6.0 STATE AND CLASS I AREA SUMMARIES

As described in Section 2.0, each state is required to submit progress reports at interim points between submittals of Regional Haze Rule (RHR) State Implementation Plans (SIPs), which assess progress towards visibility improvement goals in each state's mandatory Federal Class I areas (CIAs). Data summaries for each CIA in each Western Regional Air Partnership (WRAP) state, which address Regional Haze Rule (RHR) requirements for visibility measurements and emissions inventories are provided in this section. These summaries are intended to provide individual states with the technical information they need to determine if current RHR implementation plan elements and strategies are sufficient to meet all established reasonable progress goals, as defined in their respective initial RHR implementation plans.

6.13 UTAH

The goal of the RHR is to ensure that visibility on the 20% most impaired, or worst, days continues to improve at each Federal Class I area (CIA), and that visibility on the 20% least impaired, or best, days does not get worse, as measured at representative Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring sites. Utah has 5 mandatory Federal CIAs, which are depicted in Figure 6.13-1 and listed in Table 6.13-1, along with the associated IMPROVE monitor locations.

This section addresses differences between the 2000-2004 baseline and 2005-2009 period, for both monitored data and emission inventory estimates. Monitored data are presented for the 20% most impaired, or worst, days and for the 20% least impaired, or best, days, as per Regional Haze Rule (RHR) requirements. Annual average trend statistics for the 2000-2009 10-year period are also presented here to support assessments of changes in each monitored species that contributes to visibility impairment. Some of the highlights regarding these comparisons are listed below, and more detailed state specific information is provided in monitoring and emissions sub-sections that follow.

- For the best days, the 5-year average deciview metric decreased at all Utah Federal CIA IMPROVE sites.
- For the worst days, 5-year average deciview metric increased at the BRCA1 and CAPI1 sites, and decreased at the ZICA1 and CANY1 sites.
- Changes in deciview averages for the worst days were driven by changes in particulate organic mass, which increased at the BRCA1 and CAPI1 sites and decreased at the ZICA1 and CANY1 sites.
- Ammonium sulfate decreased at all except the ZICA1 site, but changes in 5-year averages at the ZICA1 site used estimates for baseline data that were based on changes measured in the broader Colorado Plateau region. Ammonium sulfate showed decreasing annual average trends at all sites, which was consistent with emissions inventory comparison results that showed large decreases in point source SO_2 emission inventories.
- Ammonium nitrate decreased at all except the CANY1 site, and showed a statistically significant decreasing annual average trend at the CAPI1 site. Changes in emissions inventories showed a net reduction in anthropogenic sources, with increases in area sources and decreases in mobile sources.
- Coarse mass increased at the CAPI1 and CANY1 sites, but neither site showed increasing trends. Higher 5-year averages for the current period were influenced by higher than average coarse mass events in late April 2008 at both sites.

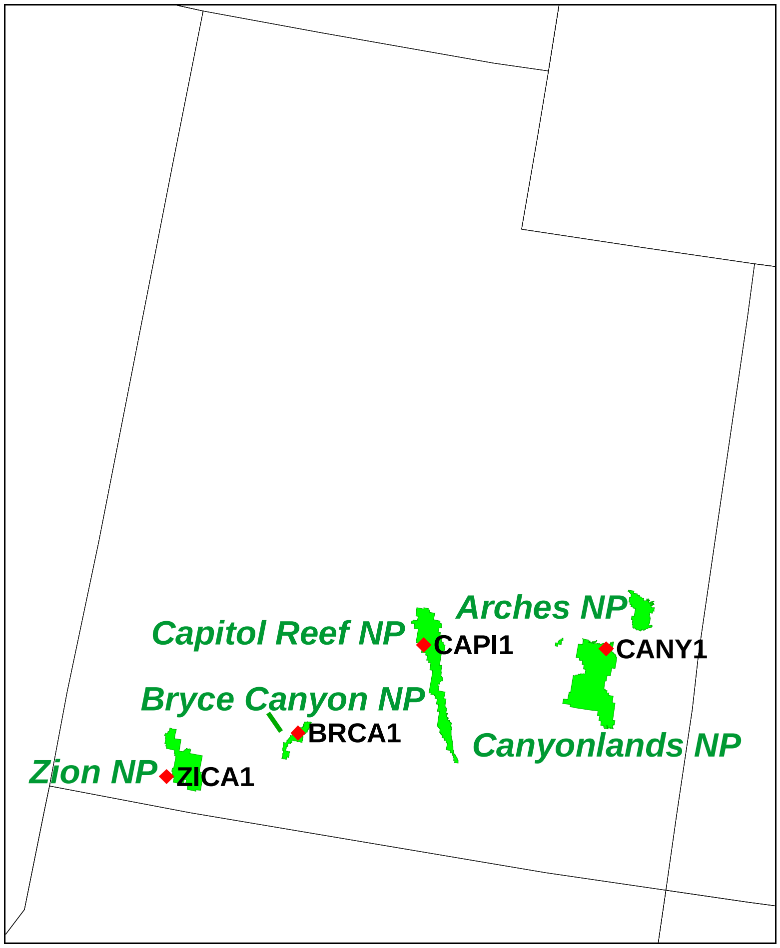

Figure 6.13-1. Map Depicting Federal CIAs and Representative IMPROVE Monitors in Utah.

Table 6.13-1
Utah CIAs and Representative IMPROVE Monitors

Class I Area	Representative IMPROVE Site	Latitude	Longitude	Elevation (m)
Bryce Canyon NP	BRCA1	37.62	-112.17	2481
Canyonlands NP	CANY1	38.46	-109.82	1798
Arches NP				
Capitol Reef NP	CAPI1	38.30	-111.29	1896
Zion NP	ZICA1*	37.20	-113.15	1215

*Replaced the ZION1 monitoring site in 2003.

6.13.1 Monitoring Data

This section addresses RHR regulatory requirements for monitored data as measured by IMPROVE monitors representing Federal CIAs in Utah, including estimates of baseline concentrations for the Zion National Park ZICA1 site. These summaries are supported by regional data presented in Section 4.0 and by more detailed site specific tables and charts in Appendix M.

As described in Section 3.1, regional haze progress in Federal CIAs is tracked using calculations based on speciated aerosol mass as collected by IMPROVE monitors. The RHR calls for tracking haze in units of deciviews (dv), where the deciview metric was designed to be linearly associated with human perception of visibility. In a pristine atmosphere, the deciview metric is near zero, and a one deciview change is approximately equivalent to a 10% change in cumulative species extinction. To better understand visibility conditions, summaries here include both the deciview metric, and the apportionment of haze into extinction due to the various measured species in units of inverse megameters (Mm^{-1}).

6.13.1.1 Zion Baseline Estimate

In Utah, the ZION1 IMPROVE monitor, which was originally intended to represent Zion National Park, began operation in 2000 at a site located on the northwest edge of the park, near an interstate highway. In 2003 a second IMPROVE monitor, ZICA1, was established approximately 19 miles from the original ZION1 along the southwest edge of the park. A map depicting both Zion National Park sites is presented in Figure 6.13-2.

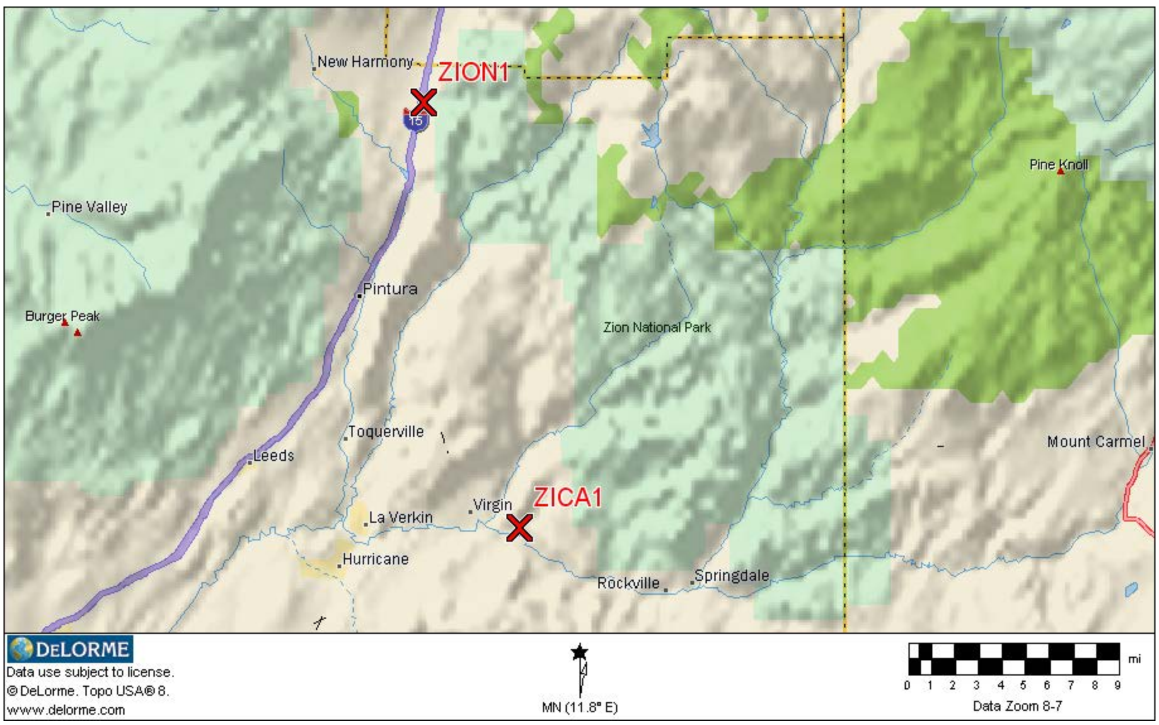

Figure 6.13-2. Map of ZION1 and ZICA1 Sites Representing Zion National Park.

The second site was installed in part because elevated ammonium nitrate at the original site was influenced by mobile sources from the interstate highway that were not representative of park conditions. Figure 6.13-3 presents a scatter plot of ammonium nitrate measurements for the period where both samplers ran concurrently between February 2, 2003, when the ZICA1 monitor was installed, and ending July 29, 2004, when monitoring at the ZION1 site was discontinued. The comparison indicates that ammonium nitrate measurements were much higher at the ZION1 site than the ZICA1 site. Because of these differences, it was determined that future RHR SIPs and progress updates should use the ZICA1 data.

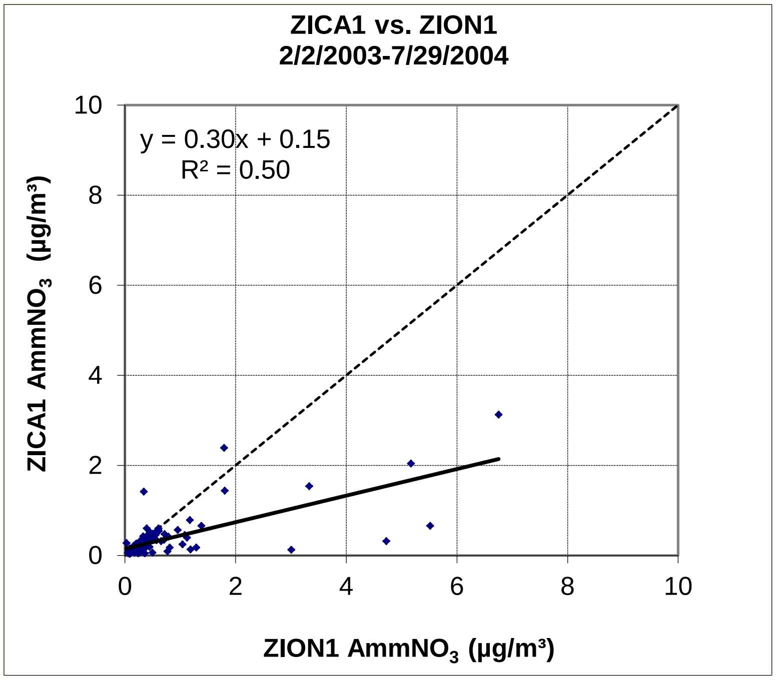

Figure 6.13-3. Correlation Plot for Ammonium Nitrate Depicting Mass Measured at the ZICA1 and ZION1 sites between February 2, 2003 and July 29, 2004.

