulate matter and ozone pollution. The Natural Events Action plan for Doña Ana County outlines specific procedures to be taken in response to future high wind events. These procedures include:

- Techniques to educate the public about the problem;
- Mitigation of health impacts on exposed populations during future events; and
- Best Available Control Measures (BACM) for significant, anthropogenic sources of windblown dust.

For any NEAP under the Natural Events Policy, a reevaluation of the plan must be conducted every five (5) years to determine if any changes are necessary to protect public health and control anthropogenic sources that may contribute to exceedances of the PM_{10} NAAQS. A reevaluation of Doña Ana County's Natural Events Action Plan was submitted to EPA in 2005. The reevaluation reviewed the conditions causing violations of the PM_{10} NAAQS in Doña Ana County; the status of the implementation of the plan; and the adequacy of the actions being implemented.

A Natural Events Action Plan was submitted to EPA for Luna County, NM in 2004. Luna County is 2,965 square miles in southwestern New Mexico with a total population of near 27,000, of which approximately 14,000 are in Deming. In 2003, violations of the federal standard for particulate matter occurred, requiring the creation of this Luna County Natural Events Action Plan to avoid nonattainment. The Natural Events Action plan for Luna County outlines specific procedures to be taken in response to future high wind events. These procedures include:

- Techniques to educate the public about the problem;
- Mitigation of health impacts on exposed populations during future events; and
- Best Available Control Measures (BACM) for significant, anthropogenic sources of windblown dust.

In March of 2007, EPA adopted the Exceptional Events rule (EER). The Exceptional Events rule replaced the NEP. The EER established procedures and criteria related to the identification, evaluation, interpretation, and use of air quality monitoring data related to any NAAQS where States petition EPA to exclude data that are affected by exceptional events.

12.7.11 Measures to Mitigate the Impacts of Construction Activities

Currently, NMED is developing a rule concerning the control of fugitive dust emissions in the state of New Mexico outside of Bernalillo County and tribal lands. A review of the complaints received by NMED over the past five years shows that fifteen percent concern fugitive dust from sources that are not required to obtain an air quality construction or operating permit. The industries receiving the most complaints include construction and development sites, bulk material processing and handling, and confined animal feeding operations (CAFOs). The rule will initially apply to emission sources having a disturbed surface area greater than two (2) acres in size as well as bulk material handling, transport, and storage. Activities addressed in the rule include but are not limited to construction, demolition, grading, excavation, clearing, grubbing, and track out of material. As scheduled, the rule is set to be adopted in early 2011.

12.7.12 Emission Limitations and Schedules of Compliance

The implementation of BART, as described in Chapter 10, will contain emission limits and schedules of compliance for those sources either installing BART controls or taking federally enforceable permit limitations. The four-factor analysis identifies some additional measures that are appropriate for this first Regional Haze Plan. The evaluation of non-BART sources as part of the LTS identifies additional emission reductions and improves visibility by 2018.

12.7.13 Source Retirement and Replacement Schedules

The New Mexico Environment Department is not currently aware of any specific scheduled shutdowns, retirements in upcoming years, or replacement schedules, such as planned installation of new control equipment to meet other regulations or routine equipment replacement or modernization. As NMED becomes aware of such actions, they will be factored into upcoming reviews.

12.7.14 Agricultural and Forestry Smoke Management Techniques

In December of 2003, NMED adopted 20.2.65 NMAC - *Smoke Management*. The New Mexico Environment Department developed the state Smoke Management Program (SMP) to protect the health and welfare of New Mexicans from the impacts of smoke from all sources of fire. In addition, this SMP meets the requirements of the Clean Air Act and the Regional Haze Rule (40 CFR 51.309). The SMP is applicable in all of New Mexico, except for tribal lands and Bernalillo County, which are separate air quality jurisdictions. Burners must also comply with all city and county ordinances relating to smoke management and vegetation burning. The regulation was submitted to EPA in December 2003 as part of the Regional Haze Section 309 SIP submittal.

The SMP requirements of burners are based on those required by EPA, and fall under two categories of burners. SMP I is primarily an information gathering level, with registration and tracking requirements for all burners at this level of emissions. SMP II has more stringent requirements related to smoke management and emissions reduction, in keeping with the higher level of emissions produced by these larger burns. These requirements make up the Smoke Management Regulation that provides the enforcement mechanism for the SMP.

