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.

6.3 CALIFORNIA

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. California has 29 mandatory Federal CIAs, which are depicted in Figure 6.3-1 and listed in Table 6.3-1, along with the associated IMPROVE monitor locations. In summaries here, monitors are grouped according to regions defined in California's 2009 Regional Haze Plan.[1]

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 or stayed the same at all California IMPROVE CIA sites.
- For the worst days, the 5-year average deciview metric decreased at most sites, but increased at the LAVO1, BLIS1, KAIS1, RAFA1, and REDW1.
- The largest decreases in 5-year averages on the worst days were due to reductions in ammonium nitrate. This is consistent with emission inventories that showed large reductions in mobile sources.
- The largest increases at sites were due to increased particulate organic mass, where highest particulate organic mass measurements were generally during the summer months, consistent with wildfire activity and biogenic activity in forested areas.
- Increases in 5-year average ammonium sulfate were observed at most sites, but increasing annual average trends were only observed at the northeast California sites, (and nearby southwest Oregon sites). Emissions inventories showed net decreases in state-wide SO_2 for all categories, but off-shore emissions that may have affected these northeastern coastal sites are not explicitly represented here.

[1] California's Regional Haze Plan is available on the California Environmental Protection Agency Air Resources Board website at http://www.arb.ca.gov/planning/reghaze/reghaze.htm.

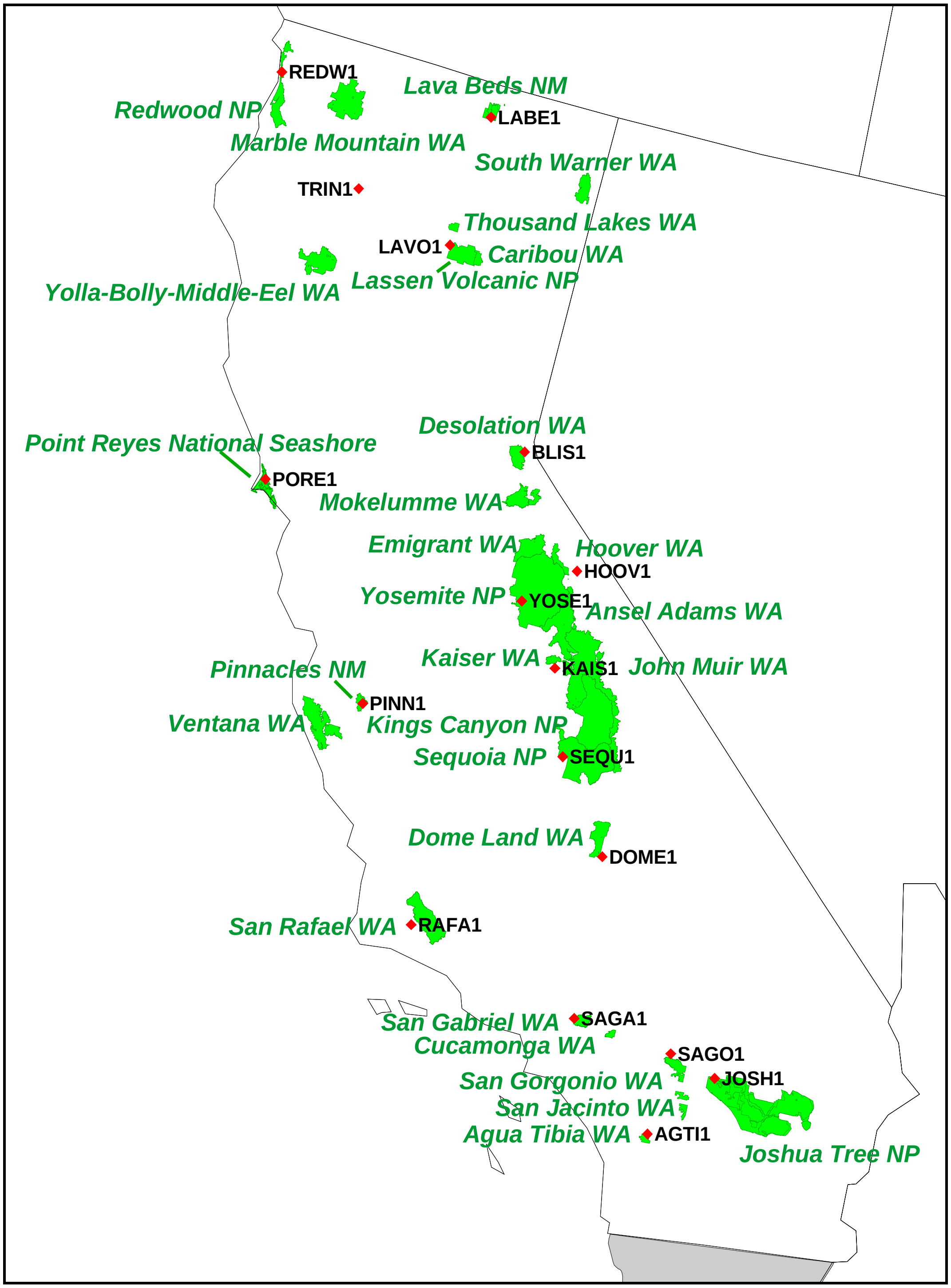

Figure 6.3-1. Map Depicting Federal CIAs and Representative IMPROVE Monitors in California.

Table 6.3-1
California CIAs and Representative IMPROVE Monitors

Class I Area	Representative IMPROVE Site	Latitude	Longitude	Elevation (m)
Northern California				
Lava Beds NM South Warner WA	LABE1	41.71	-121.51	1459
Lassen Volcanic NP Thousand Lakes WA Caribou WA	LAVO1	40.54	-121.58	1732
Marble Mountain WA Yolla-Bolly-Middle-Eel WA	TRIN1	40.79	-122.80	1014
Sierra California				
Desolation WA Mokelumne WA	BLIS1	38.98	-120.10	2130
Dome Land WA	DOME1	35.73	-118.14	927
Hoover WA	HOOV1	38.09	-119.18	2560
Kaiser WA Ansel Adams WA John Muir WA	KAIS1	37.22	-119.15	2597
Sequoia NP Kings Canyon NP	SEQU1	36.49	-118.83	519
Yosemite NP Emigrant WA	YOSE1	37.71	-119.71	1603
Southern California				
Agua Tibia WA	AGTI1	33.46	-116.97	507
Joshua Tree NP	JOSH1	34.07	-116.39	1235
San Gabriel WA Cucamonga WA	SAGA1	34.30	-118.03	1791
San Gorgonio WA San Jacinto WA	SAGO1	34.19	-116.91	1726
Coastal California				
Pinnacles NM Ventana WA	PINN1	36.48	-121.16	302
Point Reyes National Seashore	PORE1	38.12	-122.91	97
San Rafael WA	RAFA1	34.73	-120.01	956
Redwood NP	REDW1	41.56	-124.08	243

6.3.1 Monitoring Data

This section addresses RHR regulatory requirements for monitored data as measured by IMPROVE monitors representing Federal CIAs in California. These summaries are supported by regional data presented in Section 4.0 and by more detailed site specific tables and charts in Appendix C.

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}).

6.3.1.1 Current Conditions

This section addresses the regulatory question, ***what are the current visibility conditions for the most impaired and least impaired days (40 CFR 51.308 (g)(3)(i))?*** RHR guidance specifies that 5-year averages be calculated over successive 5-year periods, i.e. 2000-2004, 2005-2009, 2010-2014, etc.[2] 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 6.3-2 and 6.3-3 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 California. Figures 6.3-2 through 6.3-5 presents 5-year average extinction by region 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:

Northern California

- At the northern sites, particulate organic mass was the largest contributor to aerosol extinction, followed by ammonium sulfate.

---

[2] 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.)

Sierra California

- Both the highest and lowest average aerosol extinction for the 20% worst days at California sites were measured in the Sierra California region. SEQU1 recorded the highest average aerosol extinction (23.4 dv) in California for the 2005-2009 progress period. At the SEQU1 site, ammonium nitrate was the largest contributor to haze, followed by particulate organic mass. The HOOV1 site recorded the lowest average aerosol extinction (12.2 dv).
- At all Sierra sites except SEQU1, particulate organic mass was the largest contributor to aerosol extinction. Ammonium sulfate was the second largest contributor to haze at the BLIS1, HOOV1, KAIS1, and YOSE1 sites, and ammonium nitrate was the second largest contributor to haze at the DOME1 site.

Southern California

- At the southern California sites, ammonium nitrate was the largest contributor to aerosol extinction at all sites with the exception of AGTI1.
- At the AGTI1 site, ammonium sulfate was the largest contributor to haze followed by ammonium nitrate.

Coastal California

- At the Coastal sites, sea salt was the largest contributor to aerosol extinction at the PORE1 and REDW1 sites.
- Ammonium sulfate was the largest contributor to aerosol extinction at the PINN1 and RAFA1 sites.

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 1.3 dv (HOOV1) to 9.1 dv (PORE1).
- For all sites except DOME1, ammonium sulfate was the largest contributor to non-Rayleigh aerosol extinction. Particulate organic mass was the largest contributor at DOME1.

Table 6.3-2
California 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**
Northern California								
LABE1	14.2	22% (2)	6% (5)	**54% (1)**	9% (3)	2% (6)	7% (4)	0% (7)
LAVO1	16.0	14% (2)	4% (5)	**65% (1)**	10% (3)	2% (6)	6% (4)	0% (7)
TRIN1	17.3	12% (2)	4% (5)	**69% (1)**	8% (3)	1% (6)	4% (4)	0% (7)
Sierra California								
BLIS1	13.6	16% (2)	6% (5)	**60% (1)**	10% (3)	2% (6)	6% (4)	0% (7)
DOME1	19.2	19% (3)	24% (2)	**31% (1)**	6% (5)	2% (6)	18% (4)	0% (7)
HOOV1	12.2	18% (2)	6% (5)	**55% (1)**	11% (3)	3% (6)	8% (4)	0% (7)
KAIS1	15.7	20% (2)	15% (3)	**44% (1)**	7% (5)	3% (6)	10% (4)	0% (7)
SEQU1	23.4	17% (3)	**45% (1)**	26% (2)	6% (5)	1% (6)	6% (4)	0% (7)
YOSE1	16.9	18% (2)	12% (3)	**51% (1)**	9% (4)	2% (6)	8% (5)	0% (7)
Southern California								
AGTI1	20.9	**36% (1)**	28% (2)	15% (3)	6% (5)	1% (7)	11% (4)	3% (6)
JOSH1	17.8	24% (2)	**31% (1)**	20% (3)	7% (5)	3% (6)	13% (4)	1% (7)
SAGA1	18.0	29% (2)	**29% (1)**	21% (3)	8% (5)	2% (6)	10% (4)	1% (7)
SAGO1	20.5	17% (3)	**42% (1)**	23% (2)	7% (5)	2% (6)	9% (4)	1% (7)
Coastal California								
PINN1	18.4	**30% (1)**	24% (3)	25% (2)	6% (5)	1% (7)	9% (4)	5% (6)
PORE1	22.0	25% (3)	27% (2)	7% (5)	2% (6)	0% (7)	9% (4)	**28% (1)**
RAFA1	19.2	**31% (1)**	18% (3)	28% (2)	7% (5)	2% (7)	11% (4)	3% (6)
REDW1	19.1	32% (2)	10% (4)	15% (3)	2% (6)	0% (7)	6% (5)	**34% (1)**

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

Table 6.3-3
California 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
Northern California								
LABE1	2.8	**40% (1)**	12% (3)	25% (2)	8% (4)	2% (7)	7% (5)	6% (6)
LAVO1	2.5	**43% (1)**	11% (3)	22% (2)	8% (5)	3% (7)	9% (4)	4% (6)
TRIN1	3.2	**41% (1)**	9% (4)	25% (2)	7% (6)	2% (7)	7% (5)	10% (3)
Sierra California								
BLIS1	2.2	**38% (1)**	10% (4)	26% (2)	8% (5)	3% (6)	13% (3)	2% (7)
DOME1	5.1	24% (2)	14% (4)	**27% (1)**	11% (5)	3% (6)	18% (3)	3% (7)
HOOV1	1.3	**44% (1)**	9% (4)	19% (2)	7% (5)	5% (6)	14% (3)	1% (7)
KAIS1	1.6	**36% (1)**	9% (5)	20% (2)	14% (4)	3% (6)	16% (3)	2% (7)
SEQU1	7.9	**27% (1)**	23% (3)	25% (2)	9% (5)	2% (7)	12% (4)	2% (6)
YOSE1	2.9	**40% (1)**	13% (3)	22% (2)	9% (5)	3% (6)	12% (4)	3% (7)
Southern California								
AGTI1	7.4	**24% (1)**	15% (4)	17% (3)	12% (5)	4% (7)	23% (2)	5% (6)
JOSH1	5.3	**30% (1)**	13% (4)	18% (3)	10% (5)	5% (6)	22% (2)	2% (7)
SAGA1	4.5	**30% (1)**	22% (2)	17% (3)	8% (5)	4% (6)	16% (4)	3% (7)
SAGO1	4.5	**30% (1)**	15% (4)	18% (3)	10% (5)	4% (6)	20% (2)	3% (7)
Coastal California								
PINN1	8.0	**32% (1)**	16% (3)	19% (2)	8% (6)	1% (7)	14% (4)	10% (5)
PORE1	9.1	**42% (1)**	12% (3)	7% (5)	3% (6)	1% (7)	12% (4)	24% (2)
RAFA1	5.5	**33% (1)**	19% (2)	15% (3)	6% (6)	2% (7)	15% (4)	9% (5)
REDW1	5.6	**36% (1)**	8% (5)	16% (3)	4% (6)	1% (7)	12% (4)	23% (2)

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

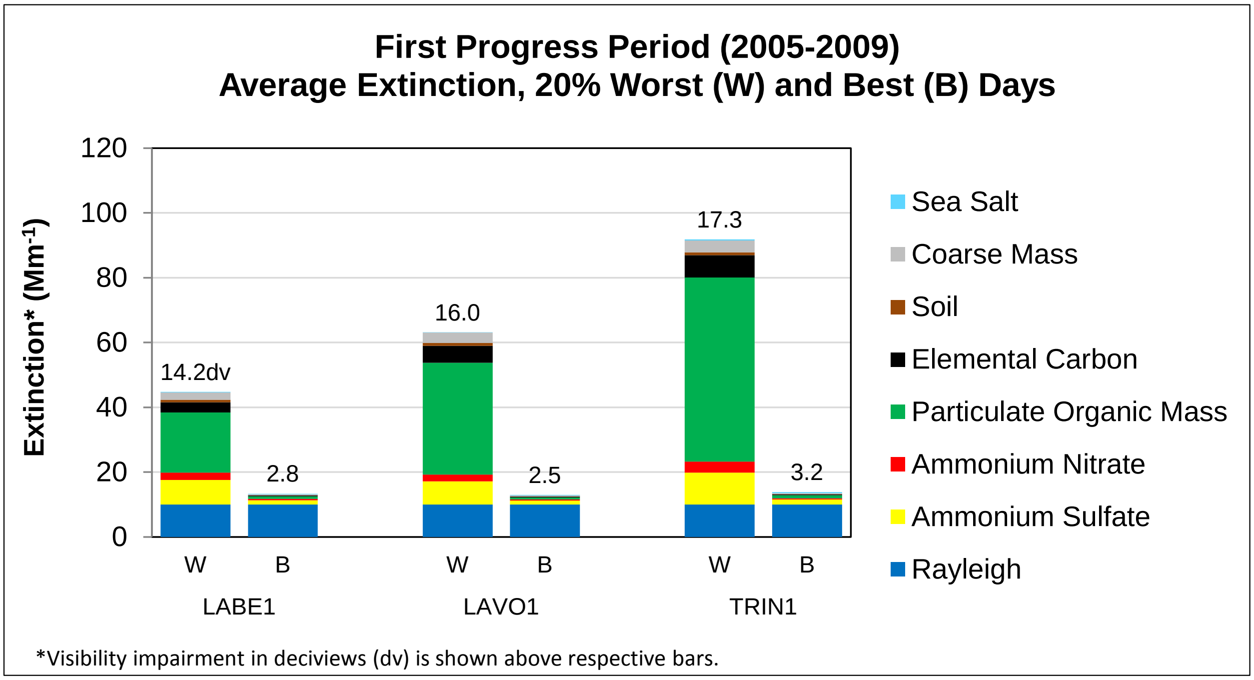

Figure 6.3-2. Average Extinction for Current Progress Period (2005-2009) for the Worst (Most Impaired) and Best (Least Impaired) Days Measured at California Class I Area IMPROVE Sites in the Northern Region.