RHR guidelines require that progress be measured again the 2000-2004 baseline period,[1] but baseline data are not available for the ZICA1 location. The RHR also states that approximations should be made for baseline conditions if these monitoring data are not available.[2] A methodology to estimate baseline conditions for the ZICA1 site was developed in consultation with the State of Utah – Division of Air Quality and IMPROVE Steering Committee representatives from the U.S. Forest Service and National Park Service. This methodology involved applying an average of ratios between progress periods and baseline periods at nearby sites in the region to scale the ZICA1 progress period. Sites selected included those that represent the 16 CIAs on the Colorado Plateau, which have previously been treated regionally as the focus of the Grand Canyon Visibility Transport Commission (GCVTC) report[3] and subsequent Section

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[1] EPA's September 2003 *Guidance for Tracking Progress Under the Regional Haze Rule* specifies that progress is tracked against the 2000-2004 baseline period using corresponding averages over successive 5-year periods, i.e. 2005-2009, 2010-2014, etc. (see page 4-2 in the Guidance document)

[2] Section 308(d)(2)(i) of the RHR states, "For mandatory Class I Federal areas without onsite monitoring data for 2000-2004, the State must establish baseline values using the most representative available monitoring data for 2000-2004, in consultation with the Administrator or his or her designee."

[3] The June 1996 *Grand Canyon Visibility Transport Commission Report, Recommendations for Improving Western Vistas* Report is available at www.wrapair.org/WRAP/reports/GCVTCFinal.PDF.

309 requirements of the RHR. Table 6.13-2 list the Colorado Plateau CIA areas and representative IMPROVE sites that were used as the basis for the ZICA1 baseline estimate.

Table 6.13-2
Colorado Plateau CIAs and Representative IMPROVE Sites

<table>
<tr><th>State</th><th>Colorado Plateau
Class I Area</th><th>IMPROVE
Site</th></tr>
<tr><td rowspan="4">AZ</td><td>Mount Baldy WA</td><td>BALD1</td></tr>
<tr><td>Grand Canyon NP</td><td>GRCA2</td></tr>
<tr><td>Petrified Forest NP</td><td>PEFO1</td></tr>
<tr><td>Sycamore Canyon WA</td><td>SYCA1</td></tr>
<tr><td rowspan="6">CO</td><td>Mesa Verde NP</td><td>MEVE1</td></tr>
<tr><td>Black Canyon of the Gunnison NP</td><td rowspan="2">WEMI1</td></tr>
<tr><td>Weminuche WA</td></tr>
<tr><td>Flat Tops WA</td><td rowspan="3">WHRI1</td></tr>
<tr><td>Maroon Bells-Snowmass WA</td></tr>
<tr><td>West Elk WA</td></tr>
<tr><td>NM</td><td>San Pedro Parks WA</td><td>SAPE1</td></tr>
<tr><td rowspan="5">UT</td><td>Bryce Canyon NP</td><td>BRCA1</td></tr>
<tr><td>Arches NP</td><td rowspan="2">CANY1</td></tr>
<tr><td>Canyonlands NP</td></tr>
<tr><td>Capitol Reef NP</td><td>CAPI1</td></tr>
<tr><td>Zion NP</td><td>ZICA1</td></tr>
</table>

To estimate baseline conditions at the ZICA1 site, ratios between the 2005-2009 progress period and the 2000-2004 baseline period were determined for each species, for both the 20% most impaired days and 20% least impaired data, for each site in the Colorado Plateau. The average of these ratios was then applied to the ZICA1 progress period measurement to estimate the 2000-2004 baseline period for each species at the ZICA1 site, for both the most and least impaired days. Table 6.13-3 lists the average progress to baseline period ratios for the Colorado Plateau sites for the 20% most impaired days, and Table 6.13-4 lists averages and ratios for the least impaired days. These average ratios were applied to the 2005-2009 progress period from the ZICA1 site to obtain species and group specific estimates, such that, for each species:

$$\frac{\text{ZICA1 Progress Period}}{\text{Colorado Plateau } \frac{\text{Progress}}{\text{Baseline}} \text{ Average}} = \text{ZICA1 Baseline Period Estimate}$$

Table 6.13-3
Colorado Plateau Sites
20% Most Impaired Visibility Days
Species Averages and Ratios

20% Most Impaired Days		GRCA1	BALD1	PEFO1	SYCA1	WEMI1	WHRI1	MEVE1	SAPE1	CANY1	BRCA1	CAPI1	Average Progress/ Baseline Ratio
Ammonium Sulfate	**Baseline Period**	5.4	6.2	6.6	5.0	5.0	4.8	6.5	5.8	5.6	5.2	5.9	**1.04**
	Progress Period	5.8	6.5	7.2	5.7	5.1	5.1	6.3	6.8	5.3	5.0	5.7	
	Ratio (progress/ baseline)	**1.09**	**1.04**	**1.08**	**1.14**	**1.02**	**1.07**	**0.97**	**1.17**	**0.95**	**0.96**	**0.97**	
Ammonium Nitrate	**Baseline Period**	2.2	1.1	1.8	2.0	1.2	1.3	2.3	1.6	3.0	2.5	3.4	**0.86**
	Progress Period	1.8	1.0	1.5	1.4	1.0	1.3	2.0	1.2	3.3	2.2	2.7	
	Ratio (progress/ baseline)	**0.81**	**0.87**	**0.83**	**0.67**	**0.83**	**1.02**	**0.86**	**0.73**	**1.10**	**0.89**	**0.80**	
Particulate Organic Carbon	**Baseline Period**	10.7	13.0	10.9	11.7	8.3	7.8	12.3	7.7	7.1	9.4	5.8	**0.91**
	Progress Period	10.7	10.9	9.5	11.2	6.9	5.6	6.5	6.3	6.2	11.8	7.6	
	Ratio (progress/ baseline)	**1.01**	**0.84**	**0.87**	**0.96**	**0.84**	**0.71**	**0.53**	**0.82**	**0.87**	**1.27**	**1.30**	
Light Absorbing Carbon	**Baseline Period**	2.4	2.8	2.9	3.2	2.0	1.8	2.4	1.6	1.7	2.4	1.6	**0.98**
	Progress Period	2.9	2.1	3.4	3.5	1.8	1.4	1.6	1.6	1.6	2.5	1.8	
	Ratio (progress/ baseline)	**1.23**	**0.75**	**1.16**	**1.12**	**0.92**	**0.81**	**0.70**	**0.96**	**0.94**	**1.07**	**1.09**	
Soil	**Baseline Period**	1.3	1.1	2.0	6.8	1.3	1.2	2.5	1.5	1.5	1.2	1.3	**1.07**
	Progress Period	1.5	1.5	2.6	5.8	1.3	1.3	2.0	1.3	1.5	1.3	1.6	
	Ratio (progress/ baseline)	**1.11**	**1.35**	**1.28**	**0.85**	**1.05**	**1.07**	**0.79**	**0.91**	**1.04**	**1.06**	**1.27**	
Coarse Mass	**Baseline Period**	3.5	2.8	7.3	9.4	3.0	2.8	6.5	2.7	3.8	4.0	3.4	**1.00**
	Progress Period	3.2	4.1	6.3	10.8	3.0	2.3	4.6	2.5	4.6	3.1	4.1	
	Ratio (progress/ baseline)	**0.92**	**1.44**	**0.87**	**1.15**	**0.99**	**0.81**	**0.70**	**0.93**	**1.20**	**0.76**	**1.20**	
Sea Salt	**Baseline Period**	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.0	**2.31**
	Progress Period	0.1	0.1	0.2	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	
	Ratio (progress/ baseline)	**0.80**	**2.36**	**5.36**	**0.93**	**0.37**	**3.05**	**1.42**	**0.57**	**1.80**	**1.31**	**7.46**	

Table 6.13-4
Colorado Plateau Sites
20% Least Impaired Visibility Days
Species Averages and Ratios

20% Least Impaired Days		GRCA1	BALD1	PEFO1	SYCA1	WEMI1	WHRI1	MEVE1	SAPE1	CANY1	BRCA1	CAPI1	Average Progress/ Baseline Ratio
Ammonium Sulfate (Mm^{-1})	Baseline Period	1.5	1.6	2.3	2.0	1.5	1.1	2.4	1.6	2.2	1.5	1.9	**0.94**
	Progress Period	1.6	1.6	2.1	2.1	1.3	1.0	2.1	1.5	1.8	1.4	1.6	
	Ratio (progress/ baseline)	**1.08**	**0.96**	**0.95**	**1.03**	**0.91**	**0.96**	**0.87**	**0.94**	**0.84**	**0.92**	**0.84**	
Ammonium Nitrate (Mm^{-1})	Baseline Period	0.4	0.4	0.8	0.9	0.3	0.3	0.8	0.4	0.6	0.7	1.0	**0.78**
	Progress Period	0.4	0.3	0.6	0.8	0.2	0.2	0.6	0.4	0.5	0.5	0.6	
	Ratio (progress/ baseline)	**1.01**	**0.74**	**0.78**	**0.92**	**0.72**	**0.73**	**0.67**	**0.83**	**0.89**	**0.76**	**0.56**	
Particulate Organic Carbon (Mm^{-1})	Baseline Period	0.6	1.2	1.9	2.4	1.2	0.6	1.5	0.7	1.1	1.0	1.3	**0.72**
	Progress Period	0.5	1.2	1.5	1.8	0.9	0.3	1.0	0.6	0.7	0.7	0.9	
	Ratio (progress/ baseline)	**0.80**	**0.94**	**0.78**	**0.75**	**0.70**	**0.51**	**0.68**	**0.78**	**0.59**	**0.71**	**0.65**	
Light Absorbing Carbon (Mm^{-1})	Baseline Period	0.3	0.6	1.3	1.6	0.8	0.5	0.6	0.4	0.4	0.4	0.6	**0.75**
	Progress Period	0.3	0.6	1.3	1.4	0.5	0.3	0.4	0.2	0.3	0.2	0.3	
	Ratio (progress/ baseline)	**0.87**	**0.92**	**0.99**	**0.88**	**0.70**	**0.72**	**0.68**	**0.63**	**0.70**	**0.60**	**0.57**	
Soil (Mm^{-1})	Baseline Period	0.1	0.2	0.4	0.7	0.2	0.1	0.4	0.2	0.3	0.1	0.3	**0.90**
	Progress Period	0.2	0.2	0.4	0.6	0.2	0.1	0.2	0.1	0.2	0.1	0.2	
	Ratio (progress/ baseline)	**1.06**	**1.04**	**1.16**	**0.86**	**0.87**	**1.04**	**0.61**	**0.96**	**0.69**	**0.95**	**0.62**	
Coarse Mass (Mm^{-1})	Baseline Period	0.4	0.5	1.0	1.0	0.7	0.2	0.7	0.3	1.0	0.5	1.0	**0.91**
	Progress Period	0.5	0.6	1.0	1.2	0.6	0.3	0.4	0.3	0.7	0.4	0.6	
	Ratio (progress/ baseline)	**1.05**	**1.29**	**1.01**	**1.13**	**0.89**	**1.02**	**0.59**	**1.02**	**0.75**	**0.71**	**0.60**	
Sea Salt (Mm^{-1})	Baseline Period	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	**2.50**
	Progress Period	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Ratio (progress/ baseline)	**1.53**	**8.34**	**4.45**	**2.42**	**1.24**	**1.25**	**1.03**	**1.02**	**1.51**	**3.92**	**0.78**	

Because of the logarithmic nature of the dv calculation (i.e., $dv = 10\ln(b_{ext}/10)$), average dv ratios were not applied. Instead, in a manner consistent with RHR calculations, ratios were applied to individual species and individual days, and 5-year average deciview value was calculated from annual average deciviews, which were in turn calculated from daily average deciview value. Table 6.13-5 lists results for the ZICA1 site, where deciview values for the baseline period are approximated as being slightly higher than the measured progress period for both the 20% most impaired and least impaired days. These estimated baseline period averages are used to represent the ZICA1 for all summaries presented in this report. Note that similar baseline estimates have also been applied to estimate baseline conditions for the HACR1 site in Hawaii, as described in Section 6.5.1.1.