A Smoke Management Program Guidance Document was revised in May of 2005, to assist burners in understanding the requirements and aid in the implementation of 20.2.65 NMAC. The intent of this process was to create a SMP that is equitable, reasonable, and implementable; is based on the best available science; and that provides all burners with the tools and information they need to manage impacts from smoke. Clarity, flexibility and ease of application were also fundamental principles of the SMP development process. The SMP is dynamic, and will be evaluated and revised as necessary, involving stakeholder review and input. Topics for evaluation could include SMP thresholds and requirements, time frames, fees, airshed boundaries, and other aspects of the program as appropriate.

NMED staff has actively participated in the WRAP Fire Emissions Joint Forum (FEJF), formed to address both policy and technical issues concerning smoke effects that are caused by wildland and agricultural fires on public, tribal, and private lands. The FEJF is guided by the recommendations contained in the GCVTC Final Report and the requirements of the Regional Haze Rule regarding fire emissions and visibility. The FEJF has developed several policies for the WRAP through a stakeholder-based consensus process to assist the WRAP states and tribes in addressing emissions from fire sources. In these policies, the WRAP seeks to provide a consistent framework that states and tribes can use to efficiently develop their individual regional haze implementation plans, long-term strategies, and periodic progress reports.

The WRAP has advanced the following policies developed by the FEJF as viable tools for states to meet the requirements of the Rule.

- The *WRAP Policy for Categorizing Fire Emissions* was developed to clarify the complex relationship between what is considered a natural source of fire and what is considered a human-caused source, as acknowledged in the Rule. A methodology to categorize fire emissions as either “natural” or “anthropogenic” is the basis of the Policy; thus providing the foundation for fire’s inclusion in natural background condition values and ultimately, the tracking of reasonable progress.

- The *WRAP Policy on Enhanced Smoke Management Programs for Visibility* defines the enhanced smoke management program as smoke management efforts that specifically address visibility, thereby going beyond the EPA Interim Policy and the AAQTF Air Quality Policy specific guidance provided for smoke management programs that address public health and nuisance concerns. The Policy identifies for states/tribes in the WRAP region the elements of an enhanced smoke management program to address visibility effects from all types of fire that contribute to visibility impairment in mandatory Federal Class I areas.

- The WRAP defines the annual emission goal as a quantifiable value that is used to measure progress each year toward the desired outcome of achieving the minimum emission increase from fire. In the *WRAP Policy on Annual Emissions Goals for Fire*, the WRAP outlines a process by which states/tribes may establish annual emission goals, based on the utilization of currently available emission reduction techniques, to include in their Regional Haze SIPs.

- It is the position of the *WRAP Policy on Fire Tracking Systems* that it is necessary to track fire activity information in the WRAP region using a fire tracking system, which will also provide the information essential to create a fire emissions inventory. The Policy identifies seven essential components of a fire tracking system that represent the minimum spatial and temporal fire activity information necessary to consistently calculate emissions and to meet the requirements of the Rule.

12.7.15 Enforceability of New Mexico's Measures

Section 51.308(d)(3)(v)(F) of the Regional Haze Rule requires states to ensure that emission limitations and control measures used to meet reasonable progress goals are enforceable.

New Mexico has ensured that all existing emission limitations and control measures for which the State of New Mexico is responsible, used to meet reasonable progress goals, are enforceable either through New Mexico Administrative Code (NMAC), or SIP measures previously approved by EPA. Enforceability of future emission limitations and control measures, for which the State of New Mexico is responsible, will be enforceable through permit conditions (BART) or SIP measures to be approved in the future by EPA.

12.8 Additional Measures in the Long-Term Strategy

This section of the LTS identifies new measures being proposed by NMED for achieving reasonable progress. These reasonable progress measures will be evaluated and discussed in the next Plan update in 2013.

12.8.1 Future Federal Mobile Programs

A new rule, "Control of Emissions of Air Pollution from Locomotives and Marine Compression-Ignition Engines Less Than 30 Liters per Cylinder", was signed on March 14, 2008. EPA estimates that by 2030, this program will reduce annual emissions of NOx by about 800,000 tons and PM emissions by 27,000 tons. Emission reductions are expected to continue as fleet turnover is completed. These standards are intended to achieve these large reductions in emissions through the use of technologies such as in-cylinder controls, aftertreatment, and low sulfur fuel, perhaps as early as 2011.