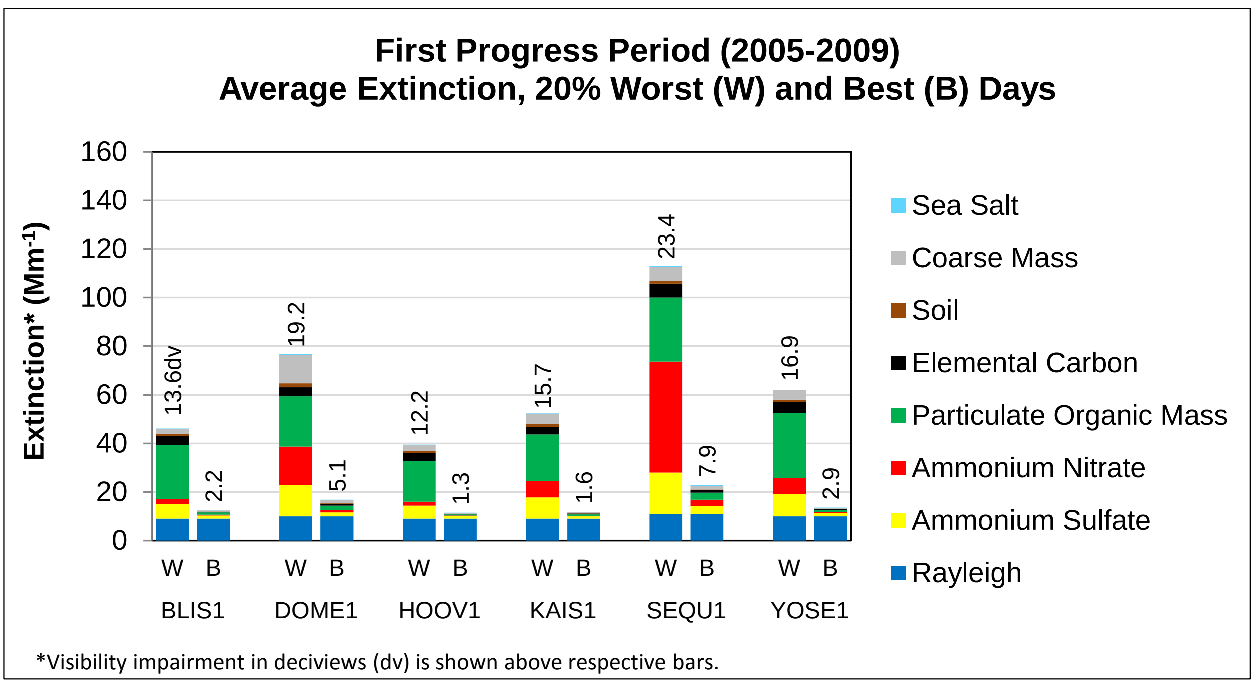

Figure 6.3-3. Average Extinction for Current Progress Period (2005-2009) for the Worst (Most Impaired) and Best (Least Impaired) Days Measured at California Class I Area IMPROVE Sites in the Sierra Region.

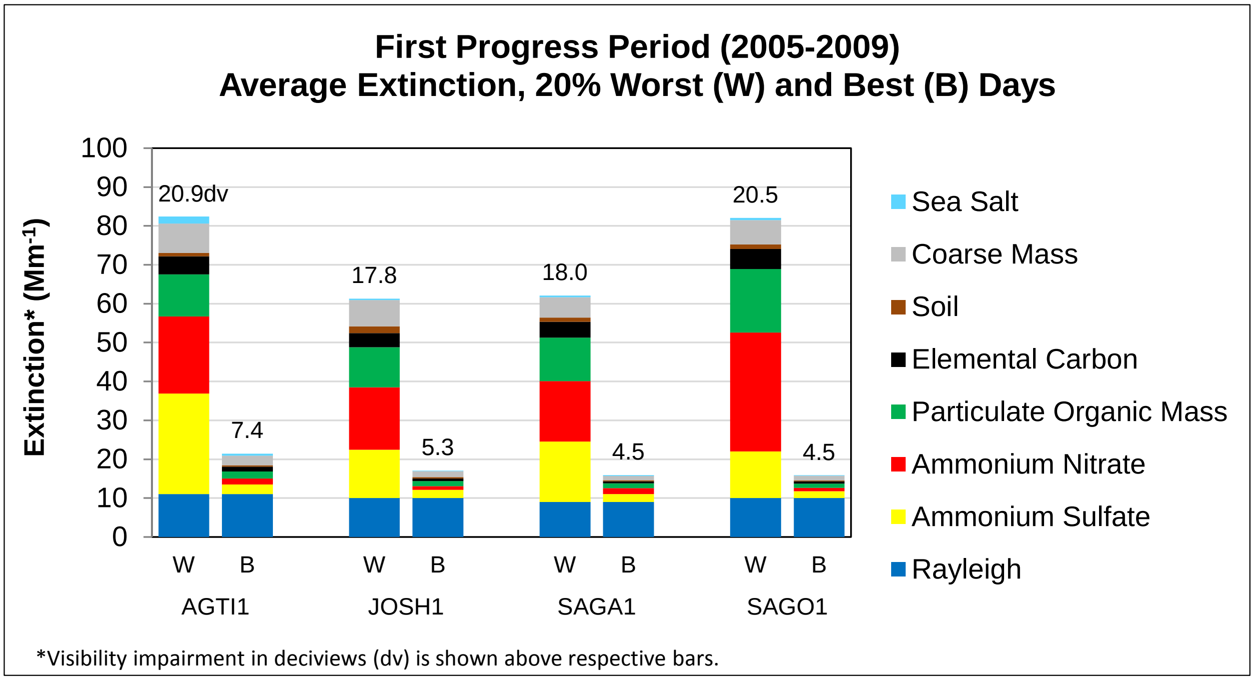

Figure 6.3-4. Average Extinction for Current Progress Period (2005-2009) for the Worst (Most Impaired) and Best (Least Impaired) Days Measured at California Class I Area IMPROVE Sites in the Southern Region.

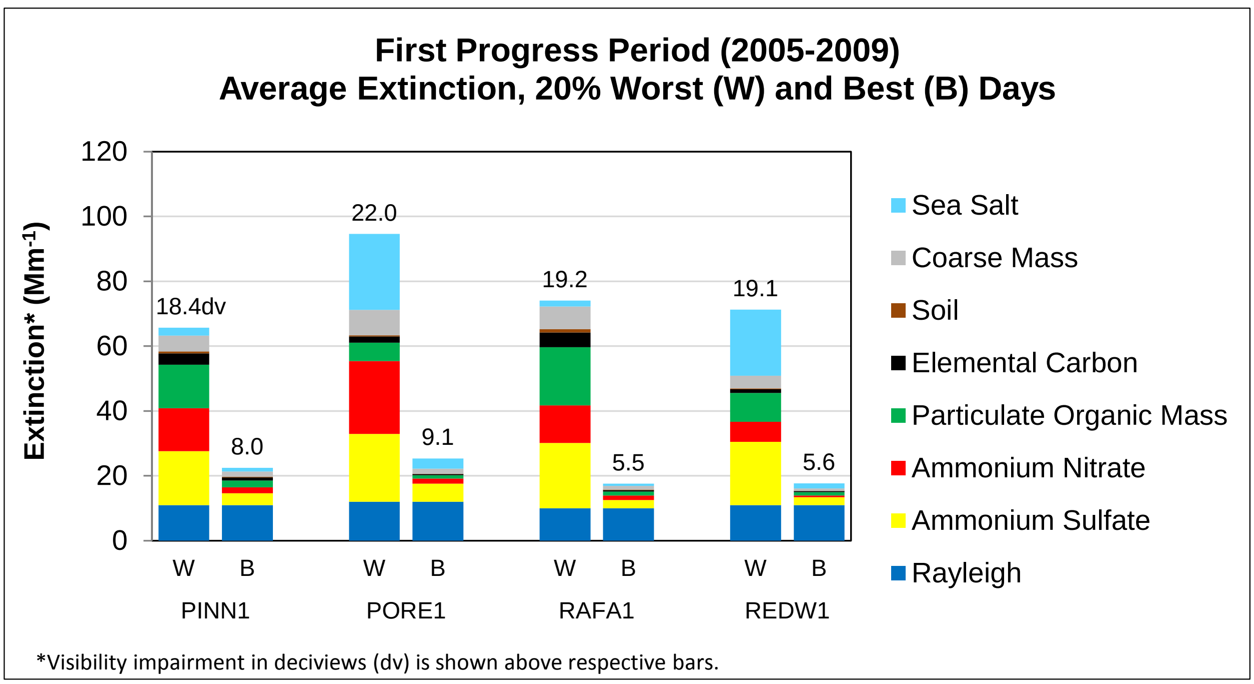

Figure 6.3-5. Average Extinction for Current Progress Period (2005-2009) for the Worst (Most Impaired) and Best (Least Impaired) Days Measured at California Class I Area IMPROVE Sites in the Coastal Region.

6.3.1.2 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 51.308 (g)(3)(ii))?*** Included here are comparisons between the 5-year average baseline conditions (2000-2004) and current progress period extinction (2005-2009).

Tables 6.3-4 and 6.3-5 present the differences between the 2000-2004 baseline period average extinction and the 2005-2009 progress period average for each site in California for the 20% most impaired days and 20% least impaired days, respectively. Averages that increased are depicted in red text and averages that decreased in blue.

Figures 6.3-6 presents the 5-year average extinction for the baseline and current progress period averages for 20% most impaired days at the northern sites, and Figure 6.3-7 presents the differences in averages by aerosol species, with increases represented above the zero line and decreases below the zero line. Figures 6.3-8 through 6.3-13 present similar plots for the other California regions, and Figures 6.3-14 through 6.3-21 present similar plots for the best days. Some general observations regarding differences in visibility impairment at sites in California are as follows:

<u>Northern California</u>

At the Northern California sites, for the 20% most impaired days, the 5-year average deciview metric decreased between the 2000-2004 and 2005-2009 periods at the LABE1 site, remained relatively unchanged at the TRIN1 site and increased at the LAVO1 site. Notable differences for individual species averages were as follows:

- At the TRIN1 site, the deciview average did not change, but total aerosol extinction increased by 23 Mm^{-1}. This discrepancy is due to the methodology used to calculate the 5-year dv metrics, as discussed in Section 3.1.2.3.
- The primary contributor to changes in extinction at these sites was particulate organic mass, which decreased slightly at the LABE1 site and increased at the LAVO1 and TRIN1 sites.

<u>Sierra California</u>

At the Sierra California site, for the 20% most impaired days, the 5-year average deciview metric decreased between the 2000-2004 and 2005-2009 periods at the DOME1, HOOV1, SEQU1, and YOSE1 sites and increased at the BLIS1 and KAIS1 sites. Notable differences for individual species averages were as follows:

- The largest decrease in deciviews for this region was measured at the SEQU1 site (-2.0 dv), where the change in average deciviews was due mostly to decreases in ammonium nitrate and particulate organic mass. Decreases in ammonium nitrate and particulate organic mass were also the largest contributors to the decrease in at the YOSE1 site.

- Increases in particulate organic matter were measured at the BLIS1, DOME1, HOOV1, and KAIS1 sites. At the HOOV1 site, the increases were offset by a decrease in coarse mass, resulting in a net improvement in deciviews.
- At the DOME1 site, the deciview average decrease, but total aerosol extinction increased (+5 Mm^{-1}). This discrepancy is due to the methodology used to calculate the 5-year dv metrics, as discussed in Section 3.1.2.3.

Southern California

At the Southern California sites, the 5-year average deciview metric decreased at all southern California sites. Notable differences for individual species averages were as follows:

- Decreasing deciview averages at these sites was largely due to reductions in ammonium nitrate. Reductions were also measured in ammonium sulfate at the AGTI1 site, particulate organic matter at the AGTI1 and SAGA1 sites, and in coarse mass at the SAGA1 site.

Coastal California

At the Coastal California sites, the 5-year average deciview metric decreased at the PINN1 and PORE1 sites and increased at the RAFA1 and REDW1 sites. Notable differences for individual species averages were as follows:

- Decreasing dv averages at the PINN1 and PORE1 sites were largely due to reductions in ammonium nitrate, partially offset by increases in ammonium sulfate and sea salt.
- The increase in deciviews at the RAFA1 site was largely due to an increase in particulate organic mass, and the increase at the REDW1 site was largely due to increases in ammonium sulfate and sea salt. At both sites, increases were slightly offset by decreases in ammonium nitrate.

Across California, the 5-year average deciview metric for the best days decreased at all sites except DOME1, where the measured deciview average remained relatively unchanged. Notable differences for individual species averages on the 20% least impaired days were as follows:

- Ammonium nitrate, particulate organic mass and elemental carbon decreased or remained the same at all sites.
- At the DOME1 site, where the average deciview value remained the same, slight decreases in ammonium sulfate, particulate organic mass and elemental carbon were offset by slight increases in soil, coarse mass and sea salt.