Table 6.13-5
ZICA1 Progress Period and Baseline Estimates

20% Least Impaired Days		**ZICA1 2005-2009 Progress Period**	**Average of Colorado Plateau Progress/Baseline Ratios**	**ZICA1 2000-2004 Baseline Estimate**
Ammonium Sulfate (Mm^{-1})	**20% Best Days**	1.7	0.94	1.8
	20% Worst Days	5.4	1.04	5.2
Ammonium Nitrate (Mm^{-1})	**20% Best Days**	0.6	0.78	0.8
	20% Worst Days	1.9	0.86	2.2
Particulate Organic Carbon (Mm^{-1})	**20% Best Days**	1.3	0.72	1.8
	20% Worst Days	8.5	0.91	9.3
Light Absorbing Carbon (Mm^{-1})	**20% Best Days**	0.6	0.75	0.8
	20% Worst Days	2.4	0.98	2.4
Soil (Mm^{-1})	**20% Best Days**	0.3	0.90	0.3
	20% Worst Days	1.8	1.07	1.7
Coarse Mass (Mm^{-1})	**20% Best Days**	1.0	0.91	1.1
	20% Worst Days	5.6	1.00	5.6
Sea Salt (Mm^{-1})	**20% Best Days**	0.0	2.50	0.0
	20% Worst Days	0.1	2.31	0.1
Deciviews (dv)	**20% Best Days**	4.3	N/A	**5.0***
	20% Worst Days	12.3	N/A	**12.5***

*Calculated from daily average b_{ext} determined using species specific average ratios from all Colorado Plateau sites.

6.13.1.2 Current Conditions

This section addresses the regulatory question, ***what are the current visibility conditions for the most impaired and least impaired days (40 CFR 51.309(d)(10)(i)(C))?*** RHR guidance specifies that 5-year averages be calculated over successive 5-year periods, i.e. 2000-2004, 2005-2009, 2010-2014, etc.[4] Current visibility conditions are represented here as the most recent successive 5-year average period available, or the 2005-2009 period average, although the most recent IMPROVE monitoring data currently available includes 2010 data.

Tables 6.13-6 and 6.13-7 present the calculated deciview values for current conditions at each site, along with the percent contribution to extinction from each aerosol species for the 20% most impaired, or worst, and 20% least impaired, or best, days for each of the Federal CIA IMPROVE monitors in Utah. Figure 6.13-4 presents 5-year average extinction for the current progress period for both the 20% most impaired and 20% least impaired days. Note that the percentages in the tables consider only the aerosol species which contribute to extinction, while the charts also show Rayleigh, or scattering due to background gases in the atmosphere.

Specific observations for the current visibility conditions on the 20% most impaired days are as follows:

- The largest contributors to aerosol extinction at Utah sites were particulate organic mass, ammonium sulfate and coarse mass.
- The highest aerosol extinction (12.3 dv) was measured at the ZICA1 site, where particulate organic mass was the largest contributor to aerosol extinction, followed by coarse mass. The lowest aerosol extinction (11.0 dv) was measured at the CANY1 site.

Specific observations for the current visibility conditions on the 20% least impaired days are as follows:

- The aerosol contribution to total extinction on the best days was less than Rayleigh, or the background scattering that would occur in clear air. Average extinction (including Rayleigh) ranged from 2.1 dv (BRCA2) to 4.3 dv (ZICA1).
- For all sites, ammonium sulfate was the largest contributor to the non-Rayleigh aerosol species of extinction

[4] EPA's September 2003 *Guidance for Tracking Progress Under the Regional Haze Rule* specifies that progress is tracked against the 2000-2004 baseline period using corresponding averages over successive 5-year periods, i.e. 2005-2009, 2010-2014, etc. (See page 4-2 in the Guidance document.)

Table 6.13-6
Utah Class I Area IMPROVE Sites
Current Visibility Conditions
2005-2009 Progress Period, 20% Most Impaired Days

Site	Deciviews (dv)	Percent Contribution to Aerosol Extinction by Species (Excludes Rayleigh) (% of Mm^{-1}) and Rank*						
		Ammonium Sulfate	Ammonium Nitrate	Particulate Organic Mass	Elemental Carbon	Soil	Coarse Mass	Sea Salt
BRCA1	11.9	19% (2)	9% (5)	**45% (1)**	10% (4)	5% (6)	12% (3)	0% (7)
CANY1	11.0	23% (2)	14% (4)	**27% (1)**	7% (5)	7% (6)	20% (3)	0% (7)
CAPI1	11.3	24% (2)	12% (4)	**32% (1)**	8% (5)	7% (6)	17% (3)	0% (7)
ZICA1	12.3	21% (3)	7% (5)	**33% (1)**	9% (4)	7% (6)	22% (2)	0% (7)

*Highest aerosol species contribution per site is highlighted in bold.

Table 6.13-7
Utah Class I Area IMPROVE Sites
Current Visibility Conditions
2005-2009 Progress Period, 20% Least Impaired Days

Site	Deciviews (dv)	Percent Contribution to Aerosol Extinction by Species (Excludes Rayleigh) (% of Mm^{-1}) and Rank						
		Ammonium Sulfate	Ammonium Nitrate	Particulate Organic Mass	Elemental Carbon	Soil	Coarse Mass	Sea Salt
BRCA1	2.1	**40% (1)**	15% (3)	22% (2)	7% (5)	4% (6)	11% (4)	1% (7)
CANY1	2.8	**43% (1)**	12% (4)	15% (3)	7% (5)	5% (6)	17% (2)	1% (7)
CAPI1	2.7	**38% (1)**	13% (4)	21% (2)	8% (5)	5% (6)	14% (3)	1% (7)
ZICA1	4.3	**30% (1)**	11% (4)	23% (2)	10% (5)	6% (6)	18% (3)	1% (7)

*Highest aerosol species contribution per site is highlighted in bold.

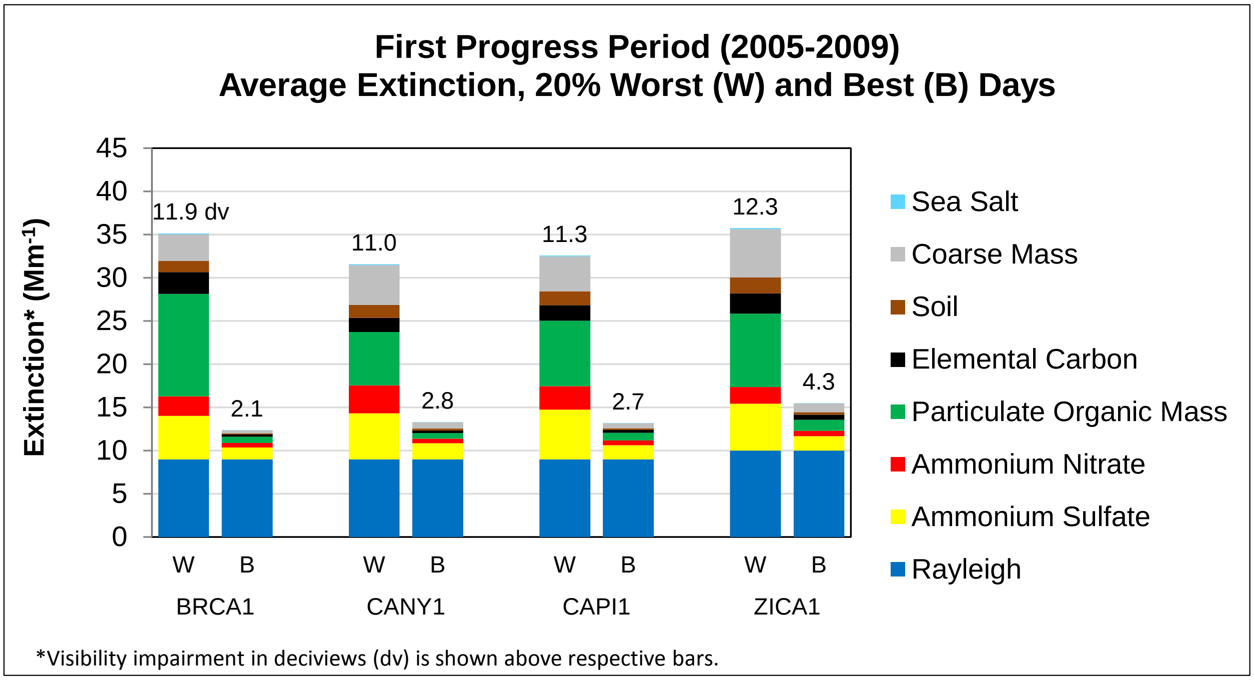

Figure 6.13-4. Average Extinction for Current Progress Period (2005-2009) for the Worst (Most Impaired) and Best (Least Impaired) Days Measured at Utah Class I Area IMPROVE Sites.

6.13.1.3 Differences between Current and Baseline Conditions

This section addresses the regulatory question, ***what is the difference between current visibility conditions for the most impaired and least impaired days and baseline visibility conditions (40 CFR 51.309(d)(10)(i)(C))?*** Included here are comparisons between the 5-year average baseline conditions (2000-2004) and current progress period extinction (2005-2009).

Table 6.13-8 presents the differences between the 2000-2004 baseline period average extinction and the 2005-2009 progress period average for each site in Utah for the 20% most impaired days, and Table 6.13-9 presents similar data for the least impaired days. Averages that increased are depicted in red text and averages that decreased in blue.

Figure 6.13-5 presents the 5-year average extinction for the baseline and current progress period averages for the worst days and Figure 6.13-6 presents the differences in averages by aerosol species, with increases represented above the zero line and decreases below the zero line. Figures 6.13-7 and 6.13-8 present similar plots for the best days.

For the 20% most impaired days, the 5-year average RHR deciview metric increased between the 2000-2004 and 2005-2009 periods at the BRCA1 and CAPI1 sites and decreased at the CANY1 and ZICA1 sites. Notable differences for individual species averages were as follows:

- Increases in 5-year average deciviews at the BRCA1 and CAPI1 sites were mostly due to increases in particulate organic mass, with some increases also measured in elemental carbon and soil. Coarse mass also contributed to increases at the CAPI1 site. Increases were offset by decreases in ammonium nitrate and ammonium sulfate at both sites.

- Ammonium sulfate decreased at all sites except ZICA1. Note that the ZICA1 site did not measure during the baseline years, and changes reported here are proportional to average changes in extinction as measured at regional sites as discussed in Section 6.13.1.1.

For the 20% least impaired days, the 5-year average deciview metric decreased at all sites. Notable differences for individual species averages on the 20% least impaired days were as follows:

- All species at all sites either decreased or stayed the same between the baseline and current progress period for the best days.
- The largest decreases on the best days were measured in particulate organic mass, ammonium nitrate, ammonium sulfate, and coarse mass.

Table 6.13-8
Utah Class I Area IMPROVE Sites
Difference in Aerosol Extinction by Species
2000-2004 Baseline Period to 2005-2009 Progress Period
20% Most Impaired Days

Site	Deciview (dv)			Change in Extinction by Species (Mm^{-1})*						
	2000-04 Baseline Period	2005-09 Progress Period	Change in dv*	Amm. Sulfate	Amm. Nitrate	POM	EC	Soil	CM	Sea Salt
BRCA1	11.6	11.9	+0.3	-0.2	-0.3	+2.5	+0.2	+0.1	-0.9	0.0
CANY1	11.2	11.0	-0.2	-0.3	+0.3	-0.9	-0.1	+0.1	+0.8	0.0
CAPI1	10.9	11.3	+0.4	-0.2	-0.7	+1.8	+0.2	+0.3	+0.7	+0.1
ZICA1	12.5	12.3	-0.2	+0.2	-0.3	-0.8	-0.1	+0.1	0.0	+0.1

*Change is calculated as progress period average minus baseline period average. Values in red indicate increases in extinction and values in blue indicate decreases.