In June 2009, EPA announced a rule (Control of Emissions from New Marine Compression-Ignition Engines at or Above 30 Liters per Cylinder) proposing more stringent exhaust emission standards for the largest marine diesel engines used for propulsion on oceangoing vessels (called Category 3 engines). The proposed engine standards are equivalent to the nitrogen oxides limits recently adopted in amendments to Annex VI to the International Convention for the Prevention of Pollution from Ships (MARPOL). The near-term standards for newly-built engines would apply beginning in 2011. Long-term standards would begin in 2016, and are based on the application of high-efficiency aftertreatment technology. By 2030, this strategy to address emissions from oceangoing vessels is expected to reduce annual emissions of NOx in the U.S. by approximately 1.2 million tons and particulate matter emissions by about 143,000 tons. When fully implemented, the coordinated strategy is anticipated to reduce NOx emissions by 80 percent and PM emissions by 85 percent, compared to the current limits applicable to these engines.

A proposed rule, the Renewable Fuel Standard (RFS2), was signed by Administrator Jackson on May 5, 2009. This rule took effect on March 26, 2010. The rule addresses changes to the Renewable Fuel Standard program as required by the Energy Independence and Security Act of 2007 (EISA). The revised statutory requirements establish new specific volume standards for cellulosic biofuel, biomass-based diesel, advanced biofuel, and total renewable fuel that must be used in transportation fuel each year. The revised statutory requirements also include new definitions and criteria for both renewable fuels and the feedstocks used to produce them, including new greenhouse gas emission (GHG) thresholds for renewable fuels. The regulatory requirements for RFS will apply to domestic and foreign producers and importers of renewable fuel. It is estimated that annual GHG emissions from transportation will be reduced by approximately 160 million tons, the equivalent of the removal of 24 million vehicles from the highways. In addition, 36 billion gallons of renewable fuel will displace approximately 11% of gasoline and diesel consumption in 2022. The majority of the reductions are expected to come from reduced petroleum imports.

12.8.2 Efforts to Address Offshore Shipping

As depicted by PSAT results in Chapter 9, offshore marine vessel emissions contribute marginally to New Mexico Class I areas. New Mexico has no authority to regulate offshore shipping emissions and must rely upon the EPA and coastal states such as California for adoption of regulations.

EPA adopted emission standards for new marine diesel engines installed on vessels flagged or registered in the United States with displacement at or above 30 liters per cylinder. Also adopted in this rulemaking were additional standards for new engines with displacement at or above 2.5 liters per cylinder but less than 30 liters per cylinder. This rule established a deadline of April 27, 2007 for EPA to promulgate a second set of emission standards for these engines. Because much of the information necessary to develop more stringent Category 3 marine diesel engines standards has become available only recently, a new deadline for the rulemaking to consider the next tier of Category 3 marine diesel engine standards has been set for December 17, 2009. On December 7, 2007, EPA announced an advance notice of proposed rulemaking regarding the above-referenced standards, first set in 2003. The advanced notice of proposed rulemaking stated that EPA was considering standards for achieving large reductions in NOx and PM through the use of technologies such as in-cylinder controls, aftertreatment, and low sulfur fuel, starting as early as 2011.

On July 24, 2008, the State of California adopted new strict regulations for marine vessels within 24 miles of shore. NMED expects that implementation of these new regulations for marine vessels will have benefits in New Mexico.

In October 2008, Member States of the International Maritime Organization (IMO) adopted new international standards for marine diesel engines and their fuels (2008 Amendments to MARPOL Annex VI) that apply globally, and establishes additional, more stringent emission requirements for ships that operate in specially-designated coastal areas where air quality problems are acute.

Under the new global standards, NOx emissions will be reduced, and the fuel sulfur cap will drop to 5,000 ppm in 2020 (pending a fuel availability review in 2018). Under the new geographic standards, ships operating in designated areas will be required to use engines that meet the most advanced technology-forcing standards for NOx emissions, and to use fuel with sulfur content at or below 1,000 ppm.

