INTERAGENCY MONITORING OF PROTECTED VISUAL ENVIRONMENTS

IMPROVE

2013 The IMPROVE Newsletter Volume 22 / Number 1

Monitoring update

Feature Article: The WRAP Regional Haze Rule Progress Report Support Document, Page 4

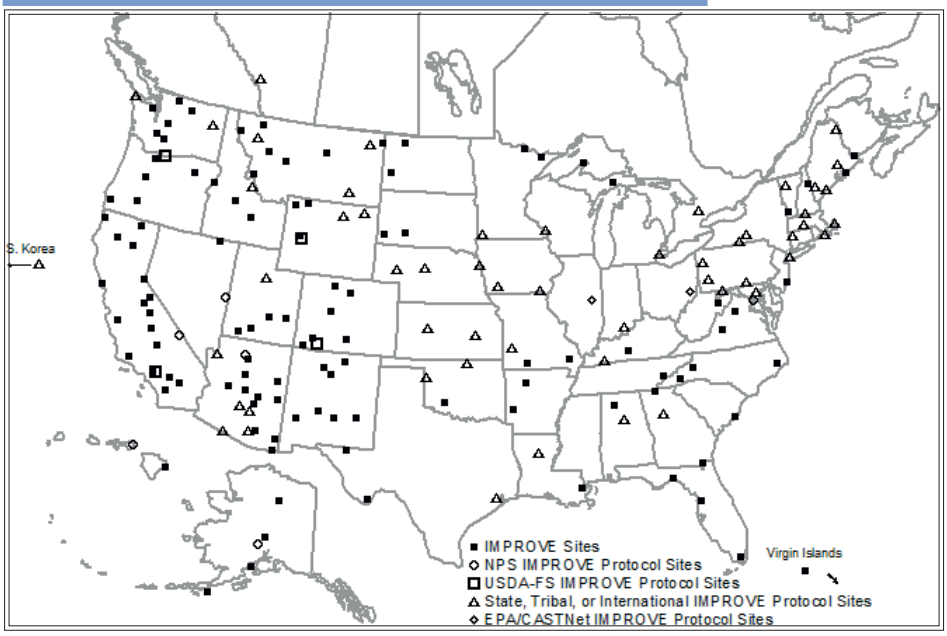
Network operation status

The IMPROVE (**I**nteragency **M**onitoring of **Pro**tected **V**isual **E**nvironments) Program consists of 110 aerosol visibility monitoring sites selected to provide regionally representative coverage and data for 155 Class I federally protected areas. Instrumentation that operates according to IMPROVE protocols in support of the program includes 52 additional aerosol samplers, and optical instrumentation (nephelometers and transmissometers), scene instrumentation (Webcamera systems), and interpretive displays. In March 2013, a new IMPROVE site was installed in South Korea; see page 2 for additional information.

IMPROVE Program participants are listed on page 7. Federal land management agencies, states, tribes, regional air partnerships, and other agencies operate supporting instrumentation at monitoring sites as presented in the map below.

Monitoring Site Assistance:
Aerosol sites: contact University of California-Davis
telephone: 530/752-1123 (Pacific time)

Optical/Scene sites: contact Air Resource Specialists, Inc.
telephone: 970/484-7941 (Mountain time)



IMPROVE and IMPROVE Protocol Sites 2013

ATTENTION: Due to cost savings measures recently implemented, the quarterly IMPROVE newsletters and the IMPROVE calendar will be discontinued until further notice. Meanwhile, the newsletter distribution list will be retained, and important news items are expected to be relayed by e-mail. Also, as the IMPROVE calendar was largely a scheduling tool, an alternate, simpler scheduling tool showing filter change dates and other important considerations is expected to be provided beginning in 2014. See Page 7 for additional information.

Data availability status

While the IMPROVE Newsletter will no longer provide quarterly data collection statistics, data will continue to be available on the Web sites noted below.

- IMPROVE Web site
  http://vista.cira.colostate.edu/improve/Data/data.htm
- VIEWS Web site
  http://vista.cira.colostate.edu/views
- Federal Environmental Database (FED)
  http://views.cira.colostate.edu/fed/

Webcamera real-time images and associated air quality data are available on agency-supported Web sites:

- National Park Service
  http://www.nature.nps.gov/air/WebCams/
- U.S. Forest Service
  http://www.fsvisimages.com
- CAMNET (Northeast Camera Network)
  http://www.hazecam.net
- Midwest Haze Camera Network
  http://www.mwhazecam.net
- Wyoming Visibility Network
  http://www.wyvisnet.com
- Phoenix Visibility Network
  http://www.phoenixvis.net

Monitoring update continued on page 3....