Table 6.13-9
Utah Class I Area IMPROVE Sites
Difference in Aerosol Extinction by Species
2000-2004 Baseline Period to 2005-2009 Progress Period
20% Least Impaired Days

Site	Deciview (dv)			Change in Extinction by Species (Mm^{-1})*						
	2000-04 Baseline Period	2005-09 Progress Period	Change in dv*	Amm. Sulfate	Amm. Nitrate	POM	EC	Soil	CM	Sea Salt
BRCA1	2.8	2.1	-0.7	-0.1	-0.2	-0.3	-0.2	0.0	-0.1	0.0
CANY1	3.7	2.8	-0.9	-0.3	-0.1	-0.5	-0.1	-0.1	-0.2	0.0
CAPI1	4.1	2.7	-1.4	-0.3	-0.4	-0.5	-0.3	-0.1	-0.4	0.0
ZICA1	5.0	4.3	-0.7	-0.1	-0.2	-0.5	-0.2	0.0	-0.1	0.0

*Change is calculated as progress period average minus baseline period average. Values in red indicate increases in extinction and values in blue indicate decreases.

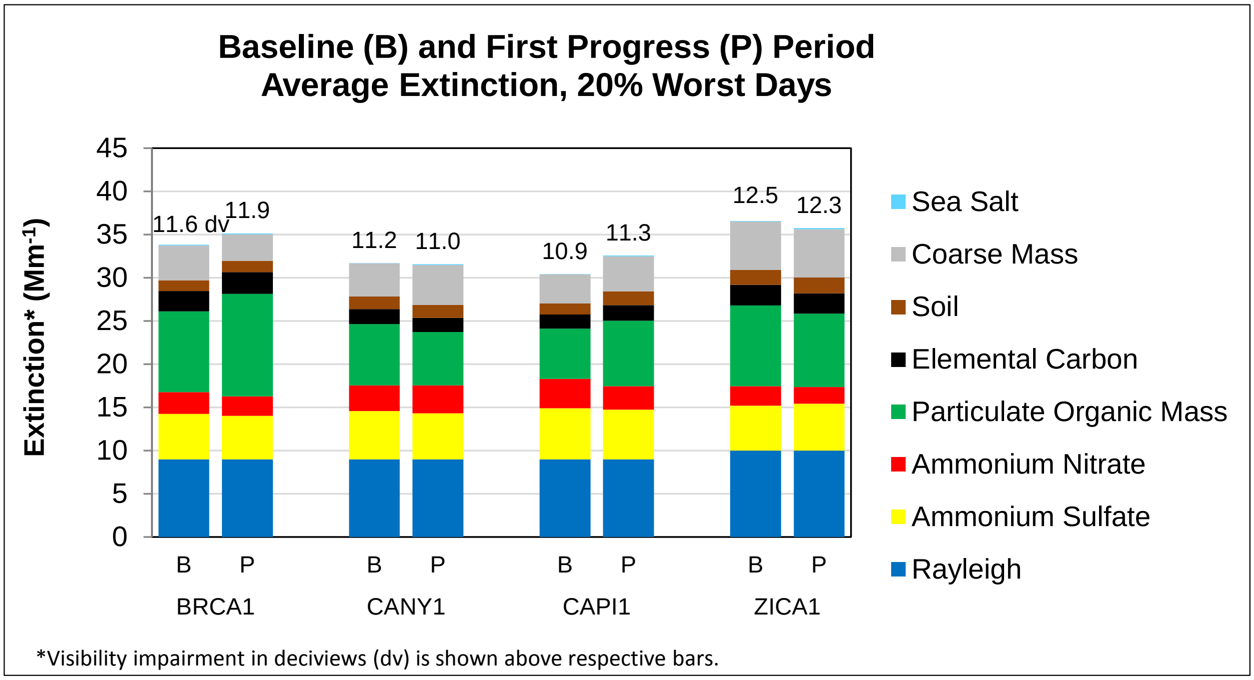

Figure 6.13-5. Average Extinction for Baseline and Progress Period Extinction for Worst (Most Impaired) Days Measured at Utah Class I Area IMPROVE Sites.

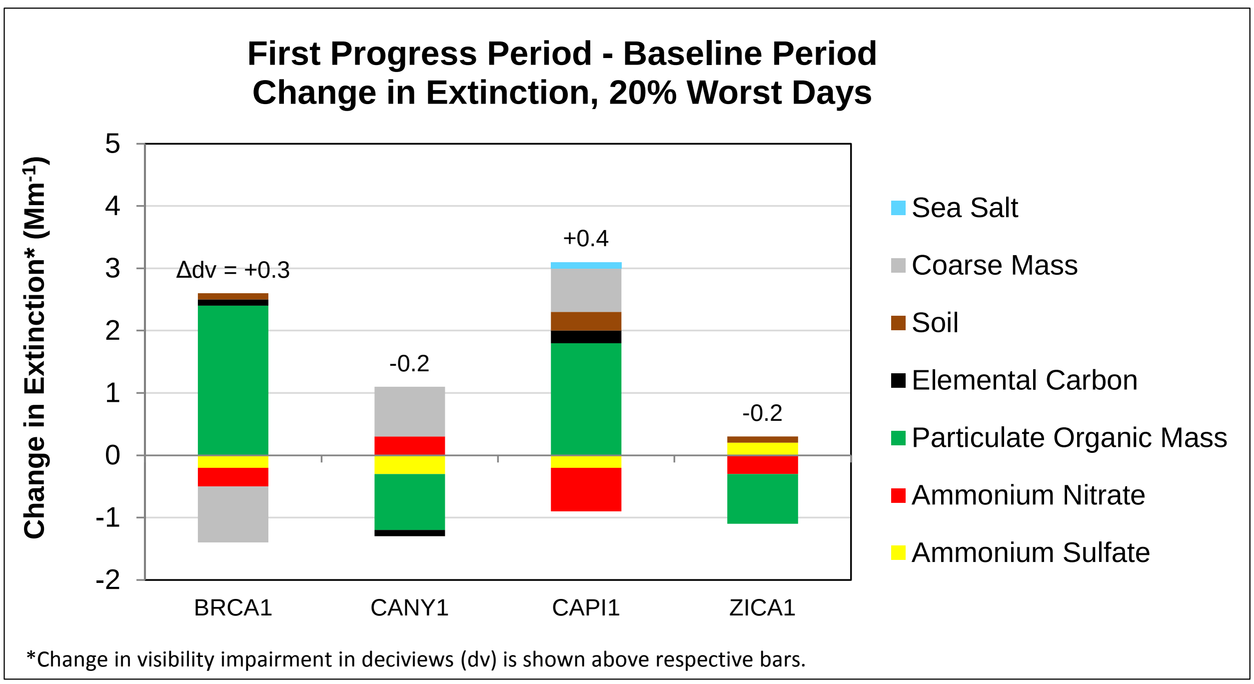

Figure 6.13-6. Difference between Average Extinction for Current Progress Period (2005-2009) and Baseline Period (2000-2004) for the Worst (Most Impaired) Days Measured at Utah Class I Area IMPROVE Sites.

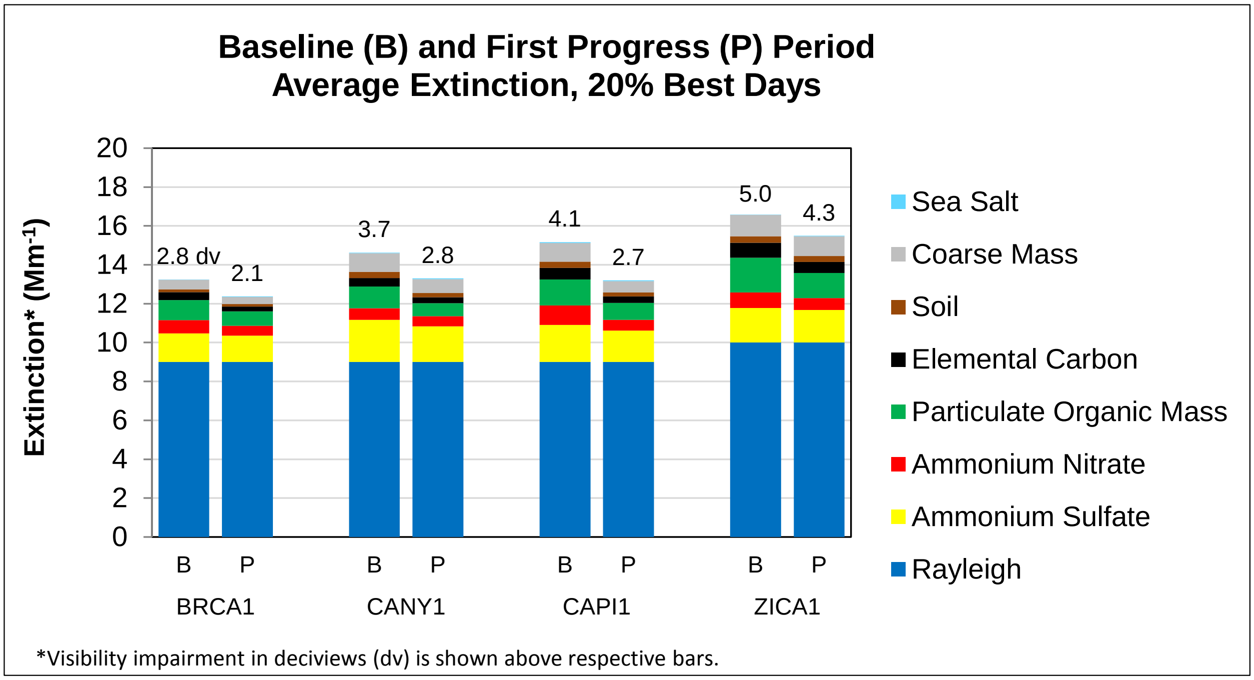

Figure 6.13-7. Average Extinction for Baseline and Progress Period Extinction for Best (Least Impaired) Days Measured at Utah Class I Area IMPROVE Sites.

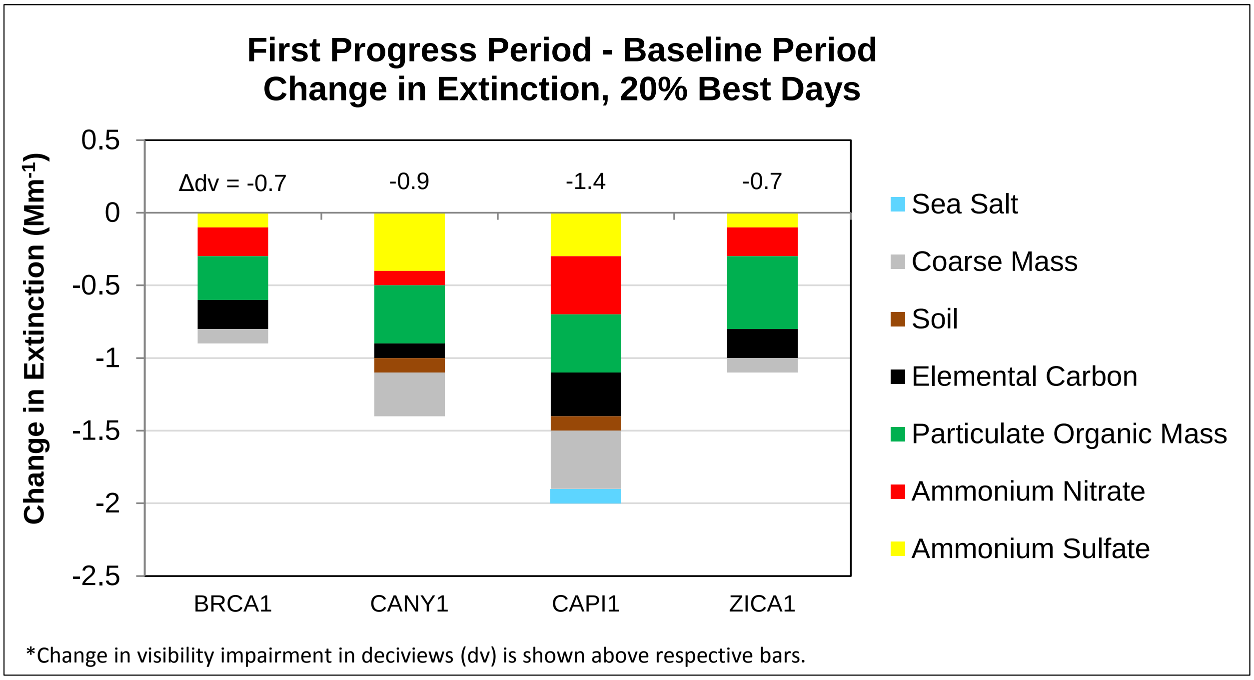

Figure 6.13-8. Difference between Average Extinction for Current Progress Period (2005-2009) and Baseline Period (2000-2004) for the Best (Least Impaired) Days Measured at Utah Class I Area IMPROVE Sites.

