



---

---

---

---

---

---

---

---



---

---

---

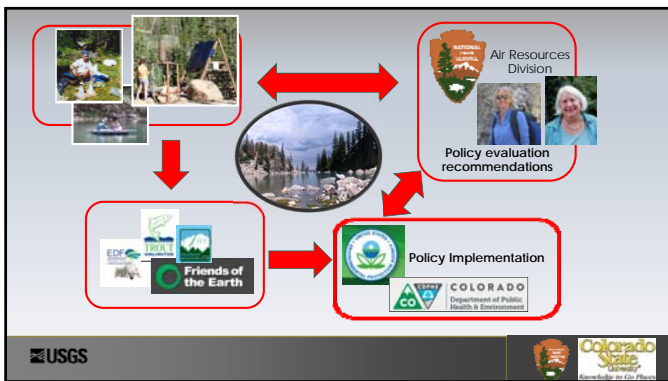
---

---

---

---

---



---

---

---

---

---

---

---

---

**OUTLINE**

Internal Management- External Threats

Visibility

Atmospheric deposition

Science into Practice

Successes and challenges ahead

USGS

---

---

---

---

---

---

---

---

Cute, dangerous, manageable

**Clean Air Act of 1977:**  
42 U.S. Code § 7470 - Congressional declaration of purpose  
(1) ...  
**(2) to preserve, protect, and enhance the air quality in national parks, .....**  
(3) ...

**National Acid Precipitation Assessment Program**  
authorized by Congress under the Acid Precipitation Act of 1980 (P.L. 96-294, Title VII)

USGS

---

---

---

---

---

---

---

---

Cute, dangerous, manageable

Complex, theoretical, not intuitive

USGS

---

---

---

---

---



---

---

---

Bad Air Day at  
Grand Canyon National Park

Grand Canyon National Park


---

---

---

---

---

---

---

---

42 U.S. Code § 7470 - Congressional declaration of purpose  
(1)...  
(2) **to preserve, protect, and enhance the air quality in national parks, .....**  
(3)...

1977

Journal of the Air Pollution Control Association  
Publication details, including instructions for authors and subscription information:  
http://www.jstor.org/stable/4518303

**The Excellent but Deteriorating Air Quality in the Lake Powell Region**  
Dale G. Heston \* & William C. Heston \*\*  
\* John Muir Institute for Environmental Studies, Inc., Hepp, California, USA  
Published online: 13 Nov 2012

1977

**Protecting Visibility in National Parks and Wilderness Areas**

**Ecology Law Quarterly**  
Volume 16 | Issue 3  
September 1982  
Visibility Protection under the Clean Air Act: Preserving Scenic and Parkland Areas in the Southwest  
Lorenz Chase

**The New York Times**  
Pollution Shrouding National Parks  
By Jeff Lebesch, the national correspondent in the Texas Panhandle. Photo by Michael S. Heston  
Published December 8, 1988  
SOME of America's most cherished scenic vistas are gradually disappearing behind a curtain of air pollution. A growing number of





---

---

---

---

---

---

---

---

Same view...

...on a **Bad Day**      ...on a **Good Day**

Sequoia National Park



Shenandoah National Park

Good Visibility Day  
Visual range: 23 miles

Bad Visibility Day  
Visual range: 12 miles

The National Mall

Great Smoky Mountains  
National Park


---

---

---

---

---

---

---

---

**300-400 visibility-related articles in the open literature**

---

---

---

---

---

---

---

---

157 visibility monitoring sites  
49 show significant improvement  
Visibility not declining anywhere

**Trends in Haze Index (Declines) on Clearest Days, 1995-2004**  
FY2005 Annual Performance Report for NPS Governmental Performance and Results Act (GPRA) Air Quality Goal 103

USGS Colorado State University

---

---

---

---

---

---

---

---

As GDP, VMT, population and energy consumption rise

Emissions have declined by 30-55% for NO<sub>x</sub>, VOC, CO, SO<sub>2</sub>

after Bachmann 2015

USGS Colorado State University

---

---

---

---

---

---

---

---

JOURNAL OF THE AMERICAN WATER RESOURCES ASSOCIATION  
1983, Vol. 19, No. 4, pp. 683-694  
DOI: 10.1111/j.1525-1367.1983.tb00101.x

### LONG-TERM WATERSHED RESEARCH AND MONITORING TO UNDERSTAND ECOSYSTEM CHANGE IN PARKS AND EQUIVALENT RESERVES

Raymond Horowitz<sup>1</sup>

Long-Term Watershed Research and Monitoring to Understand Ecosystem Change in Parks and Equivalent Reserves







Figure 1. 1975 from WRI Web Page: 9 National Watershed Activities

### Loch Vale Watershed



Long-term research and monitoring since 1983



---

---

---

---

---

---

---

---

---

---

### Our equipment is sturdy and Park Service Brown



Rain Gage

NADP Buckets

Stream Gage

Soil Lysimeter

---

---

---

---

---

---

---

---

---

---

### Sediment Diatom and Metal Stratigraphy from Rocky Mountain Lakes with Special Reference to Atmospheric Deposition




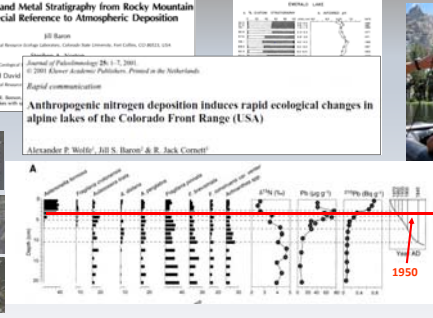
Jill Baron  
National Park Service, Natural Resource Conservation Laboratory, Colorado State University, Fort Collins, CO 80523, USA

Journal of Paleolimnology 28: 1-7, 2001.  
© 2001 Kluwer Academic Publishers. Printed in the Netherlands.