On March 27, 2009, the United States submitted a joint proposal with Canada to the IMO to designate specific areas of our coastal waters as an Emission Control Area (ECA). Compared to fuels used in ships today, ECA standards will lead to a 96 percent reduction in sulfur in ships' fuels, as well as a cut in emissions of PM by 85 percent and NOx by 80 percent. To achieve these reductions, ships must use fuel with no more than 1,000 parts per million sulfur beginning in 2015, and new ships will have to use advanced emission control technologies beginning in 2016.

12.8.3 Long-Term Control Strategies for BART Facilities

Chapter 10 outlines the BART process for New Mexico.

12.8.4 Evaluation of Control Strategies for Sources Identified in the Reasonable Progress - Four-Factor Analysis

The Reasonable Progress Goals section evaluated certain non-BART sources through a four-factor analysis for additional controls, as was required by the Federal Regional Haze Rule. This evaluation was limited, in that no guidance was provided for identifying "significant sources", and no contribution to visibility impairment thresholds were established. The New Mexico Environment Department will conduct further research to evaluate non-BART sources for possible emission controls and retrofits.

12.8.5 Oil and Gas

Oil and gas production, which is not limited to just one area of New Mexico, is a large, important, and critical component of the State economy. However, the sources associated with oil and gas production emit NOx, and to a lesser extent, PM. An extensive fleet of field equipment and an array of processing plants operate continuously conducting exploration, production, and gathering activities. Exploration and drilling includes seismic studies, engineering, well testing, drilling operations, and transportation of personnel or equipment to and from sites. Oil and gas production includes operation, maintenance, and servicing of production properties, including transportation to and from sites. Sources include turbines, drill rig engines, glycol dehydrators, amine treatment units, flares and incinerators.

Understanding the sources and volume of emissions at oil and gas production sites is key to recognizing the impact that these emissions have on visibility. To better understand the emissions from these sources, the WRAP instituted a three-phase project. One of the issues was to quantify emission inventories from stationary and mobile equipment operated as part of oil and gas field operations.

Phase I, which was completed in 2005, was an emission inventory project that estimated regional emissions from oil and gas field operations. Phase II, completed in late 2007, was an effort to more fully characterize the oil and gas field operations emissions. Phase III which began in late 2007 with the Independent Petroleum Association of Mountain States (IPAMS) in conjunction with WRAP initiating a regional oil and gas emission inventory project is underway.

A component of New Mexico's long-term strategy for reducing oil and gas emissions that affect visibility is the State's ongoing efforts to reduce emissions that contribute to ozone formation. In 2009, legislation was passed (House Bill 195) that allows the state to be to be more stringent than federal rule for areas that are violating or within 95% of violating a federal air quality standard. This allows the state to be more proactive for those areas that are violating or in jeopardy of violating a federal air quality standard.

EPA has also adopted emissions standard for the oil and gas industry that will assist the state in reducing NOx emissions. These emissions standards include:

- 40 CFR. pts. 63.160-.183 (Subpart H) – National Emission Standards for Organic Hazardous Air Pollutants for Equipment Leaks – This applies to pumps, compressors, agitators, pressure relief devices, and other pieces of equipment that are intended to operate in organic hazardous air pollutant service 300 hours or more per year within a source subject to part 63 that references subpart H. Pt. 63.160(a);

- 40 C.F.R. pts. 63.760-.777 (Subpart HH) – National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities – This applies to emission points of hazardous air pollutants located at oil and natural gas production facilities that are major or area sources of hazardous air pollutants, as well as facilities that process, upgrade, or store hydrocarbon liquids prior to the point of custody transfer, and facilities that process, upgrade, or store natural gas prior to the point at which natural gas enters the natural gas transmission and storage source category or is delivered to a final end user;

- 40 C.F.R. pts. 63.1100-.1114 (Subpart YY) – National Emission Standards for Hazardous Air Pollutants for Source Categories: Generic Maximum Achievable Control Technology (MACT) Standards – Subpart YY applies MACT standards to eight different source categories and affected sources, including ethylene production emission points located at major sources;

- 40 C.F.R. pts. 63.6080-.6175 (Subpart YYYY) – National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines – This subpart applies to stationary combustion turbines located at major sources of hazardous air pollutant emissions, including turbines located at oil and gas production facilities. Pt. 63.6085(a)-(b).

- 40 C.F.R. pts. 63.6580-.6675 (Subpart ZZZZ) – National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE) – This applies to RICE located at major sources of hazardous air pollutant emissions, including oil and gas production facilities. Pt. 63.6585(a)-(b).

