

Visibility Data Assessment

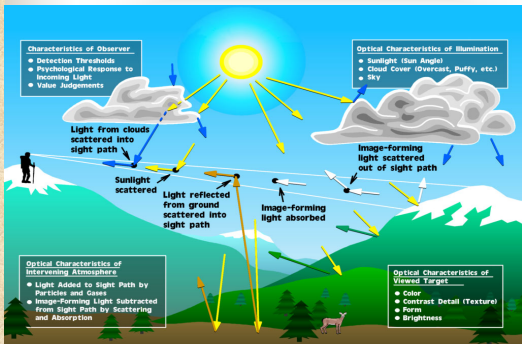
Wyoming's Long Term Strategy
for Visibility Protection
2003 Draft Review Report

Air Quality Advisory Board Meeting - April 22, 2003
Darla Potter

Overview

- Visibility
- IMPROVE Trends Analysis
- Visibility Monitoring Data Assessment
 - Wyoming IMPROVE Sites
 - Aerosol Concentration
 - Aerosol Extinction
 - Regional IMPROVE Sites
 - Green River Basin Visibility Study
 - Optical Monitoring Data

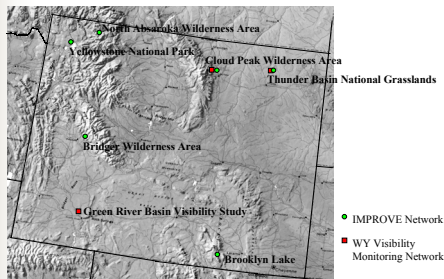
The Seeing of a Landscape Feature



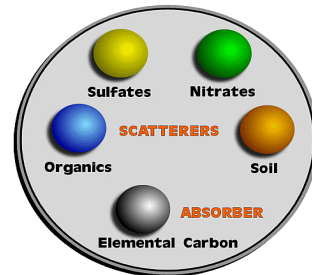
Visibility Monitoring

- Visibility characterization by scene monitoring with automatic cameras.
- Measurement of light scattering and extinction with nephelometers and transmissometers.
- Measurement of air particles that produce the light extinction with aerosol samplers.

Wyoming Visibility Monitoring Sites



Fine Pollutant Species



General Source List

(does not represent all sources of pollutants in any Class I or Class II area)

- **Ammonium Sulfate**
 - Coal Fired Power Plants and Boilers, Sour Gas Processing and Flaring, Refining Activities
- **Ammonium Nitrate**
 - Combustion Sources (boilers, heaters, compressor engines), Mobile Sources (gasoline and diesel fueled)
- **Organic Carbon**
 - Prescribed and Wild Fires, Residential Fuel Combustion, Mobile Sources (gasoline and diesel fueled), Petroleum Production and Processing, Biogenic Emissions (produced by vegetation)
- **Elemental Carbon**
 - Mobile Sources (diesel fueled), Prescribed and Wild Fires, Residential Fuel Combustion
- **Fine Soil**
 - Dust, Mineral Processing and Mining
- **Coarse Mass**
 - Dust, Prescribed and Wild Fires, Plant Particles (Pollen)

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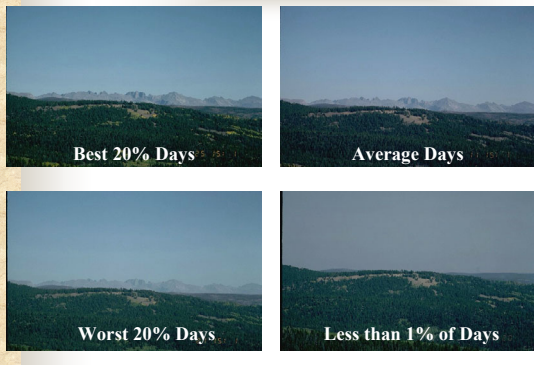
Visibility Condition Categories

- Cleanest** ■ Arithmetic mean of the 20% least-impaired valid data within the monitoring period.
 - Lowest amount of visibility impairment
- Average** ■ Arithmetic mean of all valid data within the monitoring period.
- Haziest** ■ Arithmetic mean of the 20% most-impaired valid data within the monitoring period.
 - Highest amount of visibility impairment

All data was analyzed using full calendar years.