6.13.1.4 Changes in Visibility Impairment

This section addresses the regulatory question, ***what is the change in visibility impairment for the most impaired and least impaired days over the past 5 years (40 CFR 51.309(d)(10)(i)(C))?*** Included here are changes in visibility impairment as characterized by annual average trend statistics, and some general observations regarding local and regional events and outliers on a daily and annual basis that affected the current 5-year progress period. The regulatory requirement asks for a description of changes over the past 5-year period, but trend analysis is better suited to longer periods of time, so trends for the entire 10-year planning period are presented here.

Trend statistics for the years 2000-2009 for each species at each site in Utah are summarized in Table 6.13-10, and regional trends were presented earlier in Section 4.1.1.[5] Only trends for aerosol species trends with p-value statistics less than 0.15 (85% confidence level) are presented in the table here, with increasing slopes in red and decreasing slopes in blue.[6] In some cases, trends may show decreasing tendencies while the difference between the 5-year averages do not (or vice versa), as discussed in Section 3.1.2.2. In these cases, the 5-year average for the best and worst days is the important metric for RHR regulatory purposes, but trend statistics may be of value to understand and address visibility impairment issues for planning purposes.

For each site, a more comprehensive list of all trends for all species, including the associated p-values, is provided in Appendix M. Additionally, the appendix includes plots depicting 5-year, annual, monthly and daily average extinction for each site. These plots are intended to provide a fairly comprehensive compilation of reference information for individual states to investigate local and regional events and outliers that may have influenced changes in visibility impairment as tracked using the 5-year deciview metrics. Note that similar summary products are also available from the WRAP TSS website (http://vista.cira.colostate.edu/tss/). Some general observations regarding changes in visibility impairment at sites in Utah are as follows:

- Particulate organic mass was the largest contributor to aerosol extinction at all sites in Utah. The largest difference between the 5-year average baseline and progress periods was measured for particulate organic mass at the BRCA1 site. This difference average was influenced by a high particulate organic mass events in July and August, 2009.
- For ammonium sulfate, annual average trend statistics for all measured days indicated decreasing trends at all Utah sites. A slight increase in the 5-year average ammonium

[5] Annual trends were calculated for the years 2000-2009, with a trend defined as the slope derived using Theil statistics. Trends derived from Theil statistics are useful in analyzing changes in air quality data because these statistics can show the overall tendency of measurements over long periods of time, while minimizing the effects of year-to-year fluctuations which are common in air quality data. Theil statistics are also used in EPA's National Air EPA's National Air Quality Trends Reports (http://www.epa.gov/airtrends/) and the IMPROVE program trend reports (http://vista.cira.colostate.edu/improve/Publications/improve_reports.htm)
[6] The significance of the trend is represented with p-values calculated using Mann-Kendall trend statistics. Determining a significance level helps to distinguish random variability in data from a real tendency to increase or decrease over time, where lower p-values indicate higher confidence levels in the computed slopes.

sulfate was reported for the ZICA1 site, but this was based on a baseline average estimate as described in Section 6.13.1.1. Actual data measured between 2004 and 2009 at the ZICA1 site indicated a slightly decreasing annual average trend.

- For ammonium nitrate, annual average trend statistics for all measured days indicated a decreasing trend at the CAPI1 site, and either no trend or insignificant trends at the other Utah sites.
- For soil, slightly increasing annual average trends were measured at the ZICA1 site, and an increasing trend for the worst days was measured at the CAPI1 site.
- Coarse mass increased at the CAPI1 and CANY1 sites, but these sites did not show increasing trends. Higher 5-year current period averages were influenced by higher than average coarse mass events in late April of 2008 at both sites.

Table 6.13-10
Utah Class I Area IMPROVE Sites
Change in Aerosol Extinction by Species
2000-2009 Annual Average Trends

Site	Group	Annual Trend* (Mm^{-1}/year)						
		Ammonium Sulfate	**Ammonium Nitrate**	**Particulate Organic Mass**	**Elemental Carbon**	**Soil**	**Coarse Mass**	**Sea Salt**
BRCA1	20% Best	--	0.0	-0.1	0.0	--	0.0	0.0
	20% Worst	-0.2	--	0.5	0.1	--	--	0.0
	All Days	-0.1	0.0	--	--	--	--	--
CANY1	20% Best	-0.1	--	-0.1	0.0	--	-0.1	0.0
	20% Worst	-0.1	--	--	--	--	--	0.0
	All Days	-0.1	0.0	--	0.0	0.0	--	0.0
CAPI1	20% Best	-0.1	-0.1	-0.1	0.0	--	-0.1	--
	20% Worst	--	-0.2	--	--	0.1	--	0.0
	All Days	-0.1	-0.1	--	0.0	--	--	0.0
ZICA1	20% Best	0.0	--	--	0.0	0.0	--	0.0
	20% Worst	-0.5	--	--	--	--	--	--
	All Days	-0.2	--	--	-0.1	0.1	--	--

*(--) Indicates statistically insignificant trend (<85% confidence level). Annual averages and complete trend statistics for all significance levels are included for each site in Appendix M.

6.13.2 Emissions Data

Included here are summaries depicting differences between two emission inventory years that are used to represent the 5-year baseline and current progress periods. The baseline period is represented using a 2002 inventory developed by the WRAP for use in the initial WRAP state SIPs, and the progress period is represented by a 2008 inventory which leverages recent WRAP inventory work for modeling efforts, as referenced in Section 3.2.1. For reference, Table 6.13-7 lists the major emitted pollutants inventoried, the related aerosol species, some of the major sources for each pollutant, and some notes regarding implications of these pollutants. Differences between these baseline and progress period inventories, and a separate summary of annual emissions from electrical generating units (EGUs), are presented in this section.

Table 6.13-11
Utah
Pollutants, Aerosol Species, and Major Sources

Emitted Pollutant	Related Aerosol	Major Sources	Notes
Sulfur Dioxide (SO_2)	Ammonium Sulfate	Point Sources; On- and Off-Road Mobile Sources	SO_2 emissions are generally associated with anthropogenic sources such as coal-burning power plants, other industrial sources such and refineries and cement plants, and both on- and off-road diesel engines.
Oxides of Nitrogen (NO_X)	Ammonium Nitrate	On- and Off-Road Mobile Sources; Point Sources; Area Sources	NO_X emissions are generally associated with anthropogenic sources. Common sources include virtually all combustion activities, especially those involving cars, trucks, power plants, and other industrial processes.
Ammonia (NH_3)	Ammonium Sulfate and Ammonium Nitrate	Area Sources; On-Road Mobile Sources	Gaseous NH_3 has implications in particle formation because it can form particulate ammonium. Ammonium is not directly measured by the IMPROVE program, but affects formation potential of ammonium sulfate and ammonium nitrate. All measured nitrate and sulfate is assumed to be associated with ammonium for IMPROVE reporting purposes.
Volatile Organic Compounds (VOCs)	Particulate Organic Mass (POM)	Biogenic Emissions; Vehicle Emissions; Area Sources	VOCs are gaseous emissions of carbon compounds, which are often converted to POM through chemical reactions in the atmosphere. Estimates for biogenic emissions of VOCs have undergone significant updates since 2002, so changes reported here are more reflective of methodology changes than actual changes in emissions (see Section 3.2.1).
Primary Organic Aerosol (POA)	POM	Wildfires; Area Sources	POA represents organic aerosols that are emitted directly as particles, as opposed to gases. Wildfires in the west generally dominate POA emissions, and large wildfire events are generally sporadic and highly variable from year-to-year.
Elemental Carbon (EC)	EC	Wildfires; On- and Off-Road Mobile Sources	Large EC events are often associated with large POM events during wildfires. Other sources include both on- and off-road diesel engines.
Fine Soil	Soil	Windblown Dust; Fugitive Dust; Road Dust; Area Sources	Fine soil is reported here as the crustal or soil components of $PM_{2.5}$.
Coarse Mass (PMC)	Coarse Mass	Windblown Dust; Fugitive Dust	Coarse mass is reported by the IMPROVE Network as the difference between PM_{10} and $PM_{2.5}$ mass measurements. Coarse mass is not separated by species in the same way that $PM_{2.5}$ is speciated, but these measurements are generally associated with crustal components. Similar to crustal $PM_{2.5}$, natural windblown dust is often the largest contributor to PMC.

6.13.2.1 Changes in Emissions

This section addresses the regulatory question, ***what is the change over the past 5 years in emissions of pollutants contributing to visibility impairment from all sources and activities within the State (40 CFR 51.309(d)(10)(i)(D))?*** For these summaries, emissions during the baseline years are represented using a 2002 inventory, which was developed with support from the WRAP for use in the original RHR SIP strategy development (termed plan02d). Differences between inventories are represented as the difference between the 2002 inventory, and a 2008 inventory which leverages recent inventory development work performed by the WRAP for the WestJumpAQMS and DEASCO$_3$ modeling projects (termed WestJump2008). Note that the comparisons of differences between inventories does not necessarily reflect a change in emissions, as a number of methodology changes and enhancements have occurred between development of the individual inventories, as referenced in Section 3.2.1. Inventories for all major visibility impairing pollutants are presented for major source categories, and categorized as either anthropogenic or natural emissions. State-wide inventories totals and differences are presented here, and inventory totals on a county level basis are available on the WRAP Technical Support System website (http://vista.cira.colostate.edu/tss/).

Table 6.13-12 and Figure 6.13-9 present the differences between the 2002 and 2008 sulfur dioxide (SO_2) inventories by source category. Tables 6.13-13 and Figure 6.13-10 present data for oxides of nitrogen (NO_X), and subsequent tables and figures (Tables 6.13-14 through 6.13-19 and Figures 6.13-10 through 6.13-16) present data for ammonia (NH_3), volatile organic compounds (VOCs), primary organic aerosol (POA), elemental carbon (EC), fine soil, and coarse mass. Inventory totals on a county level basis will be made available on the WRAP TSS website (http://vista.cira.colostate.edu/tss/). General observations regarding emissions inventory comparisons are listed below.

- Largest differences for point source inventories were a decrease in SO_2 emissions and an increases in NO_X.
- Area source inventories showed decreases in SO_2 and increases in NO_X, NH_3, POA, and VOCs. These changes may be due to a combination of population changes and differences in methodologies used to estimate these emissions, as referenced in Section 3.2.1. One methodology change was the reclassification of some off-road mobile sources (such as some types of marine vessels and locomotives) into the area source category in 2008, which may have contributed to increases in area source inventory totals, but decreases in off-road mobile totals.
- On-road mobile source inventory comparisons showed decreases in most parameters, especially NO_X and VOCs, with increases in POA, EC, and coarse mass. Reductions in NO_X and VOC are likely influenced by federal and state emissions standards that have already been implemented. The increases in POA, EC, and coarse mass occurred in all of the WRAP states for on-road mobile inventories, regardless of reductions in NOX and VOCs, indicating that these increases were likely due use of different on-road models, as referenced in Section 3.2.1.
- Off-road mobile source inventories showed decreases in NO_X, SO_2, and VOCs, and increases in fine soil and coarse mass, which was consistent with most contiguous

WRAP states. These differences were likely due to a combination of actual changes in source contributions and methodology differences, as referenced in Section 3.2.1. As noted previously, one major methodology difference was the reclassification of some off-road mobile sources (such as some types of marine vessels and locomotives) into the area source category in 2008, which may have contributed to decreases in the off-road inventory totals, but increases in area source totals.