Abstract communication

### Anthropogenic nitrogen deposition induces rapid ecological changes in alpine lakes of the Colorado Front Range (USA)

Alexander P. Wolfe<sup>1</sup>, Jill S. Baron<sup>2</sup> & R. Jack Cornett<sup>1</sup>



---

---

---

---

---

---

---

---

---

---

**Sediment Diatom and Metal Stratigraphy from Rocky Mountain Lakes with Special Reference to Atmospheric Deposition**

John R. Benner  
National Park Service, Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, CO 80523, USA  
Stephen A. Norton  
Department of Geological Sciences, University of Utah, Salt Lake City, UT 84142, USA  
and David R. Benner and Raymond Harman  
National Park Service, Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, CO 80523, USA

**Anthropogenic N in alpine lakes**

**- No evidence of acidification**  
**- Dramatic shift in diatom assemblages coincident with rise in N emissions**

1950

USGS Colorado State University

---

---

---

---

---

---

---

---

---

---

**>200 Loch Vale-related articles in the open literature**

N L (yr)

Soil/water chemistry  
Foliar chemistry  
N saturation  
communities  
decline

Trajectory of increasing change

USGS Colorado State University

---

---

---

---

---

---

---

---

---

---

**Rocky Mountain National Park Initiative Nitrogen Deposition Reduction Contingency Plan**

Memorandum of Understanding Agencies:

National Park Service  
Environmental Protection Agency  
Colorado Department of Public Health & Environment

Colorado Dairy Farmers  
Colorado Cattle Raisers  
NRCs  
Colorado State University  
Rocky Mountain Farmers Union  
Colorado State University

---

---

---

---

---

---

---

---

---

---

# NPS clean air accomplishments since 1990

Product/Action	Purpose	Result	Key legislation/Regulatory authority	Key NPS actions	Key partners/Other agencies	Key accomplishments	Key legislation/Regulatory authority
Wildfire risk assessment	Identify areas of high fire risk for fuels treatment and/or fuels management	Wildfire risk assessment of 14 million acres of NPS land has been completed	Wildfire Risk Assessment Act (2002)	Wildfire Risk Assessment Act (2002)	USFS, EPA, DOI, and state/local fire agencies	14 million acres of NPS land has been assessed for wildfire risk	Wildfire Risk Assessment Act (2002)
Watershed protection	Protect watersheds from sediment and other pollutants	Watershed protection plans for 14 million acres of NPS land have been completed	Watershed Protection Act (2001)	Watershed Protection Act (2001)	USFS, EPA, DOI, and state/local water agencies	14 million acres of NPS land has been protected from sediment and other pollutants	Watershed Protection Act (2001)
Air quality monitoring	Monitor air quality to identify and address non-attainment areas	Air quality monitoring networks for 14 million acres of NPS land have been established	Clean Air Act (1970)	Clean Air Act (1970)	USFS, EPA, DOI, and state/local air agencies	Air quality monitoring networks for 14 million acres of NPS land have been established	Clean Air Act (1970)
Wildfire smoke management	Reduce wildfire smoke impacts on public health and the environment	Wildfire smoke management plans for 14 million acres of NPS land have been developed	Wildfire Smoke Management Act (2001)	Wildfire Smoke Management Act (2001)	USFS, EPA, DOI, and state/local air agencies	Wildfire smoke management plans for 14 million acres of NPS land have been developed	Wildfire Smoke Management Act (2001)
Air quality planning	Develop air quality plans to address non-attainment areas	Air quality plans for 14 million acres of NPS land have been developed	Clean Air Act (1970)	Clean Air Act (1970)	USFS, EPA, DOI, and state/local air agencies	Air quality plans for 14 million acres of NPS land have been developed	Clean Air Act (1970)

---

---

---

---

---

---

---

---

## The Challenges Ahead

1. CC X Air Pollution
2. Maintain long-term studies/monitoring
3. Maintain, strengthen, and build partnerships

---

---

---

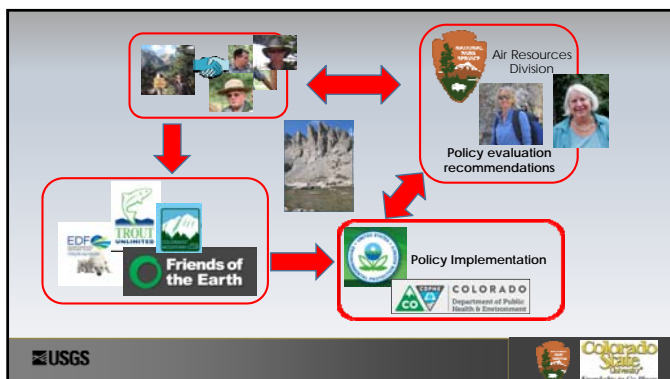
---

---

---

---

---




---

---

---

---

---

---

---

---