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Bridger Wilderness Area



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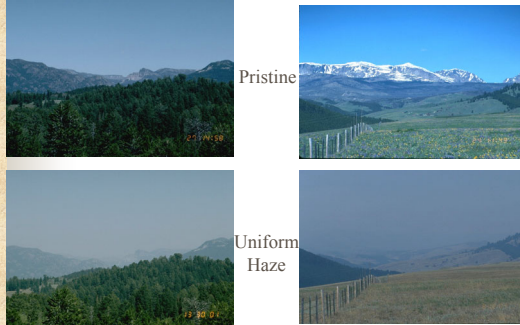
Yellowstone National Park



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Teton Wilderness

Cloud Peak



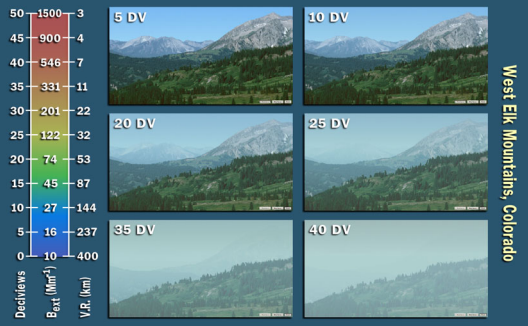
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Deciview

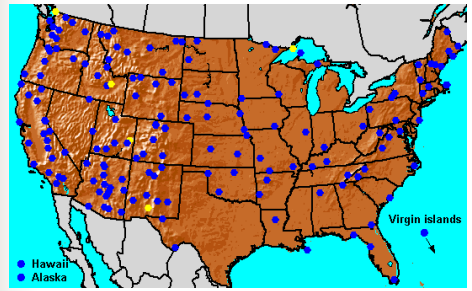
- Linear with respect to the humanly perceived visual changes in air quality.
- A 1 to 2 deciview change is a small but perceptible change.
- A pristine atmosphere is at 0 deciview.
- As deciview values increase, visibility decreases.

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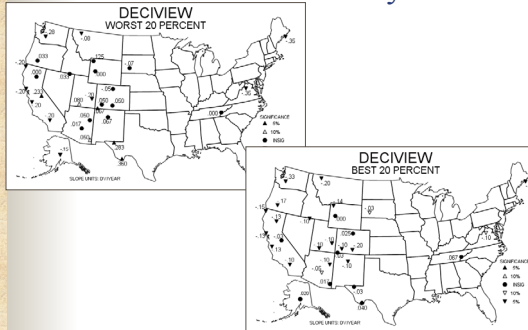
Deciview and Other Visibility Scales