- Inventory comparison results for area oil and gas showed an increase in NO_X and a decrease in VOCs. Note that inventory methodologies for these sources may have evolved substantially between the baseline and 2008 inventories as referenced in Section 3.2.1. Also, WRAP Phase III oil and gas inventories are reported here for entire basins, and include oil and gas emissions within tribal boundaries.
- For most parameters, especially POAs, VOCs, and EC, fire emission inventory estimates decreased. Note that these differences are not necessarily reflective of changes in monitored data, as the baseline period is represented by an average of 2000-2004 fire emissions, and the progress period is represented only by the fires that occurred in 2008, as referenced in Section 3.2.1.
- Comparisons between VOC inventories showed large decreases in biogenic emissions, which was consistent with other contiguous WRAP states. Estimates for biogenic emissions of VOCs have undergone significant updates since 2002, so changes reported here are more reflective of methodology changes than actual changes in emissions, as referenced in Section 3.2.1.
- Fine soil and coarse mass increased for the windblown dust inventory comparisons and the combined fugitive/road dust inventories. Large variability in changes in windblown dust was observed for the contiguous WRAP states, which was likely due in large part to enhancements in dust inventory methodology, as referenced in Section 3.2.1, rather than changes in actual emissions.

Table 6.13-12
Utah
Sulfur Dioxide Emissions by Category

Source Category	Sulfur Dioxide Emissions (tons/year)		
	2002 (Plan02d)	2008 (WestJump2008)	Difference (Percent Change)
Anthropogenic Sources			
Point	41,863	28,206	-13,658
Area	3,434	1,988	-1,447
On-Road Mobile	1,777	497	-1,280
Off-Road Mobile	4,504	286	-4,218
Area Oil and Gas	17	114	98
Fugitive and Road Dust	0	0	0
Anthropogenic Fire	70	8	-62
Total Anthropogenic	**51,665**	**31,099**	**-20,566 (-40%)**
Natural Sources			
Natural Fire	2,418	92	-2,326
Biogenic	0	0	0
Wind Blown Dust	0	0	0
Total Natural	**2,418**	**92**	**-2,326 (-96%)**
All Sources			
Total Emissions	**54,083**	**31,190**	**-22,892 (-42%)**

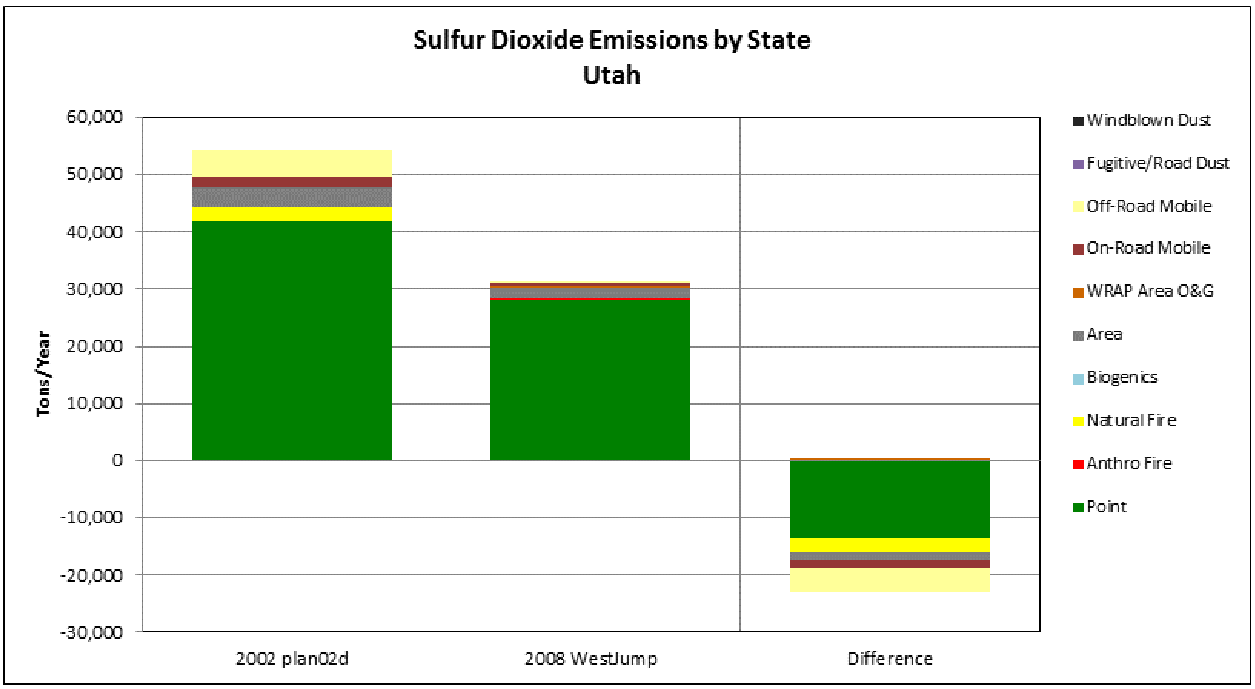

Figure 6.13-9. 2002 and 2008 Emission and Difference between Emissions Inventory Totals, for Sulfur Dioxide by Source Category for Utah.

Table 6.13-13
Utah
Oxides of Nitrogen Emissions by Category

Source Category	Oxides of Nitrogen Emissions (tons/year)		
	2002 (Plan02d)	2008 (WestJump2008)	Difference (Percent Change)
Anthropogenic Sources			
Point	84,218	87,623	3,405
Area	6,146	17,269	11,124
On-Road Mobile	77,381	64,186	-13,195
Off-Road Mobile	47,100	13,249	-33,851
Area Oil and Gas	3,335	4,136	801
Fugitive and Road Dust	0	0	0
Anthropogenic Fire	319	65	-254
Total Anthropogenic	**218,499**	**186,528**	**-31,971 (-15%)**
Natural Sources			
Natural Fire	8,873	650	-8,223
Biogenic	12,597	6,144	-6,453
Wind Blown Dust	0	0	0
Total Natural	**21,470**	**6,793**	**-14,676 (-68%)**
All Sources			
Total Emissions	**239,969**	**193,322**	**-46,647 (-19%)**

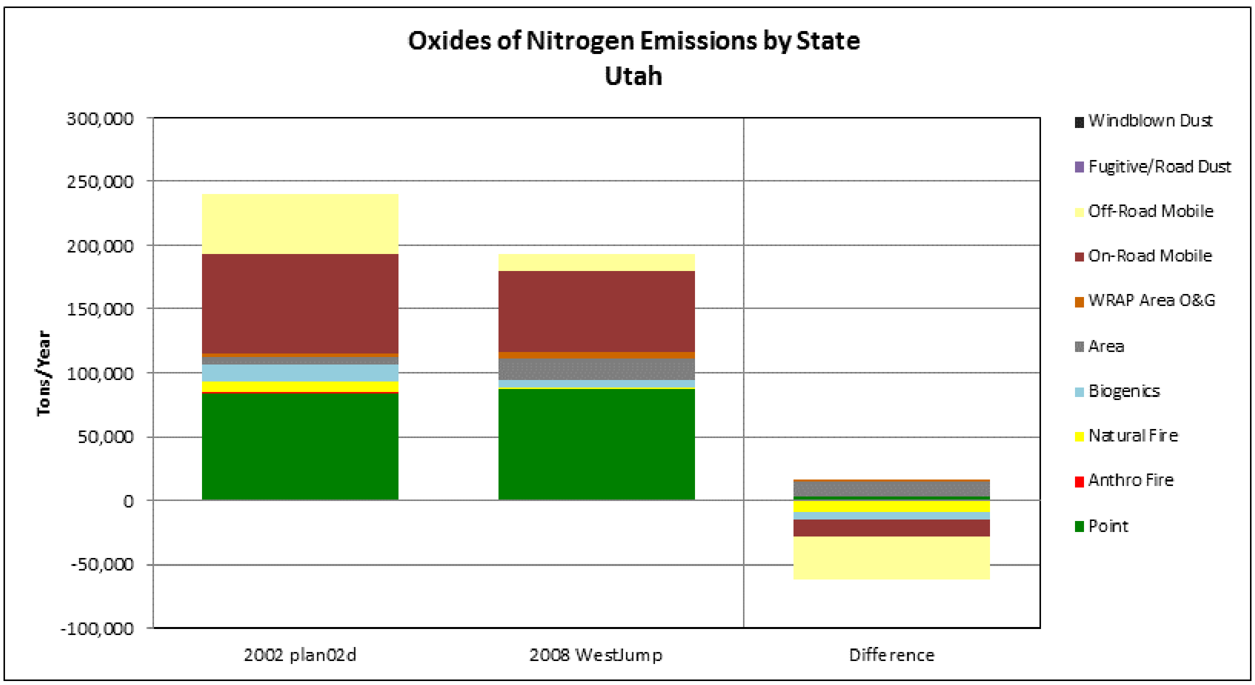

Figure 6.13-10. 2002 and 2008 Emission and Difference between Emissions Inventory Totals, for Oxides of nitrogen by Source Category for Utah.

Table 6.13-14
Utah
Ammonia Emissions by Category

Source Category	**Ammonia Emissions (tons/year)**		
	2002 (Plan02d)	**2008 (WestJump2008)**	**Difference (Percent Change)**
Anthropogenic Sources			
Point	1,905	556	-1,349
Area	23,642	37,639	13,997
On-Road Mobile	2,453	1,048	-1,405
Off-Road Mobile	32	16	-16
Area Oil and Gas	0	0	0
Fugitive and Road Dust	0	0	0
Anthropogenic Fire	75	37	-38
Total Anthropogenic	**28,107**	**39,295**	**11,189 (40%)**
Natural Sources			
Natural Fire	1,893	449	-1,444
Biogenic	0	0	0
Wind Blown Dust	0	0	0
Total Natural	**1,893**	**449**	**-1,444 (-76%)**
All Sources			
Total Emissions	**29,999**	**39,744**	**9,744 (32%)**

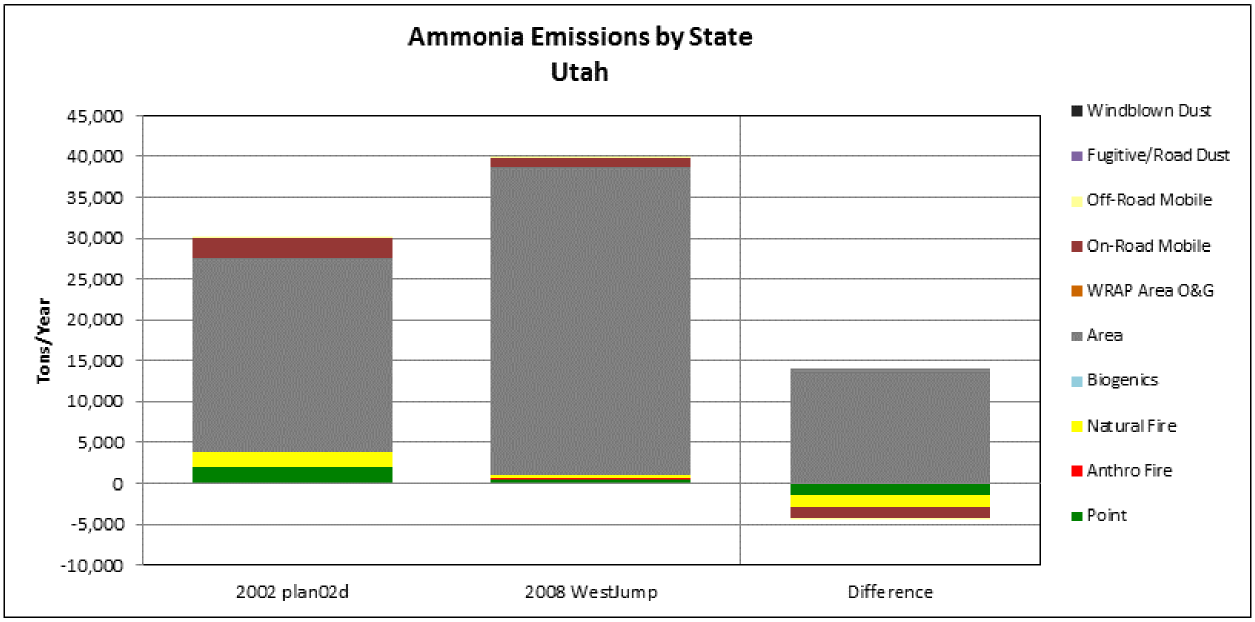

Figure 6.13-11. 2002 and 2008 Emission and Difference between Emissions Inventory Totals, for Ammonia by Source Category for Utah.

