

Appendix C: Pollutants Causing Visibility Impairment

Appendix to Chapter 7 of the State Implementation Plan

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Overview of data sources

The data relied upon for Chapter 7 came from the WRAP TSS website and is available at:

<http://vista.cira.colostate.edu/TSS/Results/HazePlanning.aspx>

By selecting a location from the map, views are given the option of viewing monitoring, emission inventory or modeling data. For this Chapter monitoring data for the individual Class I areas. The TSS website allows users to view information in a stack bar or line graph for the 20% best or worst days, by pollutant in either dv or concentration levels.

The “The Class I Summary Table” option was used to develop information for the statewide and individual Class I “Aerosol Light Extinction” 3-D bar graphs as in Figure 7-1 data.

Information for the pie charts in Chapter 7 utilized the TSS monitoring data from the base year 2002 worst 20% days. The data is available by selecting the Class I are of interest from the TSS website map, then select “Monitoring” from the box below. Select “Total Light Extinction Time Series” and the pollutant and years of interest from the pull down table. If the data isn’t displayed below the graph, click on “+Show Data.”

Statewide Base Year Aerosol Light Extinction

Figure 7-1 Data

Idaho Class I Area Base Year Aerosol Light Extinction					
	2000-04 Baseline Conditions Craters of the Moon	2000-04 Baseline Conditions Hells Canyon	2000-04 Baseline Conditions Sawtooth Wilderness	2000-04 Baseline Conditions Selway Wilderness	2000-04 Baseline Conditions Yellowstone
	(Mm-1)	(Mm-1)	(Mm-1)	(Mm-1)	(Mm-1)
Amm. Sulfate	5.69	8.37	3.06	4.83	4.26
Amm. Nitrate	11.35	28.47	0.63	1.46	1.77
Organic Carbon	9.06	15.6	22.24	20.01	13.48
Elemental Carbon	1.92	3.06	4.2	2.52	2.48
Fine Soil	1.04	0.66	0.77	0.94	0.95
Coarse Material ³	2.95	1.93	1.74	2.49	2.58
Sea Salt ³	0.03	0.05	0.12	0.26	0.02
Total Light Extinction	42.05	56.21	42.77	42.52	34.55
Deciview	14	18.55	13.78	13.41	11.76

Craters of the Moon Data

Data Figure 7-2

Craters of the Moon NM 2002 20% Worst Days										
Site	Method	Year	N	SO4 Extinction	NO3 Extinction	OMC Extinction	EC Extinction	Soil Extinction	CM Extinction	SeaSalt Extinction
CRMO1	NIA	2001	21	7.99	16.02	4.3	1.4	1.36	2.76	0
CRMO1	NIA	2002	23	4.49	13.84	10.68	2.06	1.05	2.68	0.01
CRMO1	NIA	2003	21	4.23	6.92	14.77	2.53	0.86	3.46	0
CRMO1	NIA	2004	23	6.07	8.61	6.49	1.69	0.9	2.89	0.12

Data Figure 7-10

Class I Area Visibility Summary: Craters of the Moon NM, ID								
Visibility Conditions: Worst 20% Days								
RRF Calculation Method: Specific Days (EPA)								
Emissions Scenarios: 2000-04 Baseline (plan02d) & 2018 PRPb (prp18b)								
	Monitored		Estimated		Projected			
	2000-04 Baseline Conditions	2018 Uniform Rate of Progress Target	2064 Natural Conditions	2018 Uniform Rate of Progress Target	2018 Projected Visibility Conditions	Baseline to 2018 Change In Statewide Emissions	Baseline to 2018 Change In Upwind Weighted Emissions ²	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions ²
	(Mm-1)	(Mm-1) ¹	(Mm-1)	(Mm-1) ¹	(Mm-1)	(tons / %)	(%)	(%)
Amm. Sulfate	5.69	4.39	0.83	4.39	5.35	-13,272 -34%	-25%	-30%
Amm. Nitrate	11.35	8.31	1.05	8.31	8.3	-32,418 -19%	-27%	-34%
Organic Carbon	9.06	7.73	3.98	7.73	8.73	-4,416 -8%	-5%	-25%
Elemental Carbon	1.92	1.54	0.36	1.54	1.51	-2,084 -15%	-17%	-50%
Fine Soil	1.04	1.08	1.2	1.08	1.23	2,350 16%	9%	15%
Coarse Material ³	2.95	3.2	4.05	3.2	Not Applicable	13,507 20%	12%	27%
Sea Salt ³	0.03	0.04	0.06	0.04				
Total Light Extinction	32.04	26.29	11.53	35.96	38.11	Not Applicable		
Deciview	14	12.49	7.53	12.49	13.06			
Reduction Needed		5.75	20.51					
Base year and reduction in dv	14	1.51	6.47					