Table 6.3-4
California 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
Northern California										
LABE1	15.1	14.2	-0.9	+0.8	-1.2	-3.4	-0.2	-0.2	-0.3	+0.1
LAVO1	14.1	16.0	+1.9	+0.4	-1.6	+17.3	+2.1	-0.1	+1.2	0.0
TRIN1	17.3	17.3	0.0	+1.5	-2.6	+21.6	+2.3	0.0	+1.1	0.0
Sierra California										
BLIS1	12.6	13.6	+1.0	+1.0	-0.3	+8.2	+0.7	-0.3	0.0	+0.1
DOME1	19.4	19.2	-0.2	+0.8	-0.1	+3.6	-0.2	+0.2	+0.7	+0.1
HOOV1	12.9	12.2	-0.7	+0.4	+0.1	+1.3	+0.8	-0.5	-2.3	-0.1
KAIS1	15.5	15.7	+0.2	+1.1	-0.3	+2.3	-0.2	0.0	0.0	0.0
SEQU1	25.4	23.4	-2.0	+0.5	-15.1	-6.0	-1.3	-0.1	-1.9	+0.1
YOSE1	17.6	16.9	-0.7	+1.3	-1.6	-2.3	-0.1	0.0	0.0	+0.1
Southern California										
AGTI1	23.5	20.9	-2.6	-6.0	-10.0	-6.7	-1.8	-0.3	-1.1	+1.0
JOSH1	19.6	17.8	-1.8	+0.2	-11.3	0.0	-0.5	+0.2	-1.1	+0.2
SAGA1	19.9	18.0	-1.9	+3.2	-12.1	-4.1	-0.2	+0.2	-3.0	0.0
SAGO1	22.2	20.5	-1.7	-1.2	-14.4	+2.3	0.0	+0.1	+0.1	+0.3
Coastal California										
PINN1	18.5	18.4	-0.1	+2.7	-3.8	+0.2	-1.1	0.0	+1.1	+1.5
PORE1	22.8	22.0	-0.8	+6.8	-15.9	-6.4	-1.3	-0.1	+0.3	+2.3
RAFA1	18.8	19.2	+0.4	-0.2	-1.0	+5.6	+1.5	0.0	+0.2	+1.1
REDW1	18.5	19.1	+0.6	+4.6	-0.8	+0.9	-0.3	0.0	-0.2	+2.8

*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 6.3-5
California 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})*						
	2000-2004 Baseline Period	2005-2009 Progress Period	Change in dv*	Amm. Sulfate	Amm. Nitrate	POM	EC	Soil	CM	Sea Salt
Northern California										
LABE1	3.2	2.8	**-0.4**	**+0.1**	**-0.1**	**-0.4**	**-0.1**	0.0	**-0.1**	**+0.1**
LAVO1	2.7	2.5	**-0.2**	**+0.1**	**-0.1**	**-0.2**	**-0.1**	0.0	**+0.1**	0.0
TRIN1	3.4	3.2	**-0.2**	**+0.3**	**-0.1**	**-0.5**	**-0.2**	0.0	0.0	**+0.1**
Sierra California										
BLIS1	2.5	2.2	**-0.3**	0.0	**-0.1**	**-0.2**	**-0.2**	0.0	**+0.1**	0.0
DOME1	5.1	5.1	0.0	**-0.1**	0.0	**-0.2**	**-0.1**	**+0.1**	**+0.3**	**+0.1**
HOOV1	1.4	1.3	**-0.1**	**+0.1**	**-0.1**	0.0	**-0.1**	0.0	**-0.2**	0.0
KAIS1	2.3	1.6	**-0.7**	**-0.1**	**-0.1**	**-0.5**	**-0.3**	0.0	0.0	0.0
SEQU1	8.8	7.9	**-0.9**	**+0.2**	**-0.8**	**-0.9**	**-0.5**	0.0	**-0.2**	**+0.1**
YOSE1	3.4	2.9	**-0.5**	0.0	**-0.1**	**-0.4**	**-0.1**	0.0	0.0	0.0
Southern California										
AGTI1	9.6	7.4	**-2.2**	**-1.4**	**-1.7**	**-1.2**	**-0.6**	**-0.1**	0.0	**-0.2**
JOSH1	6.1	5.3	**-0.8**	**-0.3**	**-0.6**	**-0.4**	**-0.2**	0.0	**-0.1**	0.0
SAGA1	4.8	4.5	**-0.3**	**+0.2**	**-0.5**	**-0.3**	**-0.1**	0.0	**-0.1**	**+0.1**
SAGO1	5.4	4.5	**-0.9**	**-0.1**	**-0.9**	**-0.5**	**-0.4**	0.0	**+0.3**	0.0
Coastal California										
PINN1	8.9	8.0	**-0.9**	**-0.8**	**-0.8**	**-0.5**	**-0.3**	0.0	0.0	**+0.2**
PORE1	10.5	9.1	**-1.4**	**-1.1**	**-0.8**	**-0.5**	**-0.2**	0.0	**-0.7**	**-0.3**
RAFA1	6.5	5.5	**-1.0**	**-0.2**	**-0.7**	**-0.6**	**-0.3**	0.0	**-0.1**	**+0.2**
REDW1	6.1	5.6	**-0.5**	**+0.1**	**-0.2**	**-0.4**	**-0.2**	0.0	**-0.1**	**-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.

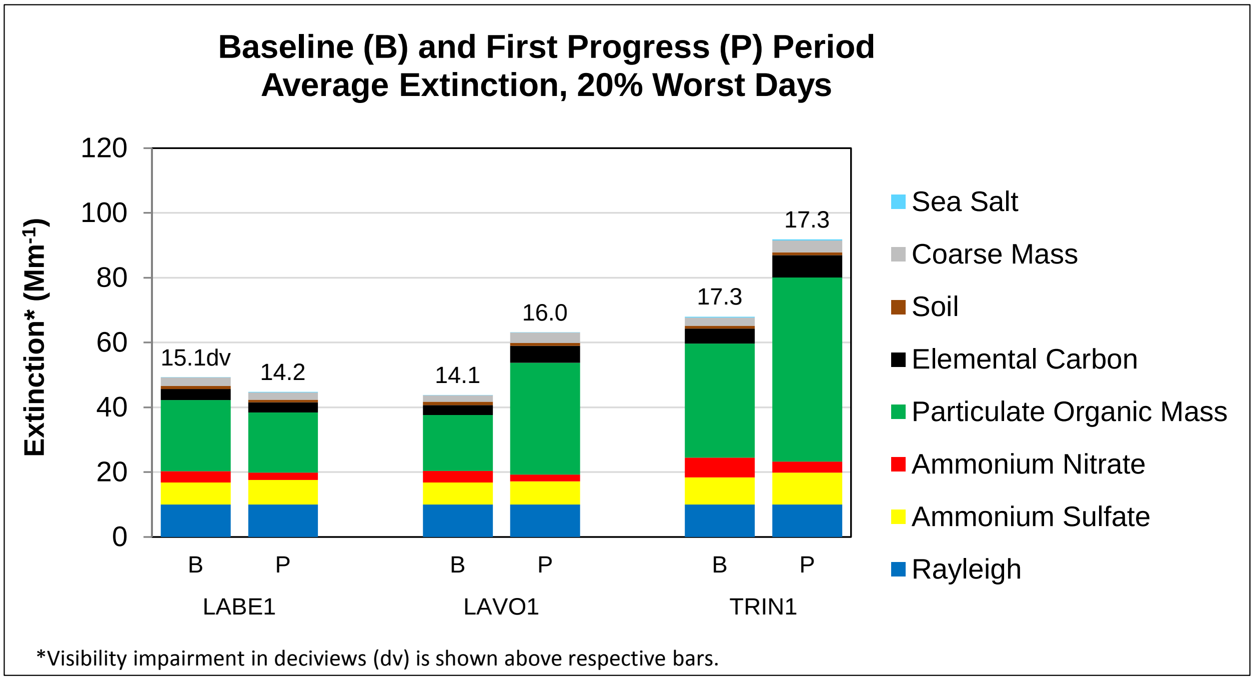

Figure 6.3-6. Average Extinction for Baseline and Progress Period Extinction for Worst (Most Impaired) Days Measured at California Class I Area IMPROVE Sites in the Northern Region.

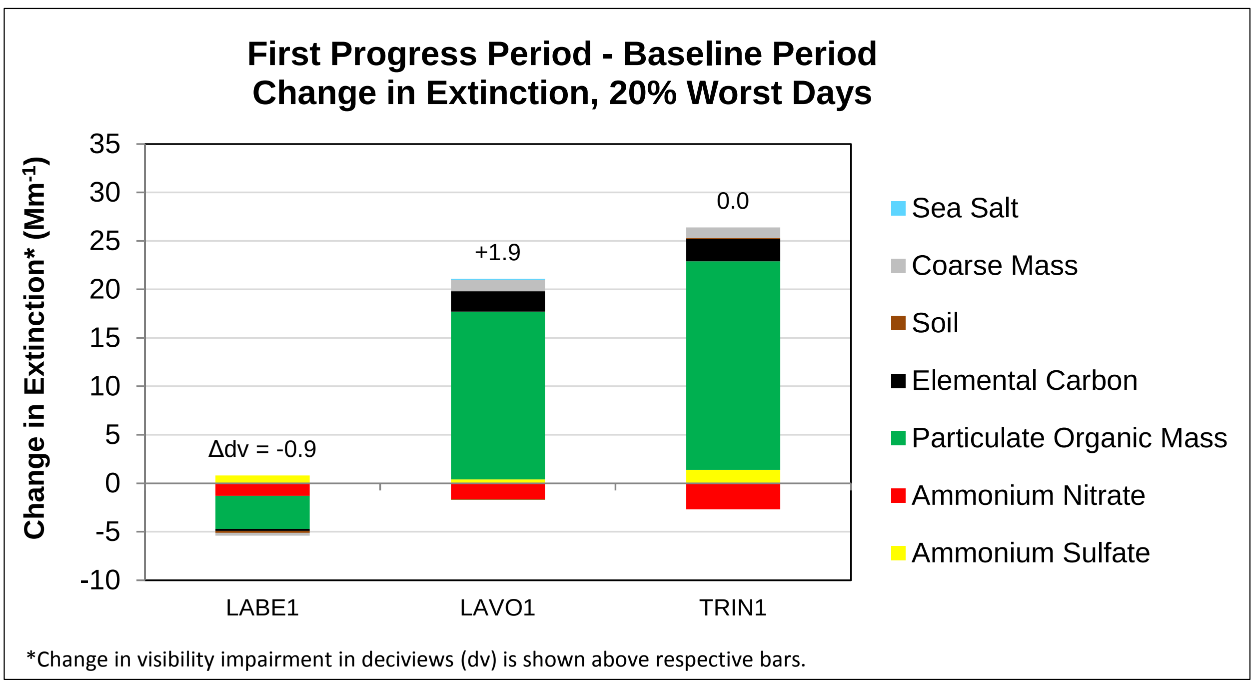

Figure 6.3-7. Difference Between Average Extinction for Current Progress Period (2005-2009) and Baseline Period (2000-2004) for the Worst (Most Impaired) Days Measured at California Class I Area IMPROVE Sites in the Northern Region.

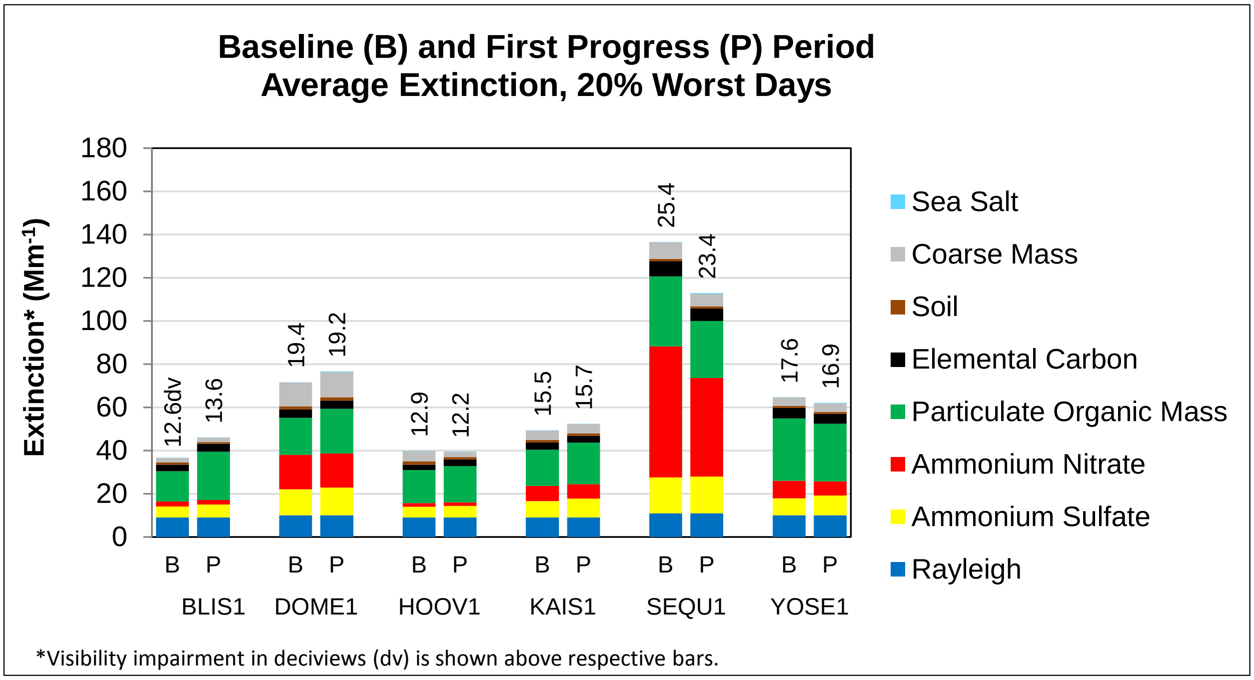

Figure 6.3-8. Average Extinction for Baseline and Progress Period Extinction for Worst (Most Impaired) Days Measured at California Class I Area IMPROVE Sites in the Sierra Region.

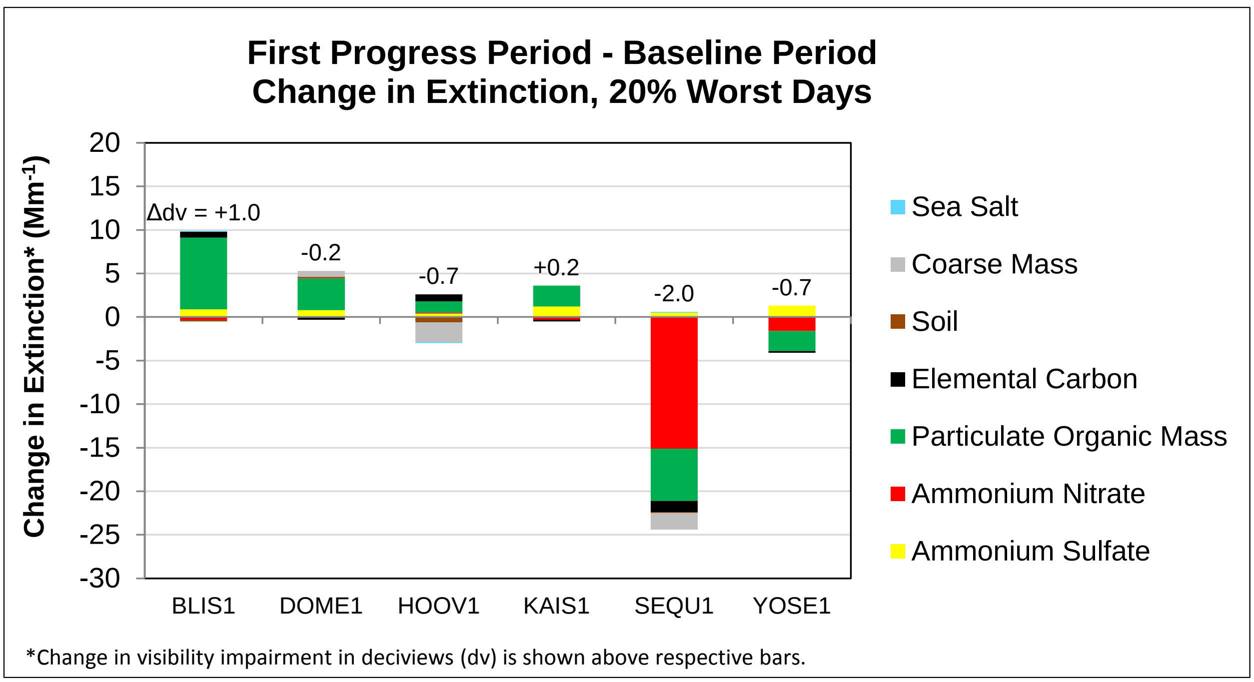

Figure 6.3-9. Difference between Average Extinction for Current Progress Period (2005-2009) and Baseline Period (2000-2004) for the Worst (Most Impaired) Days Measured at California Class I Area IMPROVE Sites in the Sierra Region.