12.9 Projection of the Net Effect on Visibility

The WRAP has projected the net effect on visibility from emission reductions by point, area and mobile sources throughout the WRAP region through 2018. The first emission projection inventory was compiled in 2006. The inventory was revised in 2007 to make preliminary evaluations of reasonable progress towards Class I areas visibility goals. The 2007 inventory focused on the most significant point and area sources of visibility impairing pollution in states and Indian Reservations. This effort included updating projections of electric generating units and incorporating known and presumed BART emission levels. Then, in the spring of 2009, the WRAP once again updated emission inventory projections for point and area sources in the WRAP region to give the most current assessment of reasonable progress towards visibility goals. Again, the updated projection inventory reflected new information about BART determinations and projection of future fossil fuel plants needed to achieve 2018 Federal electrical generation demands.

Chapter 9 of this Plan shows the specific results of the CMAQ modeling which was used to make all projections of visibility. Those results show anthropogenic emissions sources generally declining across the West through 2018. However, natural sources such as wildfires and dust and international sources in Mexico appear to offset improvements in visibility from controls on manmade sources in the U.S. In spite of the large number of growing uncontrollable sources in the WRAP region, however, New Mexico does see a net visibility improvement at the New Mexico's Class I areas through 2018. The net effect of all of the reductions in the WRAP region, known at the time of the most recent model run is demonstrated in the WRAP Class I Summary Tables shown below for each of the Class I areas in New Mexico.

Table 12-7: Class I Area Visibility Summary for BAND1 on 20% Worst Days

	Class I Area Visibility Summary: Bandelier NM, NM **Visibility Conditions:** Worst 20% Days **RRF Calculation Method:** Specific Days (EPA) **Emissions Scenarios:** 2000-04 Baseline (plan02d) & 2018 PRPb (prp18b)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)[1]	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[2] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[2] (%)
Sulfate	6.89	0.65	5.17	5.99	-1,320 -3%	-4%	-4%
Nitrate	2.51	0.81	2.09	2.53	-64,814 -19%	-24%	-26%
Organic Carbon	14.23	4.01	11.32	14	-813 -4%	1%	3%
Elemental Carbon	3.15	0.32	2.43	2.65	-1,296 -21%	-21%	-41%
Fine Soil	1.12	1.07	1.11	1.43	1,470 11%	18%	27%
Coarse Material[3]	2.93	3.64	3.09	Not Applicable	9,193 13%	17%	30%
Sea Salt[3]	0.24	0.24	0.24		Not Applicable		
Total Light Extinction	40.07	19.74	34.02	38.77			
Deciview	12.22	6.26	10.83	11.9			

1) 2018 Uniform Rate of Progress Target for Best 20% Days is not defined.
2) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRPb (prp18b) emissions scenarios.
3) Visibility projections not available due to model performance issues.
WRAP TSS - http://vista.cira.colostate.edu/tss/

Table 12-8: Class I Area Visibility Summary for BOAP1 on 20% Worst Days

	Class I Area Visibility Summary: Bosque del Apache NWRW, NM **Visibility Conditions:** Worst 20% Days **RRF Calculation Method:** Specific Days (EPA) **Emissions Scenarios:** 2000-04 Baseline (plan02d) & 2018 PRPb (prp18b)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)[1]	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[2] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[2] (%)
Sulfate	7.51	0.58	5.57	7.27	-1,320 -3%	-2%	-2%
Nitrate	3.24	1.01	2.68	3.02	-64,814 -19%	-26%	-31%
Organic Carbon	8.73	3.15	7.24	8.6	-813 -4%	1%	3%
Elemental Carbon	2.6	0.29	2.02	2.15	-1,296 -21%	-18%	-33%
Fine Soil	1.94	1.06	1.73	2.16	1,470 11%	11%	23%
Coarse Material[3]	6.69	3.56	5.90	Not Applicable	9,193 13%	4%	12%
Sea Salt[3]	0.19	0.25	0.21		Not Applicable		
Total Light Extinction	40.90	19.89	34.57	40.09			
Deciview	13.8	6.73	12.15	13.59			

1) 2018 Uniform Rate of Progress Target for Best 20% Days is not defined.
2) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRPb (prp18b) emissions scenarios.
3) Visibility projections not available due to model performance issues.
WRAP TSS - http://vista.cira.colostate.edu/tss/