Hells Canyon Wilderness Data

Data Figure 7-11

Hells Canyon Wilderness Area 20% Worst Days Light Extinction										
Site	Method	Year	N	SO4 Extinction	NO3 Extinction	OMC Extinction	EC Extinction	Soil Extinction	CM Extinction	SeaSalt Extinction
HECA1	NIA	2001	23	9.95	32.88	11.36	2.94	0.68	1.35	0
HECA1	NIA	2002	22	6.58	20.03	20.75	3.69	0.75	1.96	0.01
HECA1	NIA	2004	25	8.59	32.5	14.71	2.55	0.56	2.48	0.13

Data Figure 7-17

Hells Canyon Wilderness Area 20% Best Days Light Extinction										
Site	Method	Year	N	SO4 Extinction	NO3 Extinction	OMC Extinction	EC Extinction	Soil Extinction	CM Extinction	SeaSalt Extinction
HECA1	NIA	2001	22	2.21	1.03	1.61	0.55	0.24	0.7	0.11
HECA1	NIA	2002	21	1.91	0.79	2.29	0.74	0.32	0.9	0.04
HECA1	NIA	2004	24	1.68	0.53	2.14	0.46	0.19	0.81	0.08

Data Figure7-19

Class I Area Visibility Summary: Hells Canyon W, ID							
Visibility Conditions: Worst 20% Days							
RRF Calculation Method: Specific Days (EPA)							
Emissions Scenarios: 2000-04 Baseline (plan02d) & 2018 PRPb (prp18b)							
	Monitored		Estimated	Projected			
	2000-04 Baseline Conditions	2018 Uniform Rate of Progress Target	2064 Natural Conditions	2018 Projected Visibility Conditions	Baseline to 2018 Change In Statewide Emissions	Baseline to 2018 Change In Upwind Weighted Emissions ²	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions ²
	(Mm-1)	(Mm-1) ¹	(Mm-1)	(Mm-1)	(tons / %)	(%)	(%)
Amm. Sulfate	8.37	6.35	1.14	7.49	-20,912 -40%	-29%	-38%
Amm. Nitrate	28.47	19.69	2.67	19.91	-96,079 -37%	-22%	-30%
Organic Carbon	15.6	12.12	3.69	11.54	-3,120 -3%	-12%	-31%
Elemental Carbon	3.06	2.37	0.37	2.65	-3,043 -11%	-21%	-44%
Fine Soil	0.66	0.72	0.92	0.74	-909 -3%	10%	15%
Coarse Material ³	1.93	2.26	3.4	Not Applicable	31,039 47%	12%	27%
Sea Salt ³	0.05	0.05	0.05				
Needed Improvement	0	14.58	45.9				
Sea Salt ³	0.05	0.05	0.05				
Total Light Extinction	58.14	43.56	12.24	55.31	Not Applicable		
Deciview	18.55	16.17	8.32	16.49			
Dv needed	0	2.38	10.23				

Sawtooth Wilderness Data

Data Figure 7-20

Sawtooth Wilderness Area 20% Worst Days Light Extinction										
Site	Method	Year	N	SO4 Extinction	NO3 Extinction	OMC Extinction	EC Extinction	Soil Extinction	CM Extinction	SeaSalt Extinction
SAWT1	NIA	2001	22	3.47	0.79	23.94	5.63	1.07	2.33	0.28
SAWT1	NIA	2002	22	2.13	0.57	22.51	4.95	0.76	1.55	0
SAWT1	NIA	2003	23	2.6	0.54	21.59	2.85	0.45	1.57	0.21
SAWT1	NIA	2004	24	4.05	0.62	20.92	3.38	0.8	1.52	0.01