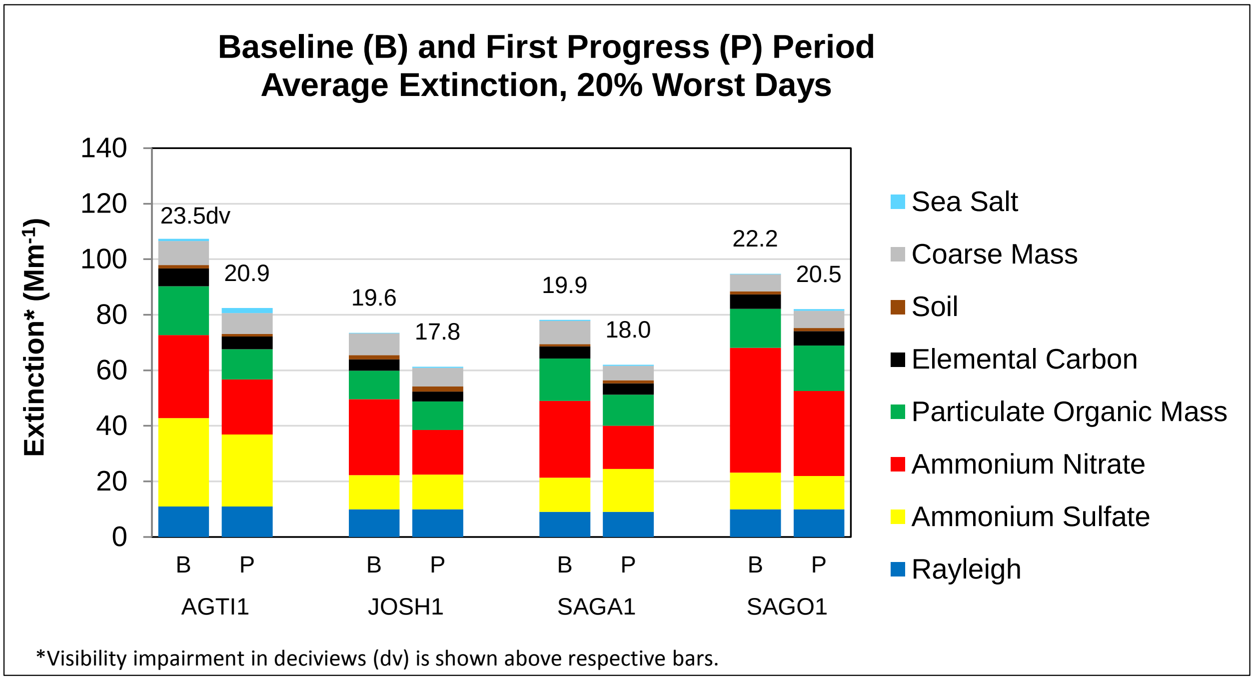

Figure 6.3-10. Average Extinction for Baseline and Progress Period Extinction for Worst (Most Impaired) Days Measured at California Class I Area IMPROVE Sites in the Southern Region.

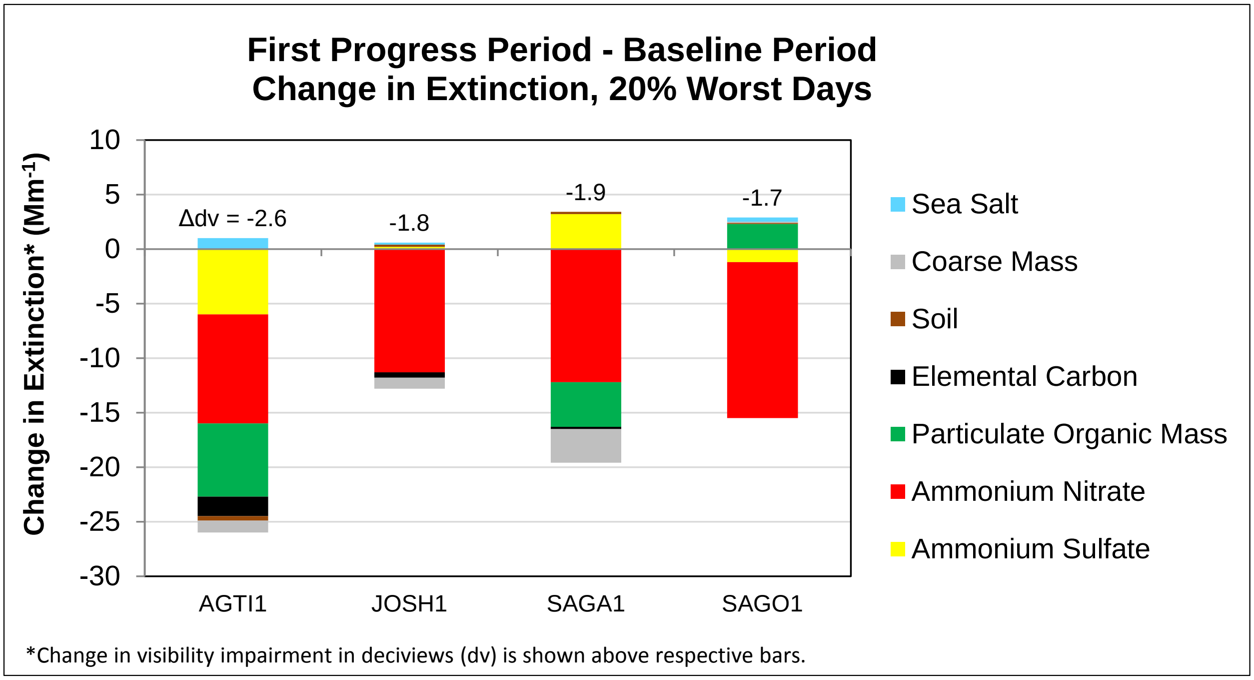

Figure 6.3-11. Difference between Average Extinction for Current Progress Period (2005-2009) and Baseline Period (2000-2004) for the Worst (Most Impaired) Days Measured at California Class I Area IMPROVE Sites in the Southern Region.

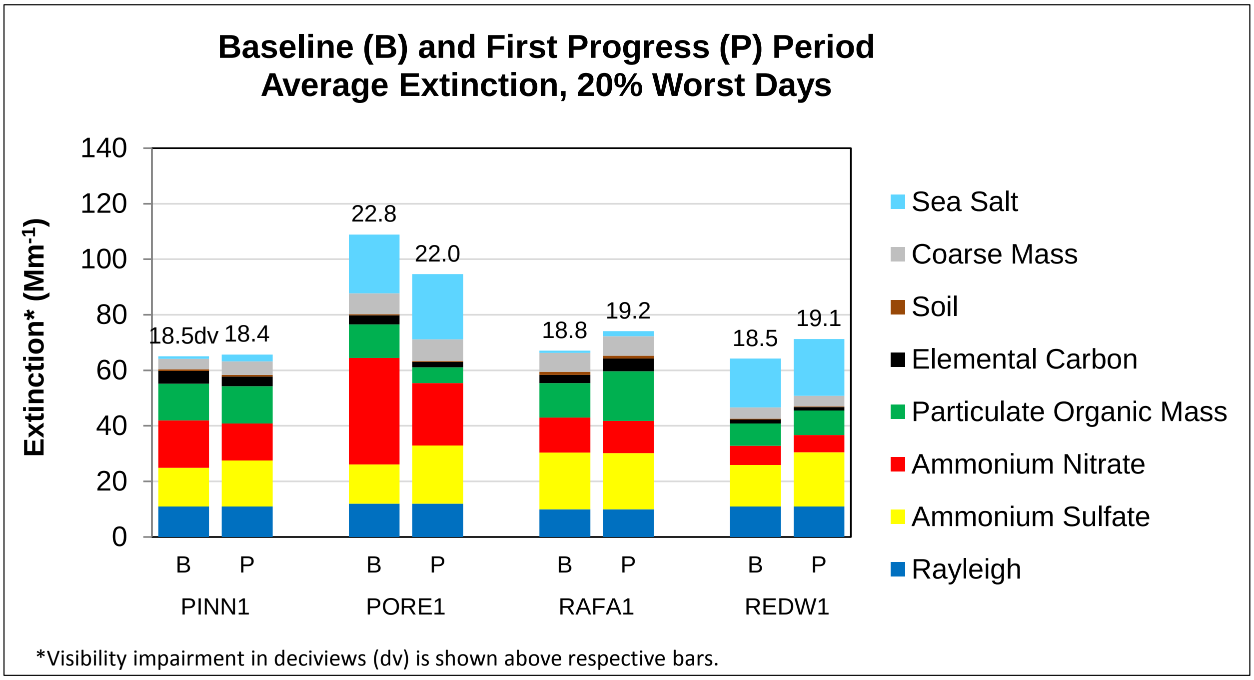

Figure 6.3-12. Average Extinction for Baseline and Progress Period Extinction for Worst (Most Impaired) Days Measured at California Class I Area IMPROVE Sites in the Coastal Region.

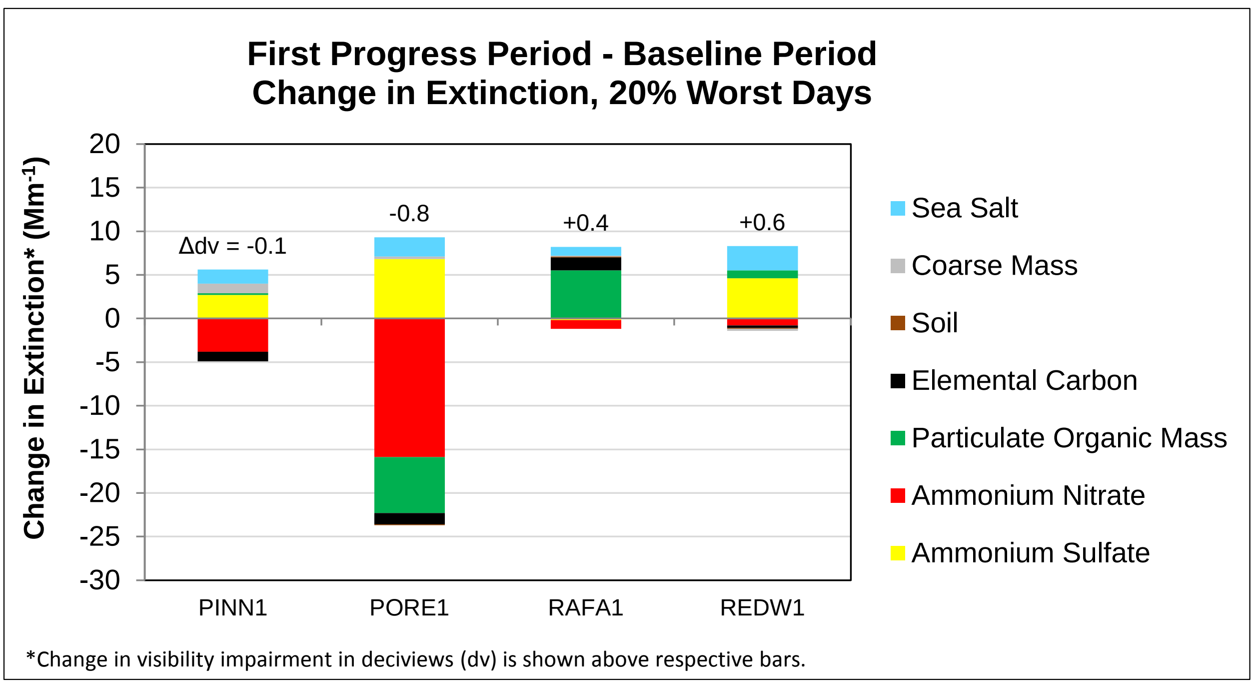

Figure 6.3-13. Difference between Average Extinction for Current Progress Period (2005-2009) and Baseline Period (2000-2004) for the Worst (Most Impaired) Days Measured at California Class I Area IMPROVE Sites in the Coastal Region.

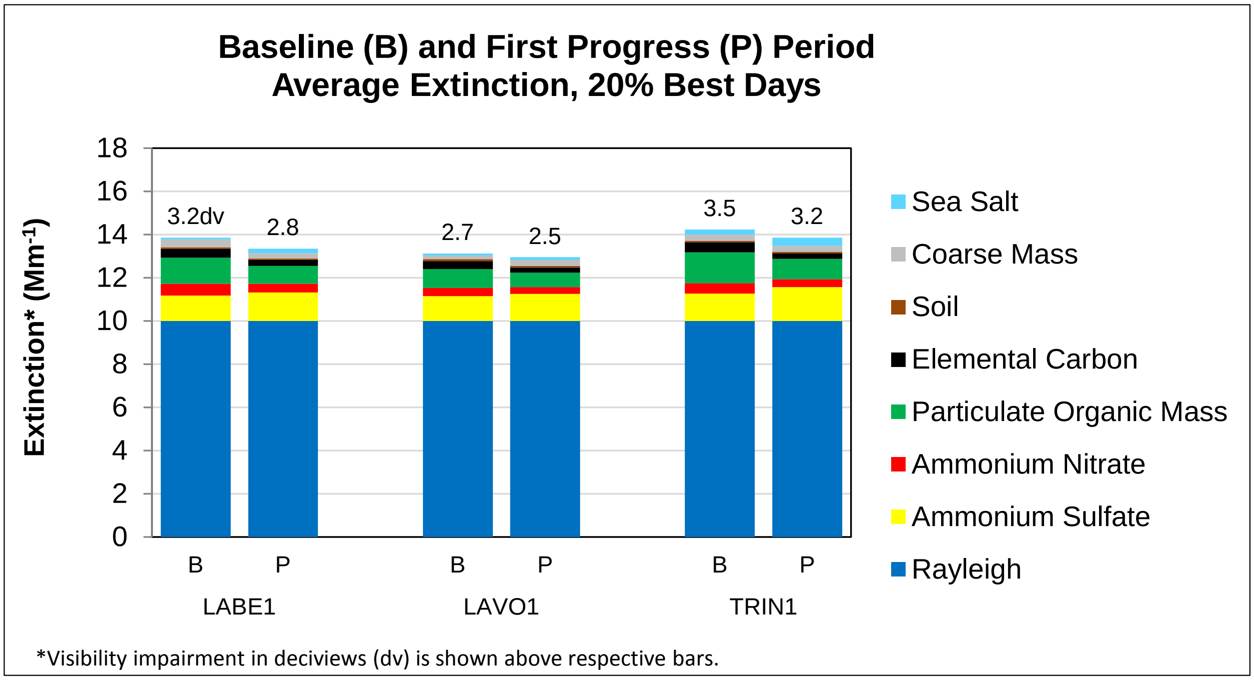

Figure 6.3-14. Average Extinction for Baseline and Progress Period Extinction for Best (Least Impaired) Days Measured at California Class I Area IMPROVE Sites in the Northern Region.