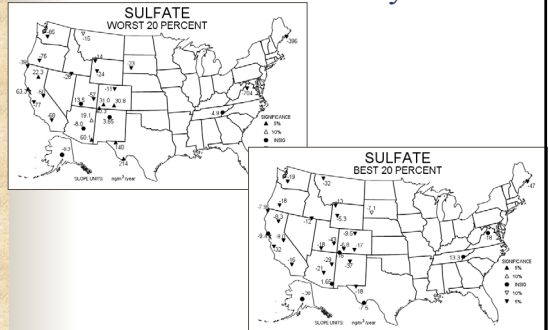
IMPROVE Monitoring Sites



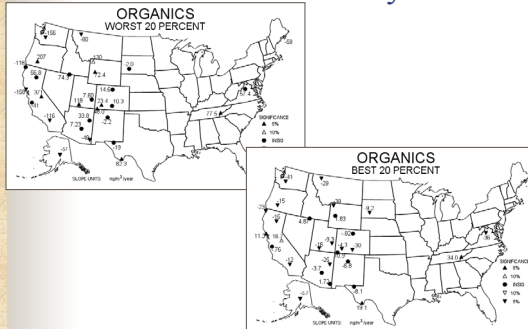
IMPROVE Trends Analysis



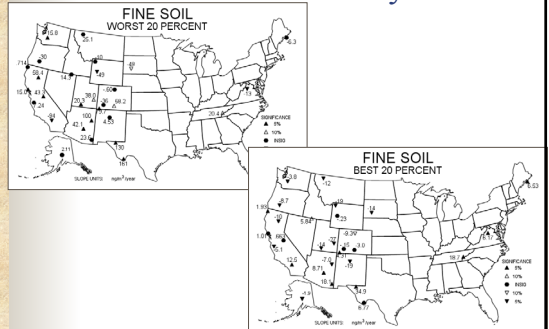
IMPROVE Trends Analysis



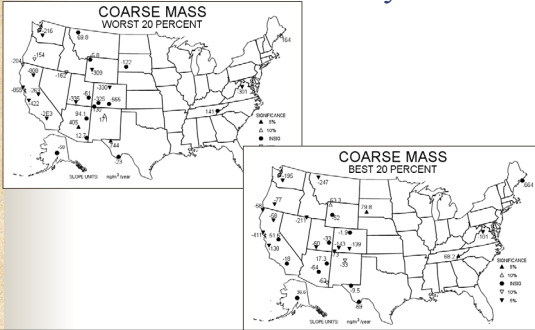
IMPROVE Trends Analysis



IMPROVE Trends Analysis

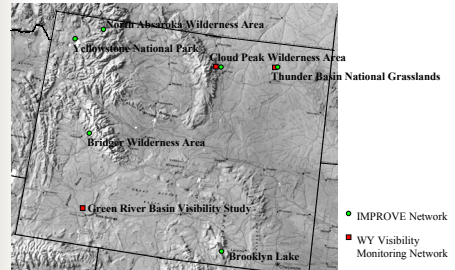


IMPROVE Trends Analysis



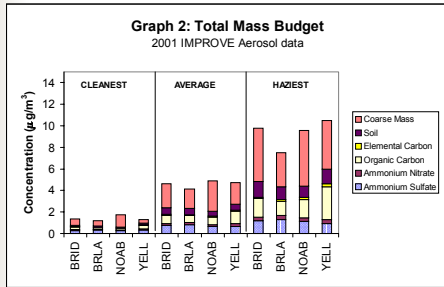
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Wyoming Visibility Monitoring Sites



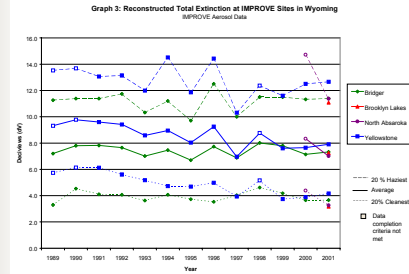
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Wyoming IMPROVE Sites Aerosol Concentration



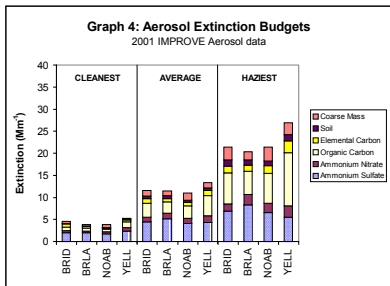
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Wyoming IMPROVE Sites Aerosol Extinction



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Wyoming IMPROVE Sites Aerosol Extinction



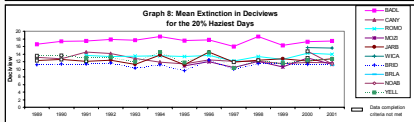
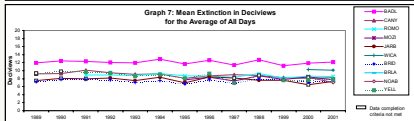
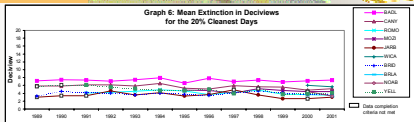
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Regional IMPROVE Sites



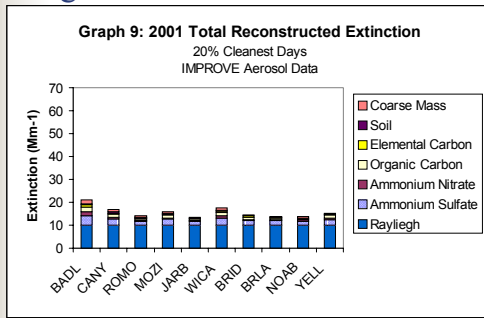
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Regional IMPROVE Sites



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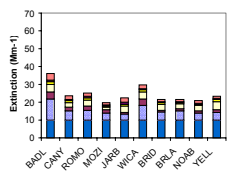
Regional IMPROVE Sites



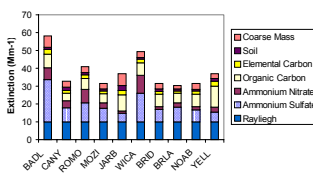
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Regional IMPROVE Sites