Data Figure 7-28

Sawtooth Wilderness Area 20% Best Days Light Extinction										
Site	Method	Year	N	SO4 Extinction	NO3 Extinction	OMC Extinction	EC Extinction	Soil Extinction	CM Extinction	SeaSalt Extinction
SAWT1	NIA	2001	22	1.74	0.36	2.81	0.88	0.14	0.33	0.04
SAWT1	NIA	2002	21	1.12	0.32	2.13	0.58	0.16	0.31	0
SAWT1	NIA	2003	22	0.83	0.22	1.92	0.46	0.09	0.31	0
SAWT1	NIA	2004	23	1.12	0.28	2.63	0.56	0.17	0.33	0.02

Figure 7-30

Class I Area Visibility Summary: Sawtooth W, ID								
Visibility Conditions: Worst 20% Days								
RRF Calculation Method: Specific Days (EPA)								
Emissions Scenarios: 2000-04 Baseline (plan02d) & 2018 PRPb (prp18b)								
	Monitored		Estimated		Projected			
	2000-04 Baseline Conditions	2018 Uniform Rate of Progress Target	2064 Natural Conditions		2018 Projected Visibility Conditions	Baseline to 2018 Change In Statewide Emissions	Baseline to 2018 Change In Upwind Weighted Emissions ²	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions ²
	(Mm-1)	(Mm-1) ¹	(Mm-1)		(Mm-1)	(tons / %)	(%)	(%)
Amm. Sulfate	3.06	2.5	0.81		2.59	-13,272 -34%	-27%	-35%
Amm. Nitrate	0.63	0.65	0.7		0.54	-32,418 -19%	-25%	-32%
Organic Carbon	22.24	16.51	3.94		20.81	-4,416 -8%	-7%	-26%
Elemental Carbon	4.2	3.2	0.38		3.73	-2,084 -15%	-16%	-44%
Fine Soil	0.77	0.81	0.94		0.79	2,350 16%	12%	18%
Coarse Material ³	1.74	1.89	2.39		Not Applicable	13,507 20%	15%	31%
Sea Salt ³	0.12	0.12	0.13					
Total Light Extinction	32.76	25.68	9.29		40.32	Not Applicable		
Deciview	13.78	12.06	6.42		13.22			
Reduction Needed	0	7.08	23.47					
Reduction Needed dv		1.72	7.36					

Selway-Bitterroot Data

Data Figure 7-31

Selway-Bitterroot Wilderness Area 20% Worst Days Light Extinction										
Site	Method	Year	N	SO4 Extinction	NO3 Extinction	OMC Extinction	EC Extinction	Soil Extinction	CM Extinction	SeaSalt Extinction
SULA1	NIA	2001	24	4.78	1.26	11.47	1.95	1.56	3.7	1.01
SULA1	NIA	2002	24	4.63	1.58	12.59	2.05	0.91	2.45	0
SULA1	NIA	2003	23	4.78	1.57	43.26	4.34	0.59	1.75	0
SULA1	NIA	2004	24	5.14	1.45	12.73	1.75	0.69	2.08	0.01

Data Figure 7-39

Selway-Bitterroot Wilderness Area 20% Best Days Light Extinction										
Site	Method	Year	N	SO4 Extinction	NO3 Extinction	OMC Extinction	EC Extinction	Soil Extinction	CM Extinction	SeaSalt Extinction
SULA1	NIA	2001	23	1.32	0.43	0.96	0.29	0.21	0.3	0.1
SULA1	NIA	2002	23	1.14	0.39	1.02	0.32	0.07	0.21	0
SULA1	NIA	2003	22	0.69	0.18	0.77	0.16	0.04	0.13	0.01
SULA1	NIA	2004	23	1.23	0.36	0.99	0.33	0.06	0.21	0.01