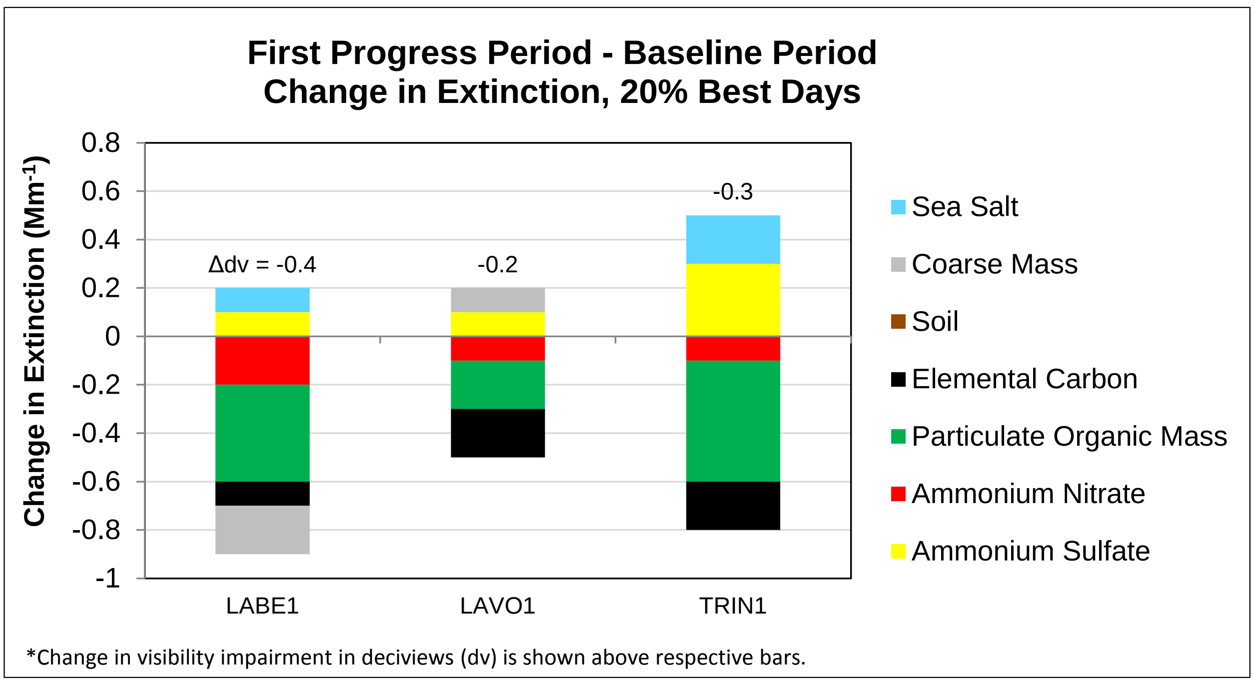

Figure 6.3-15. Difference between Average Extinction for Current Progress Period (2005-2009) and Baseline Period (2000-2004) for the Best (Least Impaired) Days Measured at California Class I Area IMPROVE Sites in the Northern Region.

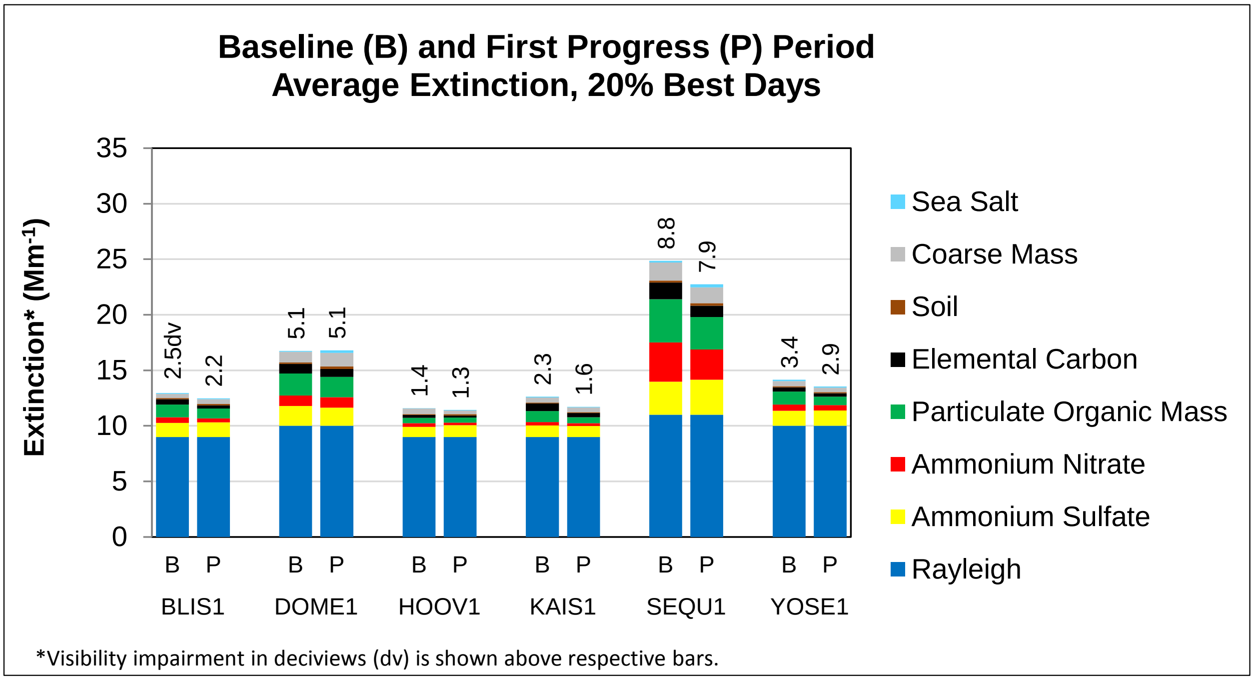

Figure 6.3-16. Average Extinction for Baseline and Progress Period Extinction for Best (Least Impaired) Days Measured at California Class I Area IMPROVE Sites in the Sierra Region.

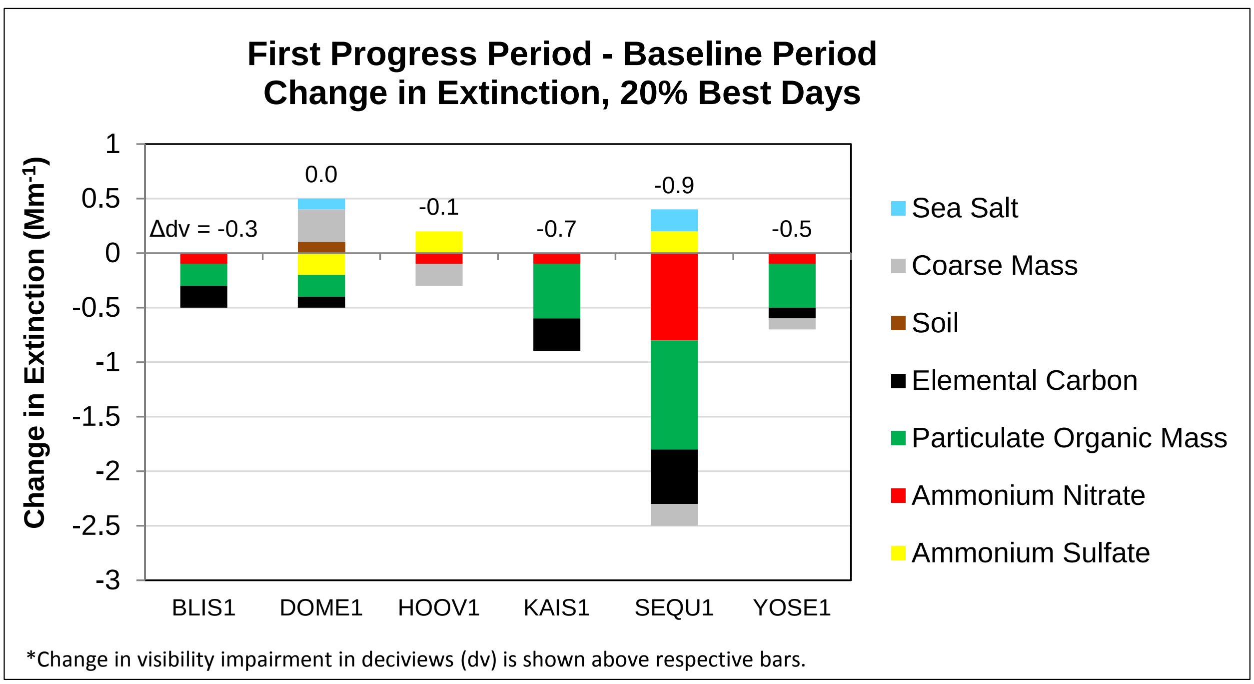

Figure 6.3-17. Difference between Average Extinction for Current Progress Period (2005-2009) and Baseline Period (2000-2004) for the Best (Least Impaired) Days Measured at California Class I Area IMPROVE Sites in the Sierra Region.

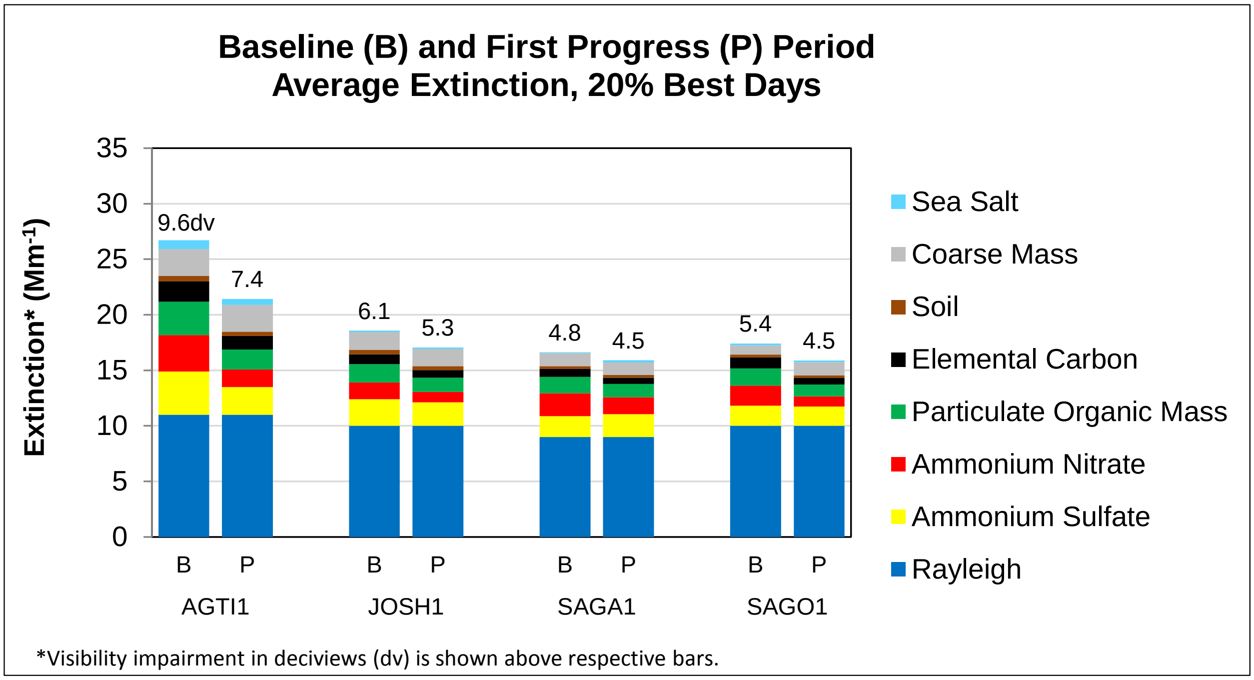

Figure 6.3-18. Average Extinction for Baseline and Progress Period Extinction for Best (Least Impaired) Days Measured at California Class I Area IMPROVE Sites in the Southern Region.

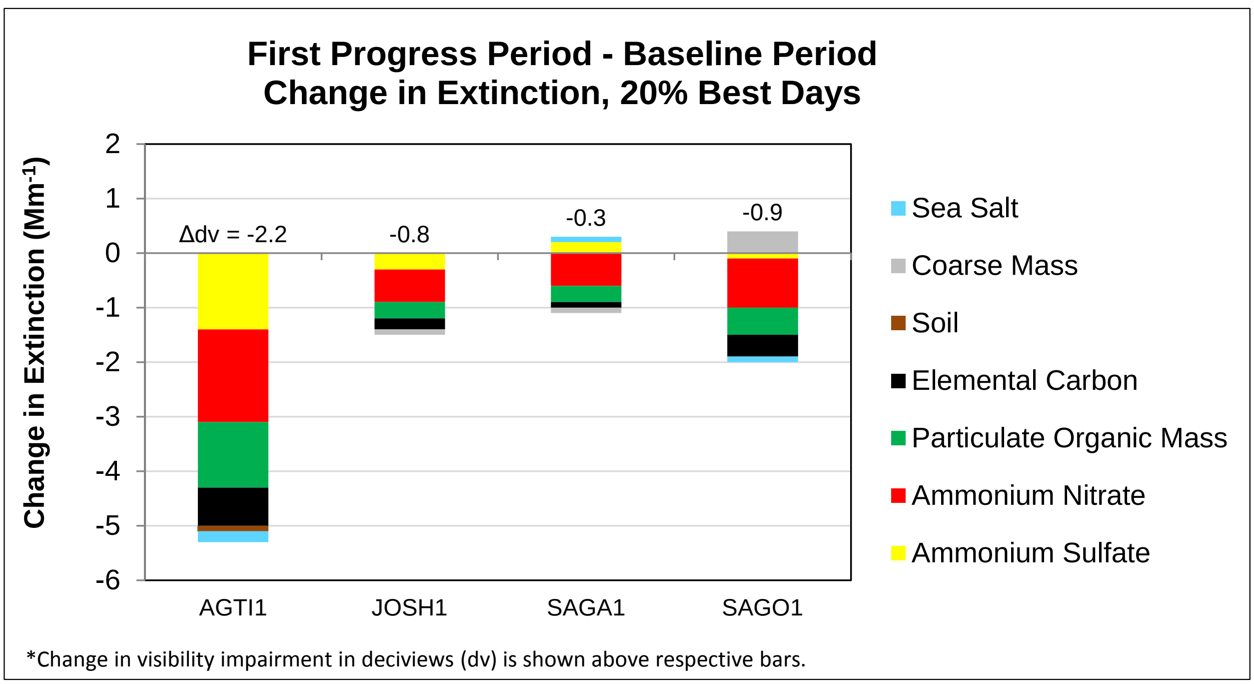

Figure 6.3-19. Difference between Average Extinction for Current Progress Period (2005-2009) and Baseline Period (2000-2004) for the Best (Least Impaired) Days Measured at California Class I Area IMPROVE Sites in the Southern Region.