Table 6.13-15
Utah
Volatile Organic Compound Emissions by Category

Source Category	Volatile Organic Compound Emissions (tons/year)		
	2002 (Plan02d)	2008 (WestJump2008)	Difference (Percent Change)
Anthropogenic Sources			
Point	7,367	9,285	1,919
Area	46,679	72,811	26,132
On-Road Mobile	49,075	27,138	-21,937
Off-Road Mobile	26,933	23,213	-3,720
Area Oil and Gas	35,961	25,358	-10,603
Fugitive and Road Dust	0	0	0
Anthropogenic Fire	536	126	-410
Total Anthropogenic	**166,550**	**157,931**	**-8,619 (-5%)**
Natural Sources			
Natural Fire	19,484	720	-18,764
Biogenic	641,481	237,799	-403,682
Wind Blown Dust	0	0	0
Total Natural	**660,965**	**238,518**	**-422,446 (-64%)**
All Sources			
Total Emissions	**827,515**	**396,449**	**-431,065 (-52%)**

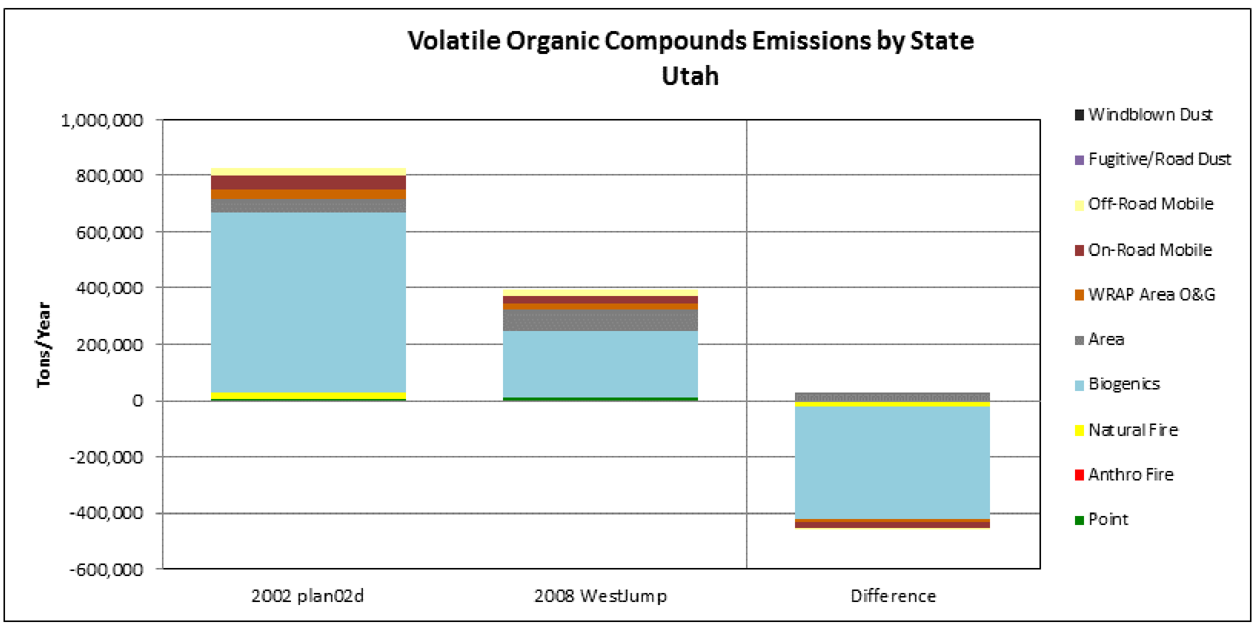

Figure 6.13-12. 2002 and 2008 Emission and Difference between Emissions Inventory Totals, for Volatile Organic Compounds by Source Category for Utah.

Table 6.13-16
Utah
Primary Organic Aerosol Emissions by Category

Source Category	Primary Organic Aerosol Emissions (tons/year)		
	2002 (Plan02d)	2008 (WestJump2008)	Difference (Percent Change)
Anthropogenic Sources			
Point*	392	75	-317
Area	578	3,045	2,468
On-Road Mobile	637	1,573	937
Off-Road Mobile	965	666	-299
Area Oil and Gas	0	28	28
Fugitive and Road Dust	141	886	745
Anthropogenic Fire	507	106	-401
Total Anthropogenic	**3,219**	**6,380**	**3,161 (98%)**
Natural Sources			
Natural Fire	26,187	1,167	-25,020
Biogenic	0	0	0
Wind Blown Dust	0	0	0
Total Natural	**26,187**	**1,167**	**-25,020 (-96%)**
All Sources			
Total Emissions	**29,407**	**7,547**	**-21,859 (-74%)**

*Point source data includes only oil and gas and regulated CEM sources. More comprehensive point source data were not available at the time this report was prepared but will be made available through the WRAP TSS (http://vista.cira.colostate.edu/tss/).

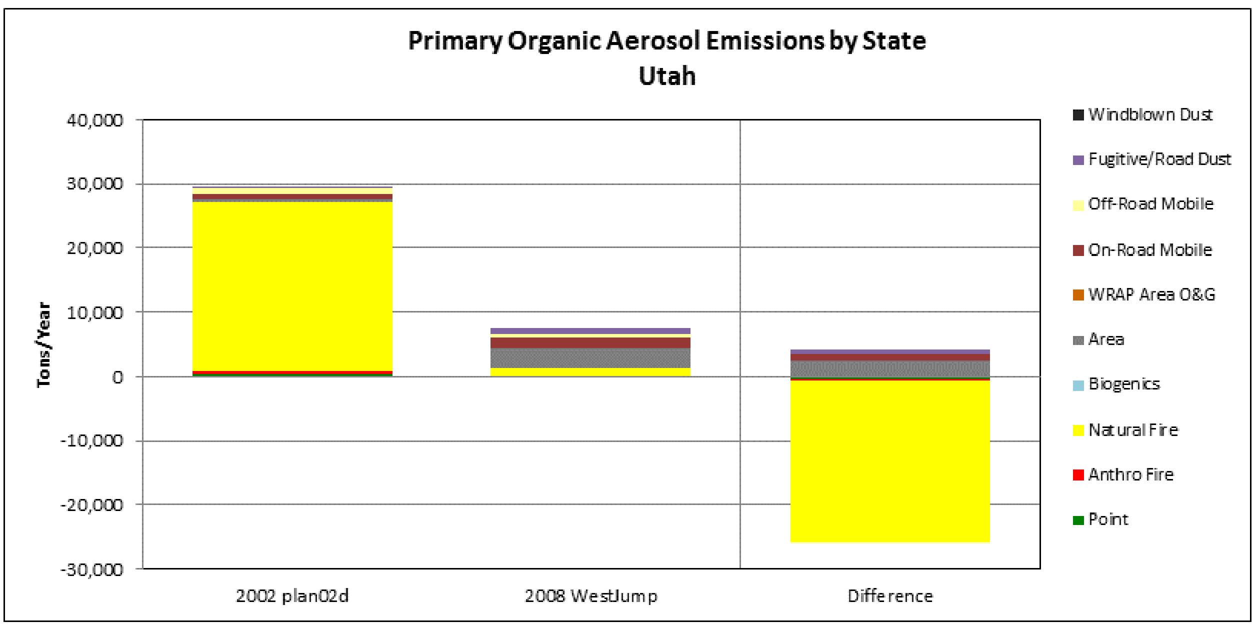

Figure 6.13-13. 2002 and 2008 Emission and Difference between Emissions Inventory Totals, for Primary Organic Aerosol by Source Category for Utah.

Table 6.13-17
Utah
Elemental Carbon Emissions by Category

Source Category	Elemental Carbon Emissions (tons/year)		
	2002 (Plan02d)	2008 (WestJump2008)	Difference (Percent Change)
Anthropogenic Sources			
Point*	102	24	-77
Area	12	513	500
On-Road Mobile	663	2,593	1,930
Off-Road Mobile	2,492	715	-1,777
Area Oil and Gas	0	0	0
Fugitive and Road Dust	11	21	11
Anthropogenic Fire	85	23	-62
Total Anthropogenic	**3,364**	**3,889**	**525 (16%)**
Natural Sources			
Natural Fire	5,405	209	-5,196
Biogenic	0	0	0
Wind Blown Dust	0	0	0
Total Natural	**5,405**	**209**	**-5,196 (-96%)**
All Sources			
Total Emissions	**8,769**	**4,098**	**-4,671 (-53%)**

*Point source data includes only oil and gas and regulated CEM sources. More comprehensive point source data were not available at the time this report was prepared but will be made available through the WRAP TSS (http://vista.cira.colostate.edu/tss/).

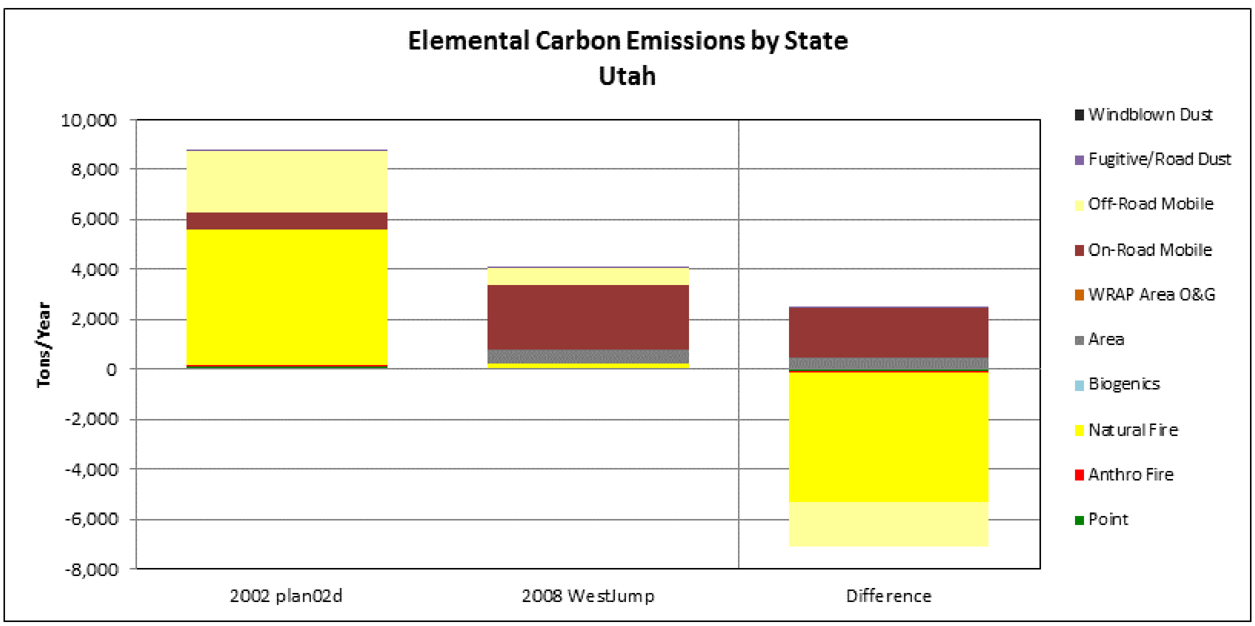

Figure 6.14-12. 2002 and 2008 Emission and Difference between Emissions Inventory Totals, for Elemental Carbon by Source Category for Utah.