Data Figure 7-41

Class I Area Visibility Summary: Anaconda-Pintler W, MT: Selway-Bitterroot W, MT							
Visibility Conditions: Worst 20% Days							
RRF Calculation Method: Specific Days (EPA)							
Emissions Scenarios: 2000-04 Baseline (plan02d) & 2018 PRPb (prp18b)							
	Monitored		Estimated	Projected			
	2000-04 Baseline Conditions	2018 Uniform Rate of Progress Target	2064 Natural Conditions	2018 Projected Visibility Conditions	Baseline to 2018 Change In Statewide Emissions	Baseline to 2018 Change In Upwind Weighted Emissions ²	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions ²
	(Mm-1)	(Mm-1) ¹	(Mm-1)	(Mm-1)	(tons / %)	(%)	(%)
Amm. Sulfate	4.83	3.86	1.1	4.32	-6,128 -12%	-15%	-29%
Amm. Nitrate	1.46	1.38	1.12	0.96	-63,099 -26%	-21%	-37%
Organic Carbon	20.01	15.46	4.84	19.09	-1,587 -3%	-2%	-20%
Elemental Carbon	2.52	2	0.43	2.4	-1,971 -17%	-6%	-39%
Fine Soil	0.94	0.93	0.91	1.02	5,807 14%	10%	17%
Coarse Material ³	2.49	2.54	2.7	Not Applicable	54,709 19%	13%	33%
Sea Salt ³	0.26	0.26	0.27				
Reduction Needed	0	6.08	21.14				
Total Light Extinction	32.51	26.43	11.37	40.54			
Deciview	13.41	12.02	7.43	12.94	Not Applicable		
Dv needed	0	1.39	5.98				

Yellowstone National Park

Data Figure 7-42

Yellowstone National Park Area 20% Worst Days Light Extinction										
Site	Method	Year	N	SO4 Extinction	NO3 Extinction	OMC Extinction	EC Extinction	Soil Extinction	CM Extinction	SeaSalt Extinction
YELL2	NIA	2000	20	4.16	1.97	18.45	3.65	0.8	2.84	0
YELL2	NIA	2001	22	4.71	2.36	16.11	2.61	1.39	2.69	0
YELL2	NIA	2002	22	3.8	1.63	11.16	1.87	1.21	3.12	0.03
YELL2	NIA	2003	21	4.07	1.43	12.8	2.33	0.44	1.3	0
YELL2	NIA	2004	23	4.57	1.46	8.89	1.94	0.92	2.94	0.07

Data Figure 7-50

Yellowstone National Park Area 20% Best Days Light Extinction										
Site	Method	Year	N	SO4 Extinction	NO3 Extinction	OMC Extinction	EC Extinction	Soil Extinction	CM Extinction	SeaSalt Extinction
YELL2	NIA	2000	19	1.68	0.88	1.13	0.15	0.09	0.25	0.05
YELL2	NIA	2001	21	1.92	0.76	1.16	0.4	0.12	0.19	0
YELL2	NIA	2002	21	1.32	0.82	1.14	0.31	0.13	0.27	0
YELL2	NIA	2003	20	1.12	0.53	0.92	0.24	0.09	0.24	0
YELL2	NIA	2004	22	1.33	0.62	1.27	0.46	0.08	0.26	0.02

Data Figure 7-51

Class I Area Visibility Summary: Grand Teton NP, WY: Red Rock Lakes NWRW, MT: Teton W, WY: Yellowstone NP, WY							
Visibility Conditions: Worst 20% Days							
RRF Calculation Method: Specific Days (EPA)							
Emissions Scenarios: 2000-04 Baseline (plan02d) & 2018 PRPb (prp18b)							
	Monitored		Estimated	Projected			
	2000-04 Baseline Conditions	2018 Uniform Rate of Progress Target	2064 Natural Conditions	2018 Projected Visibility Conditions	Baseline to 2018 Change In Statewide Emissions	Baseline to 2018 Change In Upwind Weighted Emissions ²	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions ²
	(Mm-1)	(Mm-1) ¹	(Mm-1)	(Mm-1)	(tons / %)	(%)	(%)
Amm. Sulfate	4.26	3.35	0.76	3.71	-22,794 -15%	-26%	-32%
Amm. Nitrate	1.77	1.5	0.63	1.36	-39,861 -14%	-26%	-34%
Organic Carbon	13.48	11.02	4.61	12.87	-730 -3%	-4%	-29%
Elemental Carbon	2.48	1.97	0.43	2.2	-1,217 -15%	-11%	-50%
Fine Soil	0.95	0.97	1.02	1.04	5,223 31%	14%	25%
Coarse Material ³	2.58	2.67	2.99	Not Applicable	13,394 27%	19%	42%
Sea Salt ³	0.02	0.02	0.03		Not Applicable		
Reductions Needed	0	4.04	15.07				
Total Light Extinction	25.54	21.5	10.47	32.77			
Deciview	11.76	10.52	6.44	11.23			
Deciview needed	0	1.24	5.32				