Table 12-9: Class I Area Visibility Summary for GUMO1 on 20% Worst Days

	Class I Area Visibility Summary: Carlsbad Caverns NP, NM: Guadalupe Mountains NP, TX **Visibility Conditions:** Worst 20% Days **RRF Calculation Method:** Specific Days (EPA) **Emissions Scenarios:** 2000-04 Baseline (plan02d) & 2018 PRPb (prp18b)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)[1]	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[2] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[2] (%)
Sulfate	16.51	0.8	11.50	13.92	-267,250 -28%	39%	39%
Nitrate	3.81	0.89	3.06	4.27	-699,080 -34%	-8%	-9%
Organic Carbon	6.73	3.13	5.81	6.88	5,218 8%	2%	3%
Elemental Carbon	1.34	0.23	1.07	1.19	-9,331 -37%	-13%	-18%
Fine Soil	4.37	1.27	3.57	5.26	25,703 11%	15%	27%
Coarse Material[3]	16.02	4.39	12.66	Not Applicable	6,210 0%	1%	3%
Sea Salt[3]	0.1	0.14	0.11		Not Applicable		
Total Light Extinction	57.87	19.84	45.20	56.64			
Deciview	17.19	6.65	14.73	16.92			

1) 2018 Uniform Rate of Progress Target for Best 20% Days is not defined.
2) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRPb (prp18b) emissions scenarios.
3) Visibility projections not available due to model performance issues.
WRAP TSS - http://vista.cira.colostate.edu/tss/

Table 12-10: Class I Area Visibility Summary for GILA1 on 20% Worst Days

	Class I Area Visibility Summary: Gila W, NM **Visibility Conditions:** Worst 20% Days **RRF Calculation Method:** Specific Days (EPA) **Emissions Scenarios:** 2000-04 Baseline (plan02d) & 2018 PRPb (prp18b)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)[1]	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[2] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[2] (%)
Sulfate	6.87	0.58	5.13	6.63 [~~7.67~~]	-1,320 -3%	98% [~~-2%~~]	136% [~~-2%~~]
Nitrate	0.91	0.7	0.86	0.81 [~~0.49~~]	-64,814 -19%	-26% [~~-23%~~]	-5% [~~-29%~~]
Organic Carbon	16	4.46	12.67	15.73 [~~23.26~~]	-813 -4%	-91% [~~1%~~]	-16% [~~7%~~]
Elemental Carbon	3.17	0.41	2.46	3.01 [~~5.7~~]	-1,296 -21%	-84% [~~-8%~~]	31% [~~-31%~~]
Fine Soil	1.45	1.21	1.40	1.69 [~~2.14~~]	1,470 11%	-2% [~~14%~~]	51% [~~27%~~]
Coarse Material[3]	2.85	3.53	3.00	Not Applicable	9,193 13%	-23% [~~7%~~]	-4% [~~17%~~]
Sea Salt[3]	0.07	0.16	0.09	Not Applicable	Not Applicable		
Total Light Extinction	40.31	20.05	34.30	39.79 [~~51.16~~]	Not Applicable		
Deciview	13.11	6.66	11.61	12.99 [~~15.14~~]	Not Applicable		

1) 2018 Uniform Rate of Progress Target for Best 20% Days is not defined.
2) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline [~~(plan02d)~~] (plan02d_rev) & 2018 PRPb (prp18b) emissions scenarios.
3) Visibility projections not available due to model performance issues.
WRAP TSS - http://vista.cira.colostate.edu/tss/

Table 12-11: Class I Area Visibility Summary for SACR1 on 20% Worst Days

	Class I Area Visibility Summary: Salt Creek NWRW, NM **Visibility Conditions:** Worst 20% Days **RRF Calculation Method:** Specific Days (EPA) **Emissions Scenarios:** 2000-04 Baseline (plan02d) & 2018 PRPb (prp18b)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)[1]	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[2] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[2] (%)
Sulfate	16.75	0.78	11.64	13.9	-1,320 -3%	2%	2%
Nitrate	11.15	0.77	8.07	11.11	-64,814 -19%	-20%	-23%
Organic Carbon	7.49	2.97	6.31	6.64	-813 -4%	-12%	-17%
Elemental Carbon	2.31	0.26	1.79	1.62	-1,296 -21%	-30%	-36%
Fine Soil	3.34	0.98	2.75	3.44	1,470 11%	5%	7%
Coarse Material[3]	11.47	4.09	9.46	Not Applicable	9,193 13%	-1%	-1%
Sea Salt[3]	0.2	0.2	0.20		Not Applicable		
Total Light Extinction	62.70	20.04	48.05	58.37			
Deciview	18.03	6.81	15.41	17.31			