Table 6.13-18
Utah
Fine Soil Emissions by Category

Source Category	Fine Soil Emissions (tons/year)		
	2002 (Plan02d)	**2008 (WestJump2008)**	**Difference (Percent Change)**
Anthropogenic Sources			
Point*	2,933	712	-2,222
Area	160	1,595	1,435
On-Road Mobile	426	257	-170
Off-Road Mobile	0	47	47
Area Oil and Gas	0	479	479
Fugitive and Road Dust	2,411	14,164	11,753
Anthropogenic Fire	81	43	-38
Total Anthropogenic	**6,011**	**17,296**	**11,285 (>100%)**
Natural Sources			
Natural Fire	1,719	429	-1,290
Biogenic	0	0	0
Wind Blown Dust	7,573	10,810	3,237
Total Natural	**9,292**	**11,239**	**1,948 (21%)**
All Sources			
Total Emissions	**15,302**	**28,535**	**13,232 (86%)**

*Point source data includes only oil and gas and regulated CEM sources. More comprehensive point source data were not available at the time this report was prepared but will be made available through the WRAP TSS (http://vista.cira.colostate.edu/tss/).

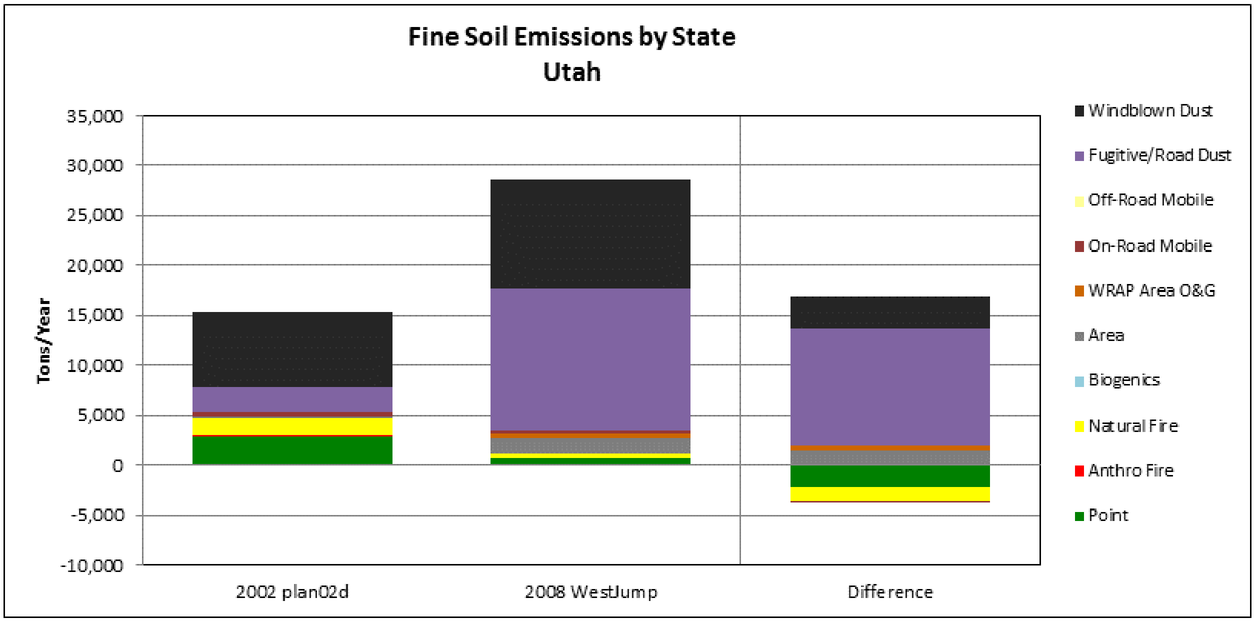

Figure 6.13-15. 2002 and 2008 Emission and Difference between Emissions Inventory Totals, for Fine Soil by Source Category for Utah.

Table 6.13-19
Utah
Coarse Mass Emissions by Category

Source Category	Coarse Mass Emissions (tons/year)		
	2002 (Plan02d)	2008 (WestJump2008)	Difference (Percent Change)
Anthropogenic Sources			
Point*	8,442	4,216	-4,226
Area	2,387	2,017	-371
On-Road Mobile	414	2,801	2,387
Off-Road Mobile	0	76	76
Area Oil and Gas	0	12	12
Fugitive and Road Dust	12,374	107,079	94,705
Anthropogenic Fire	59	20	-39
Total Anthropogenic	**23,677**	**116,221**	**92,544 (>100%)**
Natural Sources			
Natural Fire	5,671	224	-5,448
Biogenic	0	0	0
Wind Blown Dust	68,153	97,289	29,136
Total Natural	**73,824**	**97,513**	**23,689 (32%)**
All Sources			
Total Emissions	**97,501**	**213,733**	**116,233 (>100%)**

*Point source data includes only oil and gas and regulated CEM sources. More comprehensive point source data were not available at the time this report was prepared but will be made available through the WRAP TSS (http://vista.cira.colostate.edu/tss/).

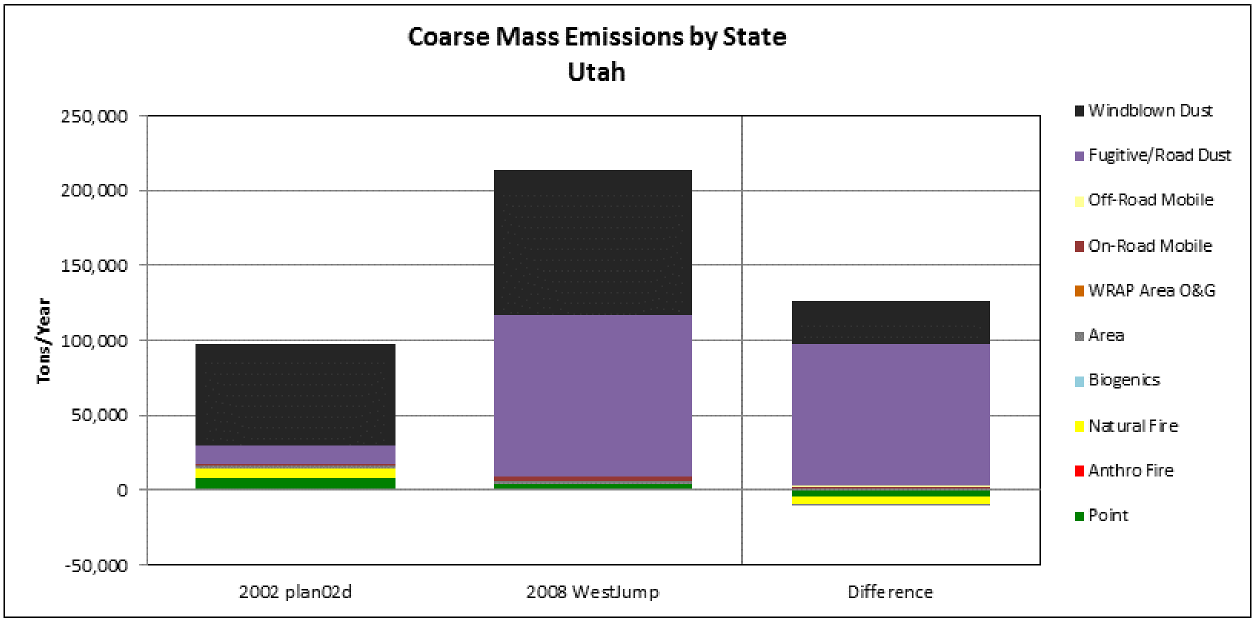

Figure 6.13-16. 2002 and 2008 Emission and Difference between Emissions Inventory Totals, for Coarse Mass by Source Category for Utah.

6.13.2.2 EGU Summary

As described in previous sections, differences between the baseline and progress period inventories presented here do not necessarily represent changes in actual emissions because numerous updates in inventory methodologies have occurred between the development of the separate inventories. Also, the 2002 baseline and 2008 progress period inventories represent only annual snapshots of emissions estimates, which may not be representative of entire 5-year monitoring periods compared. To better account for year-to-year changes in emissions, annual emission totals for Utah electrical generating units (EGU) are presented here. EGU emissions are some of the more consistently reported emissions, as tracked in EPA's Air Markets Program Database for permitted Title V facilities in the state (http://ampd.epa.gov/ampd/). RHR implementation plans are required to pay specific attention to certain major stationary sources, including EGUs, built between 1962 and 1977.

Figure 6.13-17 presents a sum of annual NO_X and SO_2 emissions as reported for Utah EGU sources between 1996 and 2010. While these types of facilities are targeted for controls in state regional haze SIPs, it should be noted that many of the controls planned for EGUs in the WRAP states had not taken place yet in 2010, while other controls separate from the RHR may have been implemented. The chart shows some periods of decline for both NO_X and SO_2, with a sharp decline in SO_2 emissions between 2006 and 2007.

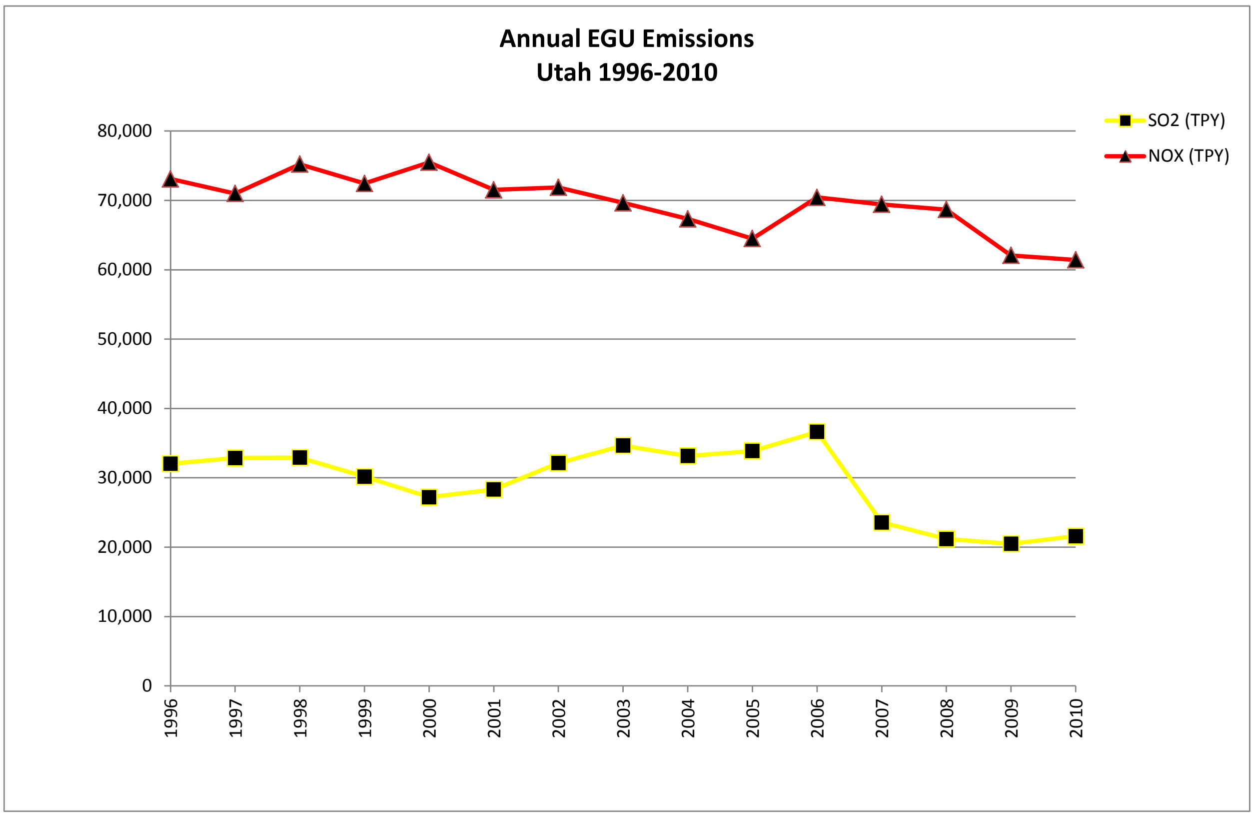

Figure 6.13-17. Sum of EGU Emissions of SO_2 and NO_X reported between 1996 and 2010 for Utah.