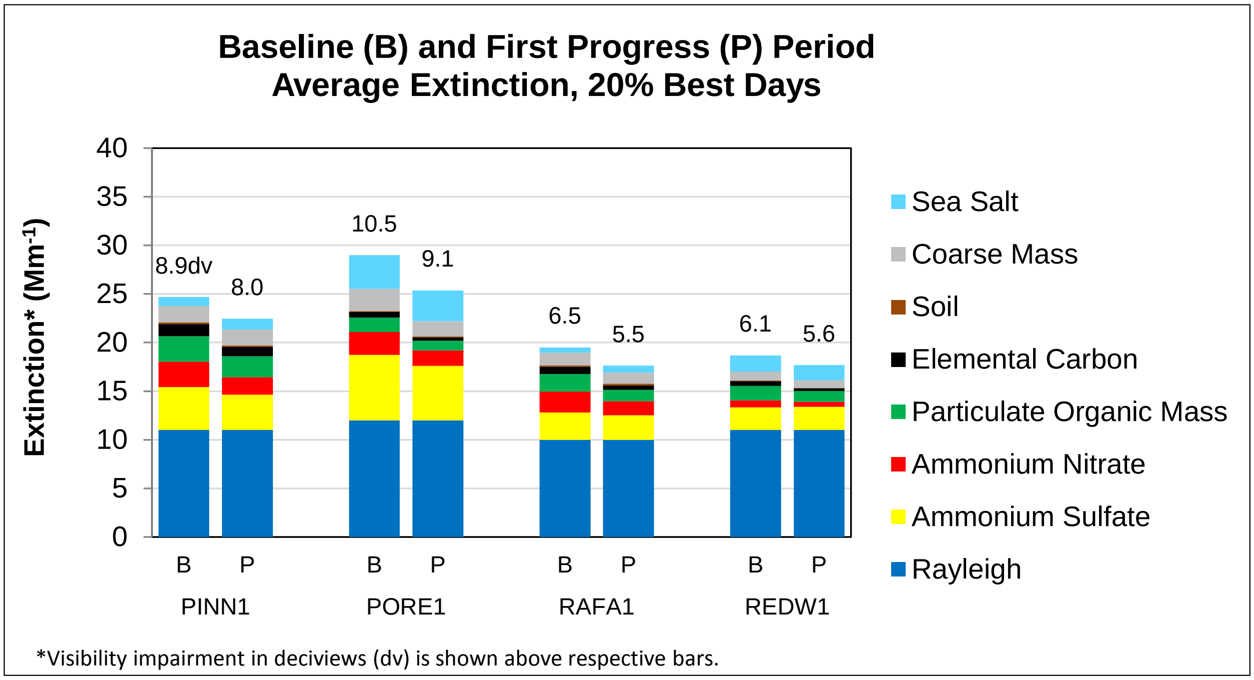

Figure 6.3-20. Average Extinction for Baseline and Progress Period Extinction for Best (Least Impaired) Days Measured at California Class I Area IMPROVE Sites in the Coastal Region.

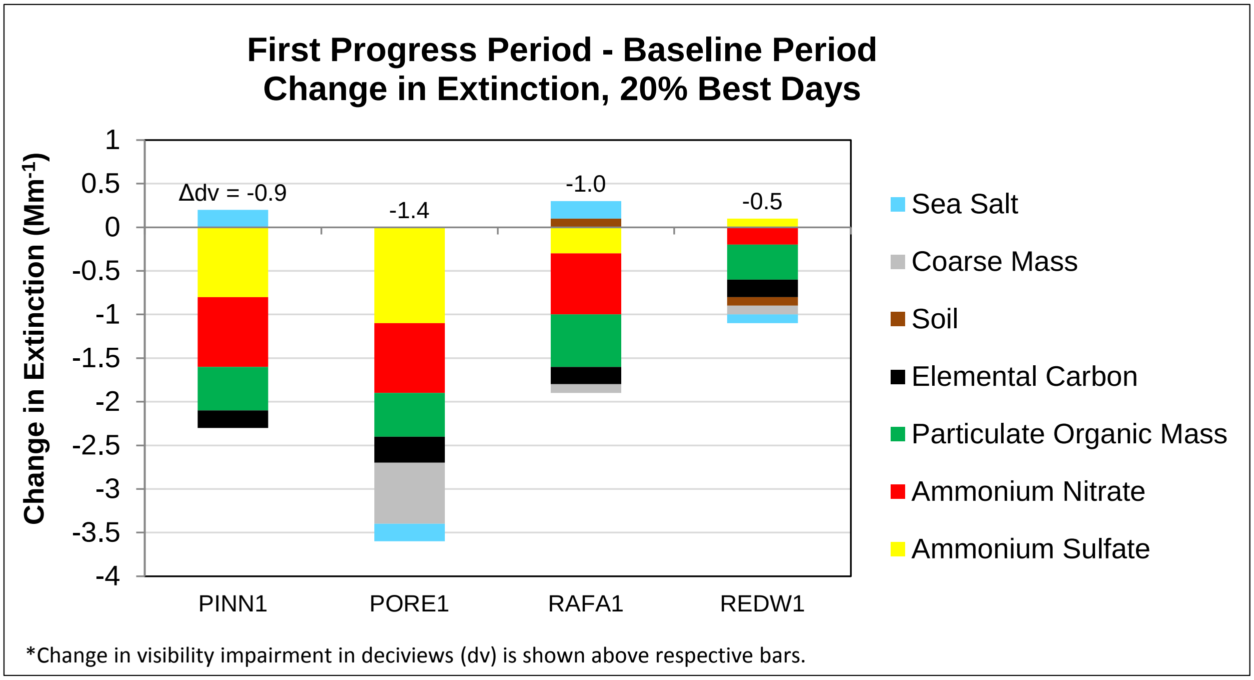

Figure 6.3-21. Difference between Average Extinction for Current Progress Period (2005-2009) and Baseline Period (2000-2004) for the Best (Least Impaired) Days Measured at California Class I Area IMPROVE Sites in the Coastal Region.

6.3.1.3 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 51.308 (g)(3)(iii))?*** 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 California are summarized in Table 6.3-6, and regional trends were presented earlier in Section 4.1.1.[3] 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.[4] 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 C. Additionally, this 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 California are as follows:

- Particulate organic mass was the largest contributor to increases in the 5-year dv metric for the 20% most impaired days at several sites in the Cascade and Sierra Nevada mountain regions. These events generally occurred during the summer months and were sporadic in nature. The largest regional particulate organic mass events were due to wildfires burning in the area during June and July 2008, with high measurements recorded at the TRIN1, LAVO1, SEQU1, YOSE1, and BLIS1 sites. A plot showing the spatial extent of high particulate organic mass measurements on

[3] 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)

[4] 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.

June 26, 2008 is presented in Section 4.1.2. A large wildfire actually destroyed the SAGA1 IMPROVE monitor in August 2009, and the SAGA1 site was not re-installed until September of 2011.

- Ammonium nitrate was the largest contributor to decreases in aerosol extinction for the worst days measured at the California sites. Annual average trends indicated decreasing trends for most sites, with the largest decreases recorded at the Southern California sites.
- 5-year average ammonium sulfate increased at most California sites, but annual average trends indicated statistically significant increasing trends only for the northern REDW1 and TRIN1 sites. Increasing trends on the worst days were also observed at the PORE1 and PINN1 sites, but the annual average trends for all days measured at these sites were not statistically significant. Increasing annual trends in ammonium sulfate were also observed at the nearby KALM1 and CRLA1 sites in southwest Oregon.

Table 6.3-6
California 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**
Northern California								
LABE1	20% Best	--	0.0	**-0.1**	0.0	--	0.0	0.0
	20% Worst	--	**-0.2**	--	--	--	--	0.0
	All Days	--	**-0.1**	--	--	--	--	0.0
LAVO1	20% Best	--	0.0	0.0	0.0	--	0.0	--
	20% Worst	--	**-0.3**	**1.6**	**0.1**	--	**0.2**	0.0
	All Days	--	**-0.1**	**0.2**	--	--	0.0	0.0
TRIN1	20% Best	--	0.0	--	0.0	--	--	0.0
	20% Worst	**0.2**	**-0.7**	--	--	--	**0.1**	--
	All Days	**0.1**	**-0.2**	--	--	0.0	0.0	0.0
Sierra California								
BLIS1	20% Best	--	0.0	--	0.0	--	0.0	--
	20% Worst	--	--	--	--	--	--	0.0
	All Days	--	**-0.1**	--	--	--	0.0	--
DOME1	20% Best	**-0.1**	--	--	0.0	--	**0.1**	0.0
	20% Worst	--	--	--	**-0.1**	--	--	0.0
	All Days	--	**-0.2**	--	**-0.1**	0.0	--	0.0
HOOV1	20% Best	--	0.0	--	0.0	0.0	--	0.0
	20% Worst	--	--	--	--	--	**-0.5**	--
	All Days	--	--	--	--	--	**-0.1**	0.0
KAIS1	20% Best	--	--	**-0.1**	**-0.1**	--	--	--
	20% Worst	--	--	--	--	--	--	--
	All Days	--	**-0.1**	--	**-0.1**	--	--	--
SEQU1	20% Best	--	--	**-0.1**	**-0.1**	0.0	--	0.0
	20% Worst	--	**-3.7**	--	**-0.3**	--	--	0.0
	All Days	**-0.2**	**-0.8**	**-0.4**	**-0.2**	0.0	**-0.1**	0.0
YOSE1	20% Best	--	0.0	**-0.1**	0.0	--	--	0.0
	20% Worst	--	**-0.5**	--	--	--	--	0.0
	All Days	**-0.1**	**-0.2**	--	0.0	--	--	--

--continued--

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

Table 6.3-6 (continued)
California 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**
Southern California								
AGTI1	20% Best	**-0.3**	**-0.4**	**-0.3**	**-0.1**	--	--	--
	20% Worst	**-1.1**	**-2.2**	**-0.6**	**-0.4**	--	**-0.2**	**0.2**
	All Days	**-0.7**	**-0.9**	**-0.4**	**-0.3**	0.0	--	**0.1**
JOSH1	20% Best	**-0.1**	**-0.1**	**-0.1**	0.0	--	0.0	0.0
	20% Worst	**-0.3**	**-2.5**	--	**-0.1**	--	**-0.3**	0.0
	All Days	--	**-0.9**	--	**-0.1**	--	**-0.1**	0.0
SAGA1	20% Best	--	--	--	**-0.1**	--	--	0.0
	20% Worst	--	**-3.0**	--	**-0.2**	**0.1**	--	--
	All Days	--	**-1.0**	**-0.1**	**-0.2**	--	--	--
SAGO1	20% Best	--	**-0.2**	**-0.1**	**-0.1**	--	**0.1**	--
	20% Worst	**-0.4**	**-3.1**	--	--	--	--	**0.1**
	All Days	**-0.1**	**-1.4**	--	**-0.1**	--	--	0.0
Coastal California								
PINN1	20% Best	**-0.2**	**-0.1**	**-0.1**	**-0.1**	--	0.0	--
	20% Worst	**0.4**	--	--	**-0.3**	--	**0.1**	**0.3**
	All Days	--	**-0.3**	**-0.2**	**-0.2**	--	--	**0.1**
PORE1	20% Best	**-0.2**	**-0.2**	**-0.1**	0.0	0.0	**-0.1**	--
	20% Worst	**0.7**	--	**-0.7**	**-0.3**	--	--	**0.7**
	All Days	--	**-0.6**	**-0.3**	**-0.1**	--	--	--
RAFA1	20% Best	0.0	**-0.1**	**-0.1**	**-0.1**	0.0	0.0	0.0
	20% Worst	--	**-0.3**	--	--	--	--	**0.2**
	All Days	--	**-0.3**	--	**-0.1**	--	--	**0.1**
REDW1	20% Best	--	0.0	**-0.1**	0.0	--	0.0	**-0.1**
	20% Worst	**0.9**	**-0.3**	--	**-0.1**	--	--	--
	All Days	**0.1**	**-0.1**	--	**-0.1**	--	0.0	--

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

6.3.2 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 6.3-7 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 6.3-7
California
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.

6.3.2.1 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 51.308 (g)(4))?*** 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 plan02c). 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 6.3-8 and Figure 6.3-22 present the differences between the 2002 and 2008 sulfur dioxide (SO_2) inventories by source category. Tables 6.3-9 and Figure 6.3-23 present data for oxides of nitrogen (NO_X), and subsequent tables and figures (Tables 6.3-10 through 6.3-15 and Figures 6.3-24 through 6.3-29) present data for ammonia (NH_3), volatile organic compounds (VOCs), primary organic aerosol (POA), elemental carbon (EC), fine soil and coarse mass. General observations regarding emissions inventory comparisons are listed below.

- Point source inventories showed decreases in all parameters except NH_3 and coarse mass. Note that NO_X reductions are consistent with the summary of annual EGU NO_X emissions is included in Section 6.3.2.2.
- Area source inventories showed increases in all parameters except VOCs, with the largest increases in NO_X, NH_3, and POA. These increases 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 large decreases in SO_2, NO_X, NH_3 and VOCs. These reductions are likely influenced by federal and state emissions standards that have already been implemented.
- Off-road mobile source inventories showed decreases in SO_2, NO_X, and VOCs, but slight increases in fine soil and coarse mass. Note that different off-road models were used to represent the different years, 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 decreases in NO_X and VOCs, but note that the WRAP Phase III oil and gas emission inventories did not include California basins, so current estimates are based on area source oil and gas emissions reported by the state.
- For most parameters, especially POAs, VOCs and EC, natural fire emission inventory estimates increased. 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, which was a high fire year in California.
- 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 combined fugitive/road dust inventories, and decreased for windblown dust. Large variability in changes in windblown dust was observed for all 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 6.3-8
California
Change in Sulfur Dioxide Emissions by Category

Source Category	**Sulfur Dioxide Emissions (tons/year)**		
	2002 (Plan02c)	**2008 (WestJump2008)**	**Difference (Percent Change)**
Anthropogenic Sources			
Point	42,227	27,325	-14,902
Area	8,257	9,562	1,305
On-Road Mobile	4,034	1,936	-2,098
Off-Road Mobile	7,554	428	-7,127
Area Oil and Gas	57	0	-57
Fugitive and Road Dust	0	0	0
Anthropogenic Fire	882	243	-639
Total Anthropogenic	**63,011**	**39,495**	**-23,516 (-37%)**
Natural Sources			
Natural Fire	9,840	17,151	7,311
Biogenic	0	0	0
Wind Blown Dust	0	0	0
Total Natural	**9,840**	**17,151**	**7,311 (74%)**
All Sources			
Total Emissions	**72,850**	**56,645**	**-16,205 (-22%)**

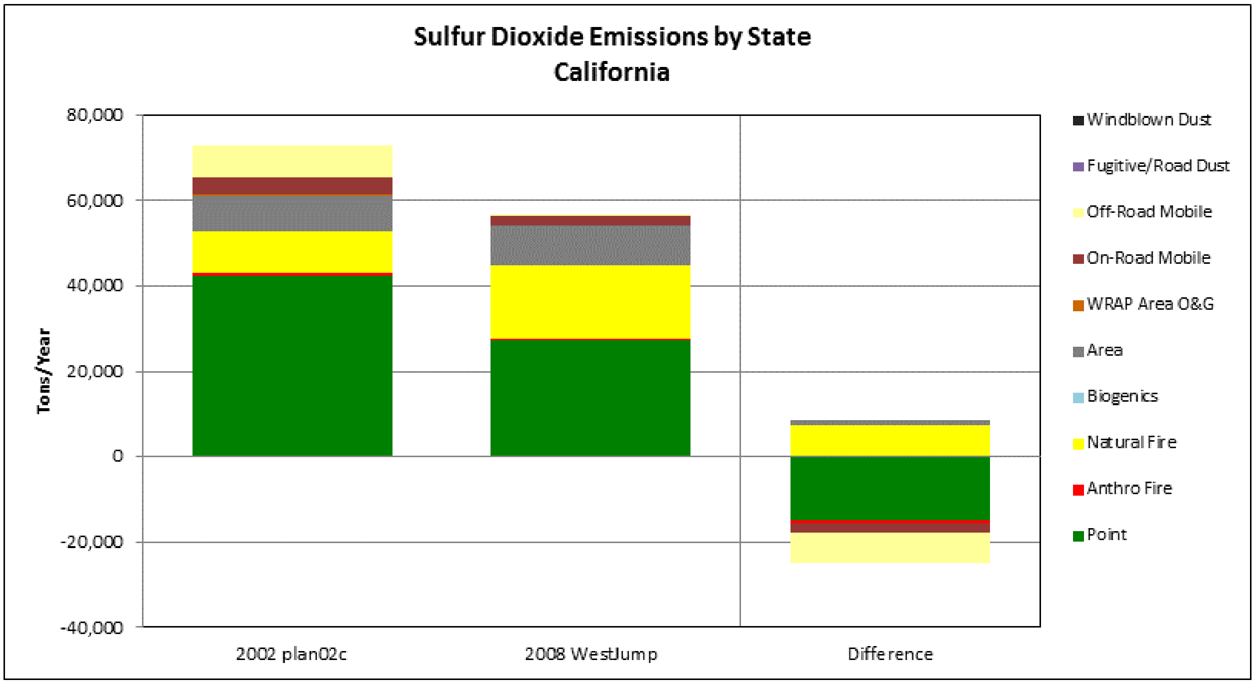

Figure 6.3-22. 2002 and 2008 Emission and Difference between Emissions Inventory Totals, for Sulfur Dioxide by Source Category for California.