1) 2018 Uniform Rate of Progress Target for Best 20% Days is not defined.
2) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRPb (prp18b) emissions scenarios.
3) Visibility projections not available due to model performance issues.
WRAP TSS - http://vista.cira.colostate.edu/tss/

Table 12-12: Class I Area Visibility Summary for WHIT1 on 20% Worst Days

	Class I Area Visibility Summary: White Mountain W, NM **Visibility Conditions:** Worst 20% Days **RRF Calculation Method:** Specific Days (EPA) **Emissions Scenarios:** 2000-04 Baseline (plan02d) & 2018 PRPb (prp18b)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)[1]	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[2] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[2] (%)
Sulfate	10.51	0.74	7.64	9.33	-1,320 -3%	0%	0%
Nitrate	3.05	0.98	2.53	2.99	-64,814 -19%	-23%	-27%
Organic Carbon	8.97	3.72	7.59	8.64	-813 -4%	-3%	-6%
Elemental Carbon	1.82	0.31	1.45	1.42	-1,296 -21%	-20%	-32%
Fine Soil	1.89	1.19	1.72	2.02	1,470 11%	7%	11%
Coarse Material[3]	6.68	4.35	6.10	Not Applicable	9,193 13%	0%	1%
Sea Salt[3]	0.17	0.22	0.18		Not Applicable		
Total Light Extinction	42.08	20.51	35.64	40.24			
Deciview	13.7	6.8	12.09	13.26			

1) 2018 Uniform Rate of Progress Target for Best 20% Days is not defined.
2) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRPb (prp18b) emissions scenarios.
3) Visibility projections not available due to model performance issues.
WRAP TSS - http://vista.cira.colostate.edu/tss/

Table 12-13: Class I Area Visibility Summary for WHPE1 on 20% Worst Days

	Class I Area Visibility Summary: Pecos W, NM: Wheeler Peak W, NM **Visibility Conditions:** Worst 20% Days **RRF Calculation Method:** Specific Days (EPA) **Emissions Scenarios:** 2000-04 Baseline (plan02d) & 2018 PRPb (prp18b)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)[1]	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[2] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[2] (%)
Sulfate	5.27	0.75	4.07	4.68	-1,320 -3%	-21%	-23%
Nitrate	1.64	0.84	1.44	1.61	-64,814 -19%	-24%	-28%
Organic Carbon	8.37	4.2	7.30	8.23	-813 -4%	0%	2%
Elemental Carbon	2.18	0.4	1.74	2.1	-1,296 -21%	-11%	-40%
Fine Soil	1.75	1.18	1.61	2	1,470 11%	12%	22%
Coarse Material[3]	2.77	3.21	2.87	Not Applicable	9,193 13%	12%	27%
Sea Salt[3]	0.47	0.49	0.48		Not Applicable		
Total Light Extinction	30.44	19.07	27.33	29.87			
Deciview	10.41	6.08	9.40	10.23			

1) 2018 Uniform Rate of Progress Target for Best 20% Days is not defined.
2) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRPb (prp18b) emissions scenarios.
3) Visibility projections not available due to model performance issues.
WRAP TSS - http://vista.cira.colostate.edu/tss/

CHAPTER 13: OTHER SIP REQUIREMENTS AND COMMITMENTS

13.1 Enforceability of Emission Limitations and Control Measures

Section 51.308(d)(3)(v)(F) requires States to ensure that emission limitations and control measures used to meet reasonable progress goals are enforceable.

New Mexico has ensured that all emission limitations and control measures used to meet reasonable progress goals are enforceable. New Mexico requests EPA approval of these measures.

13.2 Commitment to Future Regional Haze SIP Revisions

40 CFR 51.308(f) requires NMED to revise its Regional Haze Implementation Plan and submit a Plan revision to the USEPA by July 31, 2018 and every ten years thereafter. In accordance with the requirements listed in Section 51.308(f) of the Federal rule for regional haze, New Mexico commits to revising and submitting this Regional Haze Implementation Plan by July 31, 2018 and every ten years thereafter.