Graph 10: 2001 Total Reconstructed Extinction Average of all Days IMPROVE Aerosol Data

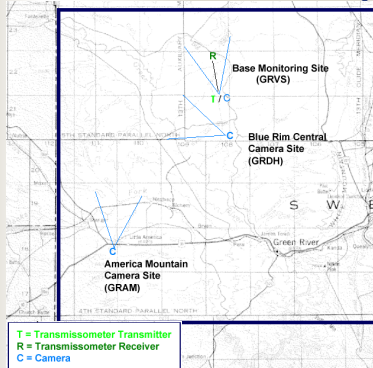


Graph 11: 2001 Total Reconstructed Extinction 20% Hazeiest Days IMPROVE Aerosol Data



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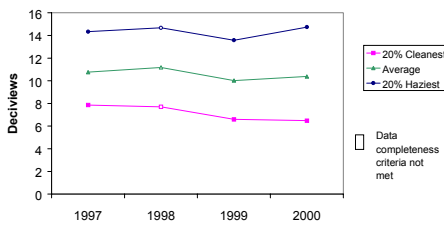
Green River Basin Visibility Study



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Green River Basin Visibility Study

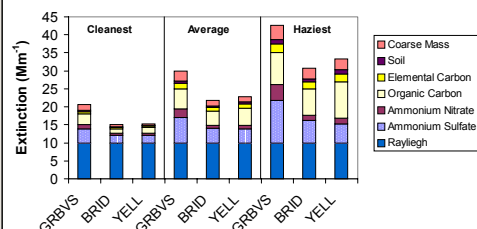
Graph 12: Mean Extinction in Deciviews for Green River Basin Visibility Study Aerosol Data



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Green River Basin Visibility Study

Graph 13: Reconstructed Extinction Budget for sites in Wyoming 1997-2000

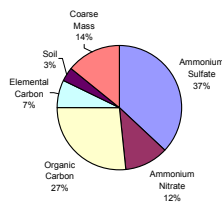


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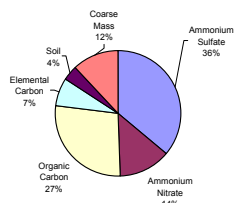
Green River Basin Visibility Study

1997 – 2000 Average Aerosol Extinction Budgets

20% Cleanest Days



20% Haziest Days



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Cloud Peak Wilderness Area Thunder Basin National Grasslands



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Optical Monitoring Data

Site	Time Period	Standard Visual Range (kilometers)					
		Transmissometer			Nephelometer		
		Cleanest	Average	Haziest	Cleanest	Average	Haziest
Cloud Peak	3/1/01 – 12/31/01	206	131	85	337	192	114
Cloud Peak	1/1/02 – 12/31/02	252	134	81	380	204	107
Thunder Basin	5/2/01 – 12/31/01	148	99	66	326	185	114*
Thunder Basin	1/1/02 – 12/31/02	186	104	56	330	175	89

* 5/5/01 – 12/31/01

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Preliminary Conclusions

Wyoming's Long Term Strategy
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Preliminary Conclusions

- Emission inventories indicate that NO_x and SO_2 actual emissions from major stationary sources are approximately equal.
- Ammonium sulfate aerosol concentrations are well above ammonium nitrate aerosol concentrations measured at Wyoming IMPROVE sites.
- Based on the emissions inventories, aerosol concentrations, and reconstructed extinction budgets, NO_x emissions have a significantly smaller impact on visibility than SO_2 emissions.

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Preliminary Conclusions

- All Wyoming IMPROVE sites are subject to impacts from long range transport of visibility impairing aerosols.
- The development and implementation of a Regional Haze State Implementation Plan will play a key role in future measures to remedy regional haze visibility impairment in Wyoming's Mandatory Federal Class I Areas.

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Preliminary Conclusions

- There has been no certification of visibility impairment, that can be attributed to a source or small group of sources, in Wyoming.
- This Long Term Strategy, Wyoming's Visibility SIP, WAQSR Chapter 9, Section 2 along with WAQSR Chapter 6, Sections 2 and 4 are adequate for making reasonable progress toward the national visibility goal of remedying existing and preventing future impairment that can be attributed to a source or small group of sources.

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Questions

Visibility Data Assessment

Preliminary Conclusions

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Oral Comments

Air Quality Advisory Board
Federal Land Managers
Public

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