Table 6.3-9
California
Change in Oxides of Nitrogen Emissions by Category

Source Category	Oxides of nitrogen Emissions (tons/year)		
	2002 (Plan02c)	2008 (WestJump2008)	Difference (Percent Change)
Anthropogenic Sources			
Point	104,991	94,740	-10,251
Area	106,399	153,233	46,834
On-Road Mobile	581,080	513,028	-68,052
Off-Road Mobile	328,300	233,142	-95,159
Area Oil and Gas	8,071	2,221	-5,851
Fugitive and Road Dust	0	0	0
Anthropogenic Fire	6,589	1,612	-4,978
Total Anthropogenic	**1,135,431**	**997,975**	**-137,456 (-12%)**
Natural Sources			
Natural Fire	35,975	121,138	85,163
Biogenic	57,068	18,218	-38,850
Wind Blown Dust	0	0	0
Total Natural	**93,043**	**139,356**	**46,313 (50%)**
All Sources			
Total Emissions	**1,228,474**	**1,137,331**	**-91,142 (-7%)**

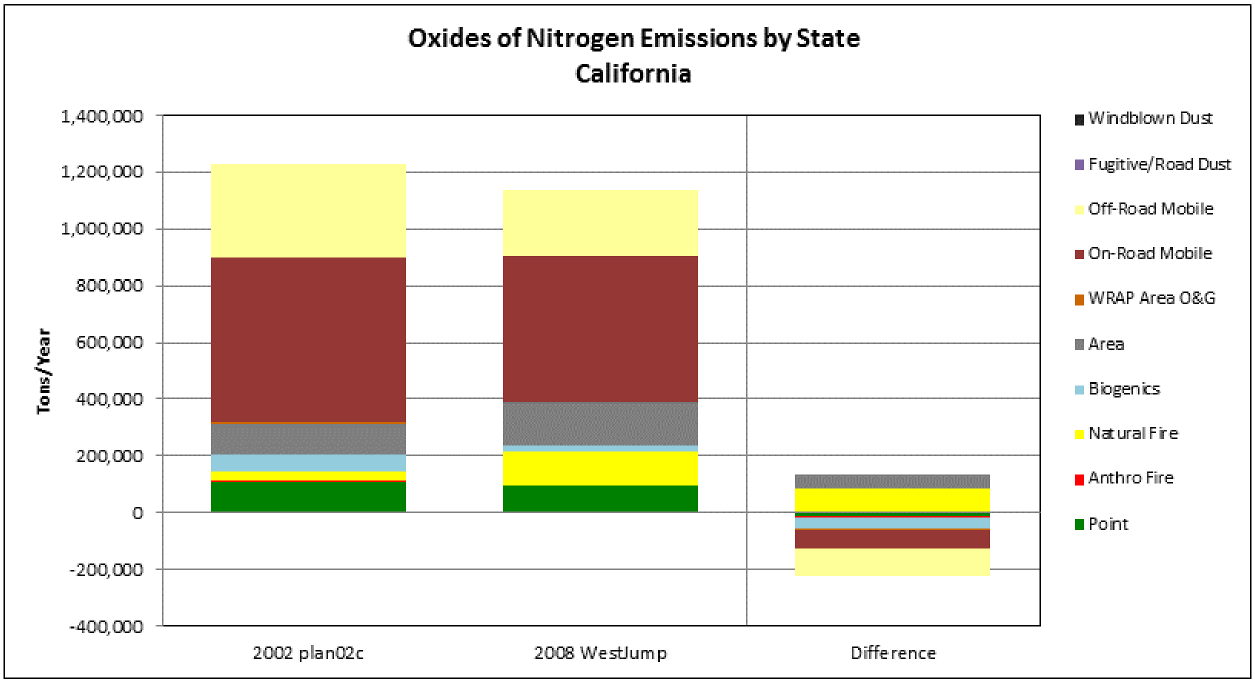

Figure 6.3-23. 2002 and 2008 Emission and Difference between Emissions Inventory Totals, for Oxides of nitrogen by Source Category for California.

Table 6.3-10
California
Ammonia Emissions by Category

Source Category	Ammonia Emissions (tons/year)		
	2002 (Plan02c)	2008 (WestJump2008)	Difference (Percent Change)
Anthropogenic Sources			
Point	433	11,590	11,156
Area	200,289	322,270	121,981
On-Road Mobile	22,118	8,729	-13,389
Off-Road Mobile	561	192	-369
Area Oil and Gas	0	0	0
Fugitive and Road Dust	0	0	0
Anthropogenic Fire	1,756	1,033	-723
Total Anthropogenic	**225,157**	**343,813**	**118,657 (53%)**
Natural Sources			
Natural Fire	7,595	84,489	76,894
Biogenic	0	0	0
Wind Blown Dust	0	0	0
Total Natural	**7,595**	**84,489**	**76,894 (>100%)**
All Sources			
Total Emissions	**232,752**	**428,302**	**195,550 (84%)**

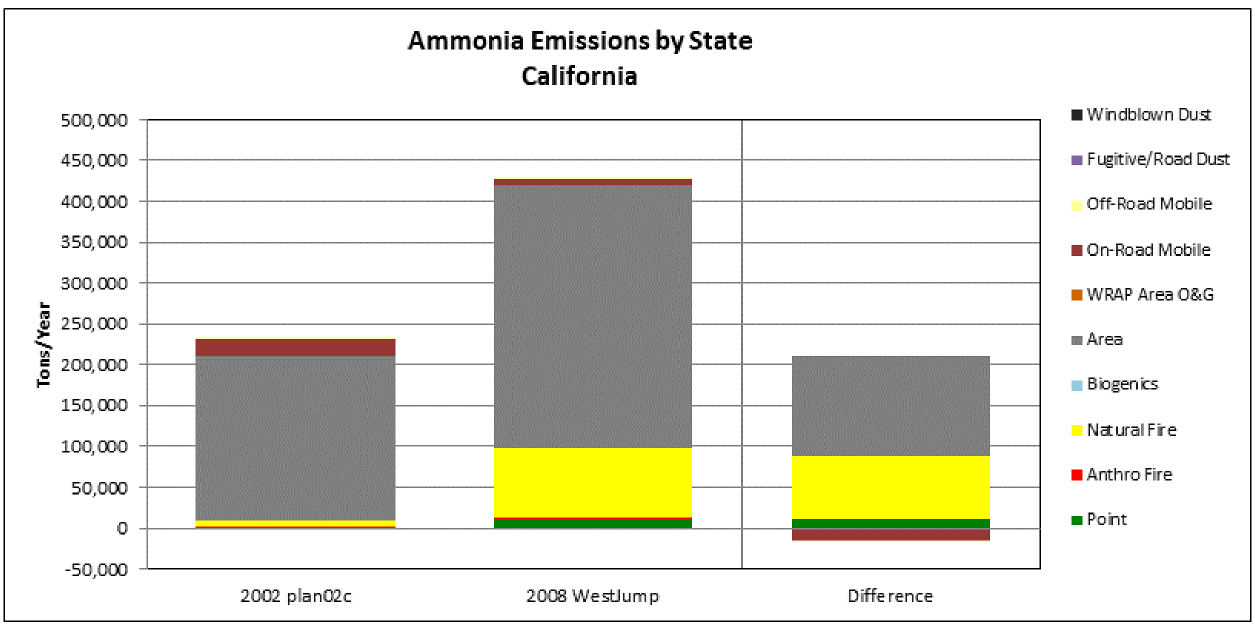

Figure 6.3-24. 2002 and 2008 Emission and Difference between Emissions Inventory Totals, for Ammonia by Source Category for California.

Table 6.3-11
California
Volatile Organic Compound Emissions by Category

Source Category	Volatile Organic Compounds Emissions (tons/year)		
	2002 (Plan02c)	2008 (WestJump2008)	Difference (Percent Change)
Anthropogenic Sources			
Point	54,632	42,303	-12,330
Area	325,054	297,201	-27,853
On-Road Mobile	324,943	198,383	-126,560
Off-Road Mobile	193,462	164,441	-29,021
Area Oil and Gas	18,709	15,149	-3,560
Fugitive and Road Dust	0	0	0
Anthropogenic Fire	10,060	2,318	-7,742
Total Anthropogenic	**926,860**	**719,795**	**-207,066 (-22%)**
Natural Sources			
Natural Fire	78,945	128,362	49,417
Biogenic	2,811,253	1,230,279	-1,580,974
Wind Blown Dust	0	0	0
Total Natural	**2,890,198**	**1,358,641**	**-1,531,557 (-53%)**
All Sources			
Total Emissions	**3,817,058**	**2,078,435**	**-1,738,622 (-46%)**

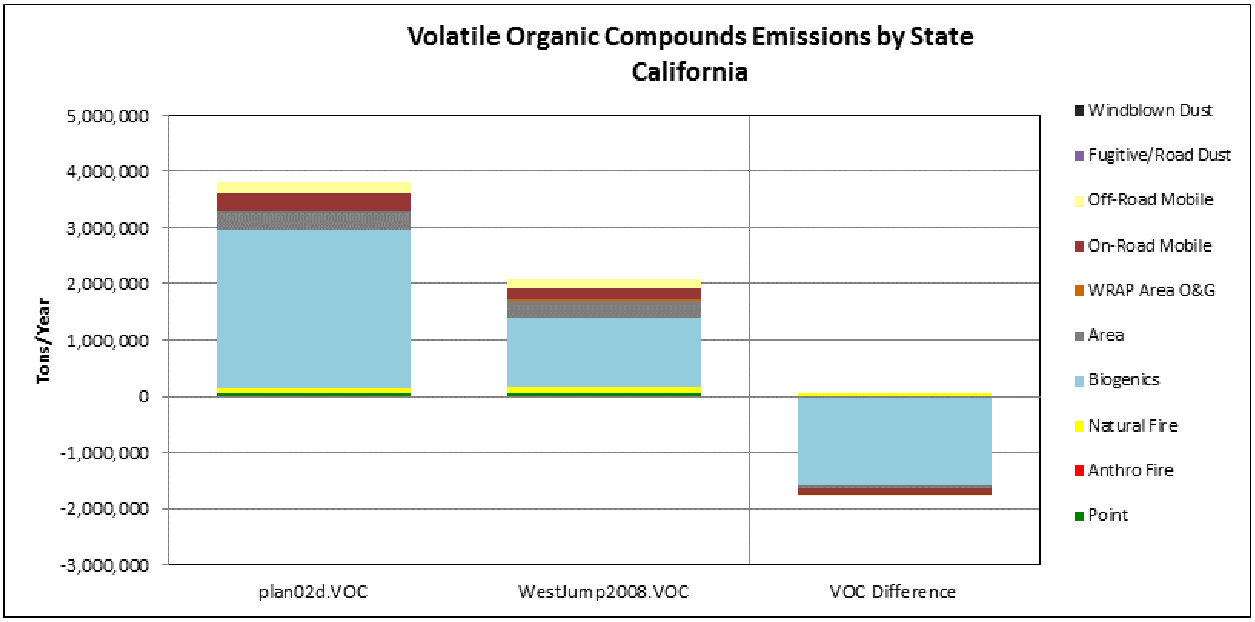

Figure 6.3-25. 2002 and 2008 Emission and Difference between Emissions Inventory Totals, for Volatile Organic Compounds by Source Category for California.

Table 6.3-12
California
Primary Organic Aerosol Emissions by Category

Source Category	Primary Organic Aerosol Emissions (tons/year)		
	2002 (Plan02c)	**2008 (WestJump2008)**	**Difference (Percent Change)**
Anthropogenic Sources			
Point*	5,515	286	-5,229
Area	33,807	50,127	16,320
On-Road Mobile	8,059	**	**
Off-Road Mobile	5,932	6,014	82
Area Oil and Gas	8	0	-8
Fugitive and Road Dust	2,126	2,498	372
Anthropogenic Fire	9,052	2,681	-6,371
Total Anthropogenic	**56,440****	**61,606****	**5,166 (9%)****
Natural Sources			
Natural Fire	92,097	248,841	156,744
Biogenic	0	0	0
Wind Blown Dust	0	0	0
Total Natural	**92,097**	**248,841**	**156,744 (>100%)**
All Sources			
Total Emissions	**148,537**	**310,447**	**161,910 (>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/).
**Sums and differences do not include on-road emissions, as 2008 inventory primary organic aerosol totals were not available from this source for comparison purposes.

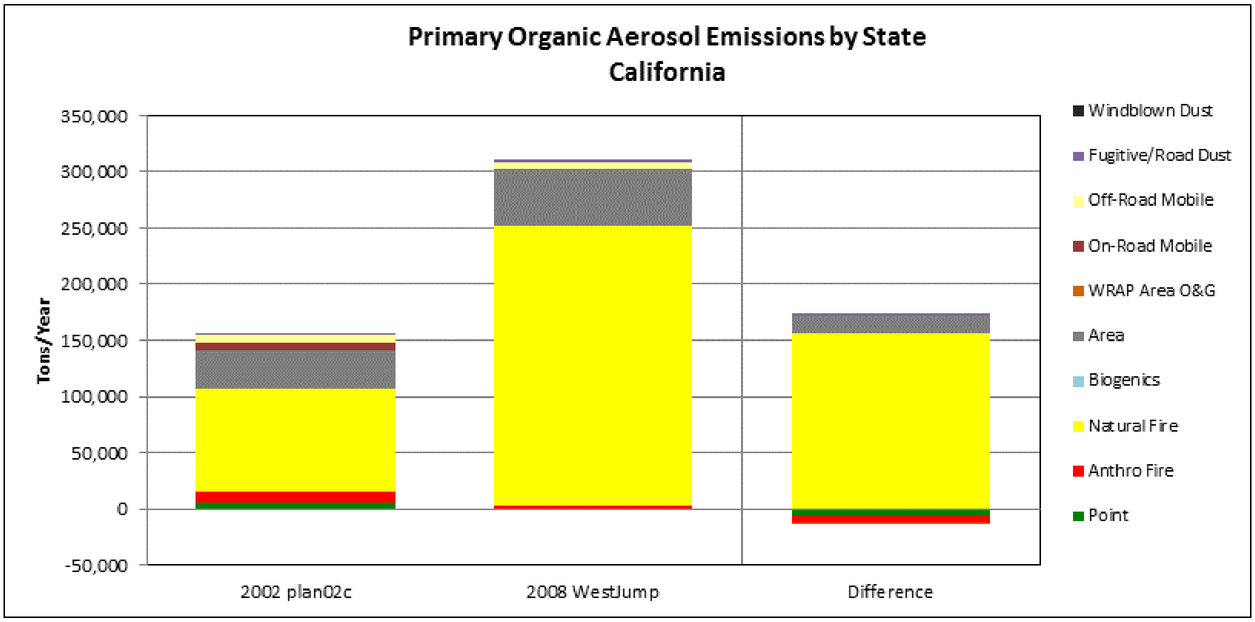

Figure 6.3-26. 2002 and 2008 Emission and Difference between Emissions Inventory Totals, for Primary Organic Aerosol by Source Category for California.