In addition, 51.308(g) requires periodic reports evaluating progress towards the reasonable progress goals established for each mandatory Class I area. In accordance with the requirements listed in 51.308(g) of the Federal rule for regional haze, NMED commits to submitting a report on reasonable progress to the USEPA every five years following the initial submittal of the SIP. The report will be in the form of a SIP revision. The reasonable progress report will evaluate the progress made towards the reasonable progress goal for each mandatory Class I area located within New Mexico and in each mandatory Class I area located outside New Mexico which may be affected by emissions from within New Mexico.

The requirements listed in 51.308(g) include the following:

A description of the status of implementation of all measures included in the implementation plan for achieving reasonable progress goals for mandatory Class I Federal areas both within and outside the state;

1. Summary of emission reductions achieved thus far;

2. Assessment of changes in visibility conditions at each Class I area (current vs. baseline), expressed as 5-year averages of annual values for least impaired and most impaired days;

3. Analysis of emissions changes over the 5-year period, identified by source or activity, using the most recent updated emissions inventory;

4. Analysis of any significant changes in anthropogenic emissions in or out of the state which have impeded progress;

5. Assessment of the sufficiency of the implementation plan to meet reasonable progress goals;

6. Review of the State's visibility monitoring strategy and any modifications to the strategy as necessary.

13.3 Commitment to Periodic Progress Reports

40 CFR 51.308(g), requires a State/Tribe to submit a progress report to EPA every five years evaluating progress towards the reasonable progress goals(s). The first progress report is due five years from the submittal of the initial implementation plan and must be in the form of an implementation plan revision that complies with Sections 51.102 and 51.103. at a minimum, the progress reports must contain the elements in paragraphs 51.308(g)(1) through (7) for each Class I area as summarized below.

1) Implementation status of the current SIP measures;
2) Summary of emissions reductions;
3) Assessment of most/least impaired days;
4) Analysis of emission reductions by pollutant;
5) Significant changes in anthropogenic emissions;
6) Assessment of the current SIP sufficiency to meet reasonable progress goals; and
7) Assessment of visibility monitoring strategy.

In accordance with the requirements listed in Section 51.308(g) of the federal regional haze rule, New Mexico commits to submitting a report on reasonable progress report will evaluate the progress made towards the reasonable progress goal for each mandatory Class I area located within New Mexico and in each mandatory Class I area located outside New Mexico, which may be affected by emissions from New Mexico.

13.4 Determination of Plan Adequacy

Depending on the findings of the five-year progress report, New Mexico commits to taking one of the actions listed in 40 CFR 51.308(h). The findings of the five-year progress report will determine which action is appropriate and necessary.

List of Possible Actions (40 CFR 51.308(h))

1. NMED determines that the existing SIP requires no further substantive revision in order to achieve established goals. NMED provides to the EPA Administrator a negative declaration that further revision of the SIP is not needed at this time.

2. NMED determines that the existing SIP may be inadequate to ensure reasonable progress due to emissions from other states, which participated in the regional planning process. NMED provides notification to the EPA Administrator and the states that participated in regional planning. NMED collaborates with states and FLMs through the regional planning process to address the SIP's deficiencies.

3. NMED determines that the current SIP may be inadequate to ensure reasonable progress due to emissions from another country. NMED provides notification, along with available information, to the EPA Administrator.

4. NMED determines that the existing SIP is inadequate to ensure reasonable progress due to emissions within the state. NMED will consult with FLMs and revise its SIP to address the Plan's deficiencies within one year.

CHAPTER 14: APPENDICES AND TECHNICAL SUPPORT DOCUMENTATION

Appendix A: Emissions Overview (WRAP, undated)

Appendix B: Air Quality Modeling (WRAP, undated)

Appendix C: Summary of WRAP RMC BART Modeling for New Mexico

Appendix D: New Mexico BART Determination for San Juan Generating Station

Appendix E: Supplementary Information for Four Factor Analyses by WRAP States, EC/R Incorporated, May 4, 2009 (corrected April 20, 2010)

Appendix F: Supplementary Information for Four-Factor Analyses for Selected Individual Facilities in New Mexico, May 5, 2009