Table 6.3-13
California
Elemental Carbon Emissions by Category

Source Category	Elemental Carbon Emissions (tons/year)		
	2002 (Plan02c)	**2008 (WestJump2008)**	**Difference (Percent Change)**
Anthropogenic Sources			
Point*	933	370	-563
Area	4,671	7,019	2,348
On-Road Mobile	9,560	**	**
Off-Road Mobile	12,018	8,165	-3,853
Area Oil and Gas	0	0	0
Fugitive and Road Dust	177	72	-105
Anthropogenic Fire	1,038	442	-596
Total Anthropogenic	**18,837****	**16,068****	**-2,769 (-15%)****
Natural Sources			
Natural Fire	19,078	36,994	17,915
Biogenic	0		0
Wind Blown Dust	0		0
Total Natural	**19,078**	**36,994**	**17,915 (94%)**
All Sources			
Total Emissions	**37,915****	**53,062****	**15,147 (40%)****

*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/).

**Sums and differences do not include on-road emissions, as 2008 inventory elemental carbon totals were not available from this source for comparison purposes.

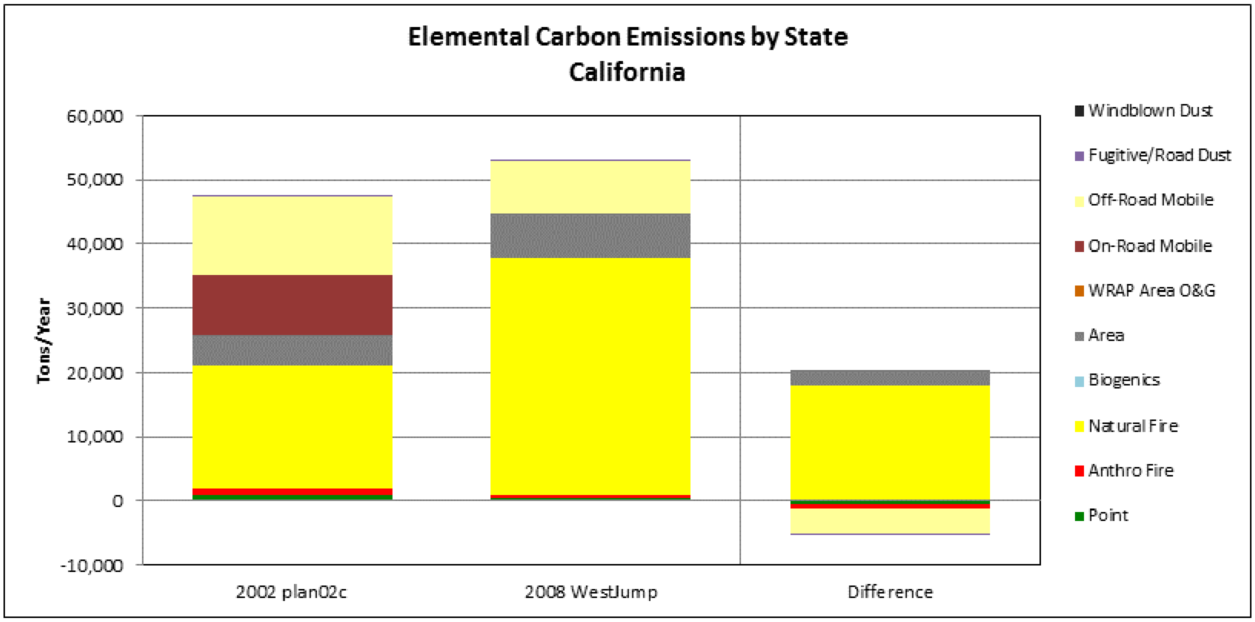

Figure 6.3-27. 2002 and 2008 Emission and Difference between Emissions Inventory Totals, for Elemental Carbon by Source Category for California.

Table 6.3-14
California
Change in Fine Soil Emissions by Category

Source Category	Fine Soil Emissions (tons/year)		
	2002 (Plan02c)	**2008 (WestJump2008)**	**Difference (Percent Change)**
Anthropogenic Sources			
Point*	10,537	208	-10,330
Area	20,678	24,063	3,385
On-Road Mobile	2,125	**	**
Off-Road Mobile	0	423	423
Area Oil and Gas	134	5	-129
Fugitive and Road Dust	23,629	36,701	13,072
Anthropogenic Fire	2,562	1,014	-1,548
Total Anthropogenic	**57,540****	**62,414****	**4,874 (8%)****
Natural Sources			
Natural Fire	5,880	90,876	84,995
Biogenic	0	0	0
Wind Blown Dust	8,137	12,133	3,997
Total Natural	**14,017**	**103,009**	**88,992 (>100%)**
All Sources			
Total Emissions	**71,557****	**165,423****	**93,866 (>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/).
**Sums and differences do not include on-road emissions, as 2008 inventory fine soil totals were not available from this source for comparison purposes.

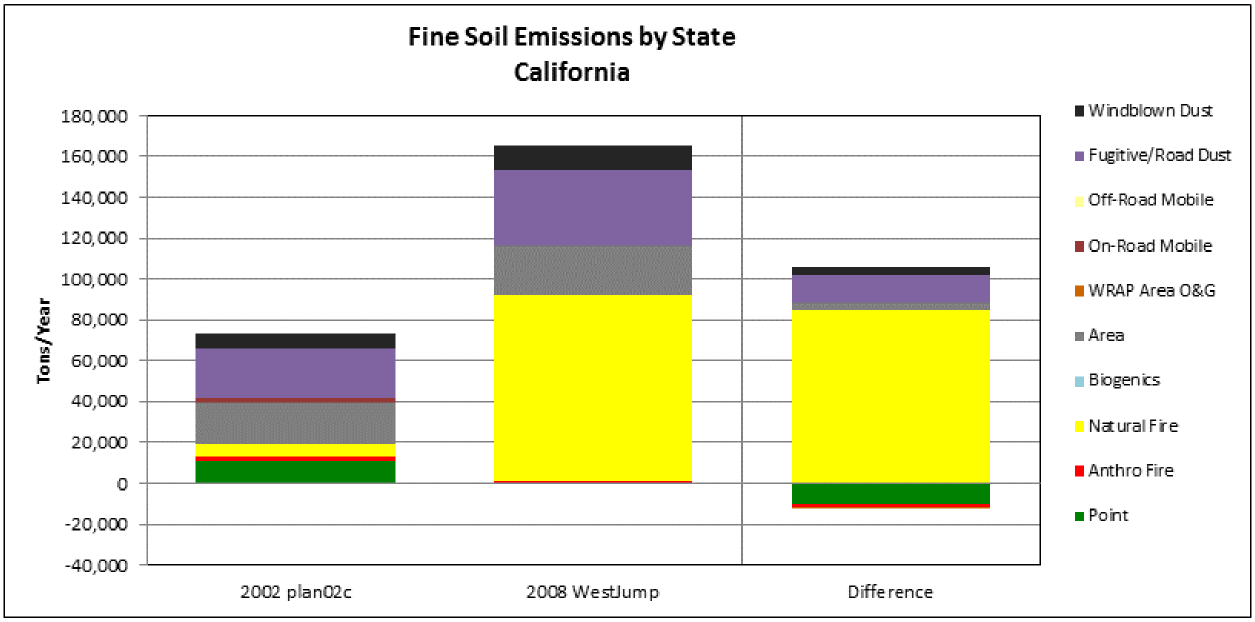

Figure 6.3-28. 2002 and 2008 Emission and Difference between Emissions Inventory Totals, for Fine Soil by Source Category for California.

Table 6.3-15
California
Coarse Mass Emissions by Category

Source Category	Coarse Mass Emissions (tons/year)		
	2002 (Plan02c)	**2008 (WestJump2008)**	**Difference (Percent Change)**
Anthropogenic Sources			
Point*	10,172	15,941	5,770
Area	11,886	19,571	7,685
On-Road Mobile	5,075	*	*
Off-Road Mobile	0	2,174	2,174
Area Oil and Gas	0	0	0
Fugitive and Road Dust	177,621	292,800	115,179
Anthropogenic Fire	1,164	421	-743
Total Anthropogenic	**200,843****	**330,907****	**130,064 (65%)****
Natural Sources			
Natural Fire	23,124	47,647	24,524
Biogenic	0	0	0
Wind Blown Dust	73,230	109,203	35,973
Total Natural	**96,354**	**156,850**	**60,497 (63%)**
All Sources			
Total Emissions	**297,197****	**487,757****	**190,560 (64%)****

*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/).
**Sums and differences do not include on-road emissions, as 2008 inventory coarse mass totals were not available from this source for comparison purposes.

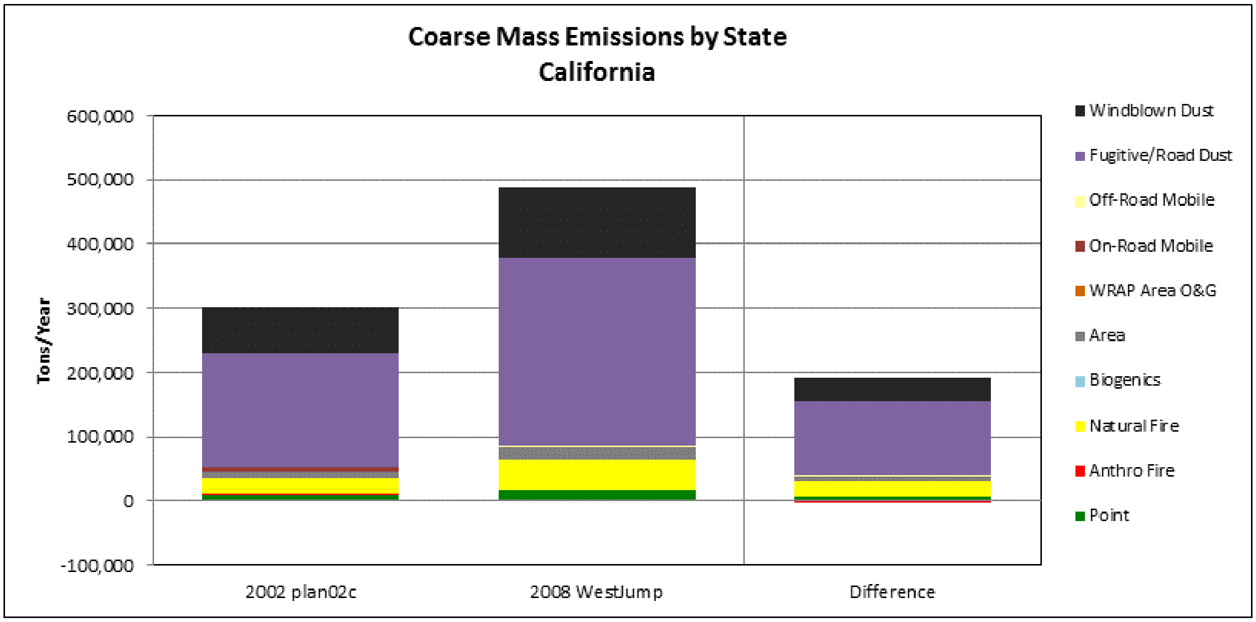

Figure 6.3-29. 2002 and 2008 Emission and Difference between Emissions Inventory Totals, for Coarse Mass by Source Category for California.

6.3.2.2 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 California 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 6.3-30 presents a sum of annual NO_X and SO_2 emissions as reported for California 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 very little reported for SO_2 emissions, and periods of sharp decline for NO_X, especially between 2000 and 2004. In California, low SO_2 EGU emissions is likely due to the fact that very few of the boilers burn oil as an energy source, and California switched to low SO_X rules earlier that federal requirements.

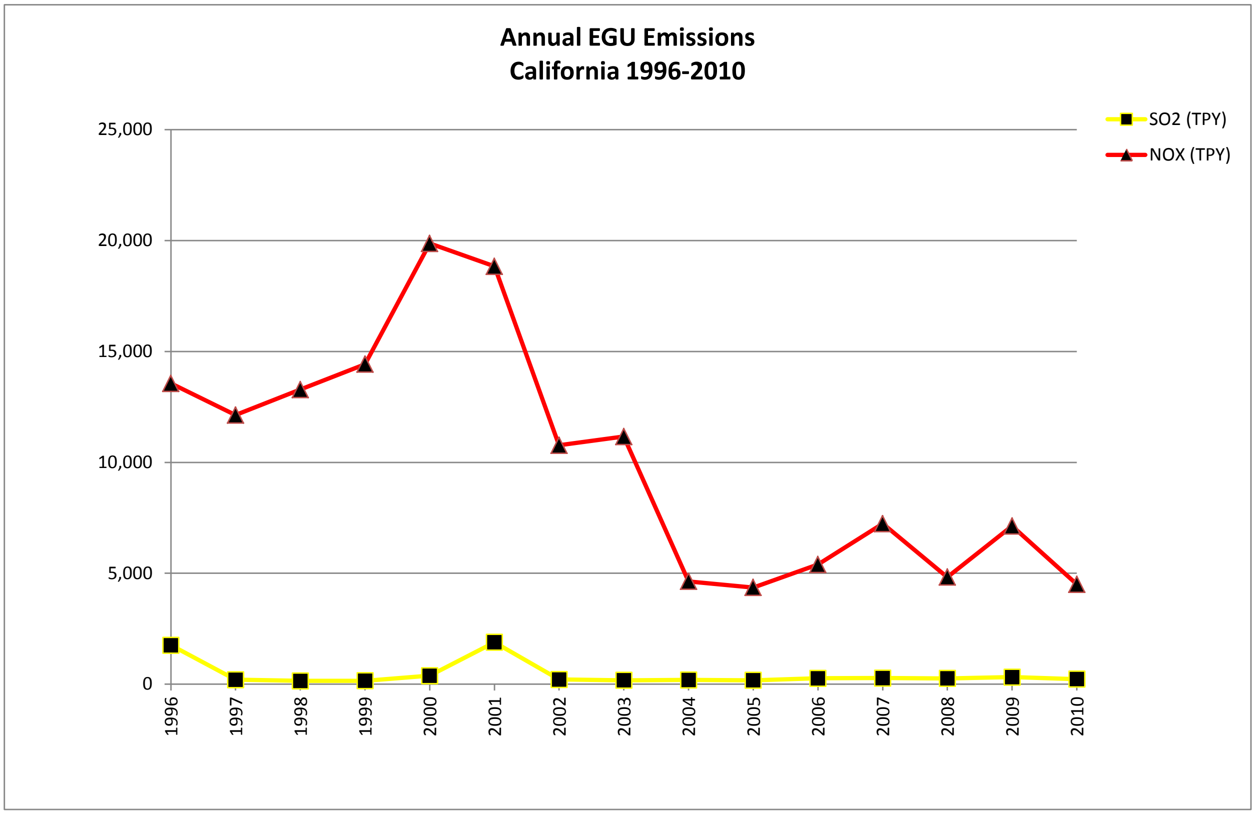

Figure 6.3-30. Sum of EGU Emissions of SO_2 and NO_X reported between 1996 and 2010 for California.