Visibility news

New IMPROVE site in South Korea

Sampling began in March 2013 at a new site on Baengnyeong Island, South Korea, the first IMPROVE site in Asia. The site is located on the grounds of the Baengnyeong Island Atmospheric Research Center, a research facility operated by the National Institute of Environmental Research (NIER), a division of the Korea Ministry of Environment which provides the funding for operating this site.

South Korea IMPROVE Site.

Aerosol sampling at Baengnyeong Island is intended to characterize regional air quality to the northwest of Seoul, approximately halfway along a trajectory between Seoul and Beijing, China. Baengnyeong Island is the westernmost point of South Korea, located over 200 km to the west of Seoul. The island is located off the southwest tip of North Korea, just 17 km from the North Korean mainland. The monitoring site is well-removed from major emission sources and thus should be representative of the region. The island has fewer than 5,000 permanent residents plus a roughly equivalent number of South Korean military personnel.

The IMPROVE sampler is installed outdoors, mounted to a railing on the second-floor balcony of the Atmospheric Research Center building. The site is serviced weekly by scientific staff from the Atmospheric Research Center. The IMPROVE code for this new site is BYIS1.

The site was installed by Jose Mojica, manager of the IMPROVE field operations staff at UC Davis. He was assisted by Taehyoung Lee, a longtime scientist at Colorado State University now at Hankuk University of Foreign Studies in South Korea. Dr. Lee's knowledge of the area and of the language proved invaluable in the successful launch of this new IMPROVE site. Dr. Lee had also accompanied Chuck McDade of UC Davis to Baengnyeong Island in 2011 to make initial arrangements and to scout the location for the IMPROVE sampler.

A Memorandum of Understanding between NIER and the IMPROVE Steering Committee established the new Korean site as a full-fledged IMPROVE site. It is operated under the same schedule and protocols as all other sites and the samples are analyzed in the IMPROVE laboratories. Data will be available through the IMPROVE database on the FED Website, *http://views.cira.colostate.edu/fed/*. The NIER Baengnyeong Island Atmospheric Research Center is a fully equipped atmospheric measurement laboratory housed in a permanent building completed in 2008. Its goals are to provide reliable background air quality data to characterize emissions entering South Korea from elsewhere in Asia, to evaluate the effects of long-range transport of air pollutants, and to observe episodes of Asian Dust.

For more information contact Chuck McDade at UC-Davis. Telephone: 530-752-7119. E-mail: mcdade@crocker.ucdavis.edu

Visibility news continued on page 7....

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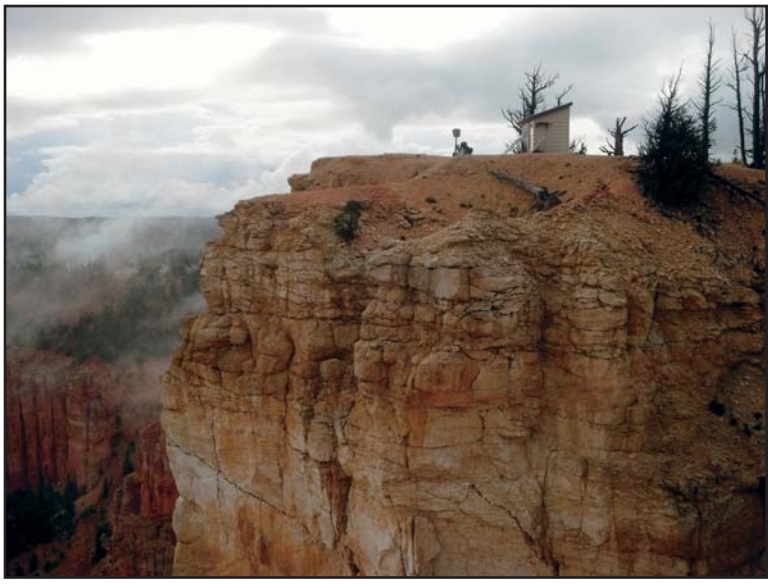
Past issues of the IMPROVE Newsletter will continue to be available on the IMPROVE Web site at *http://vista.cira.colostate.edu/improve/Publications/news_letters.htm.*

Monitoring update *continued from page 1 ....*

Nighttime visibility monitoring at Bryce Canyon

Bryce Canyon is a park renowned for clear night sky conditions. Recently, there have been concerns about potential nighttime visibility effects from possible 24-hour operations at a surface strip coal mine proposed nearby. In an effort to track current and future nighttime visibility conditions in the park, the National Park Service (NPS) worked with Air Resource Specialists, Inc. (ARS) to install a digital camera system that has been optimized to monitor visual conditions and light pollution in night sky images.

On September 10, 2013, the camera system was deployed near Yovimpa Point at the southwest edge of Bryce Canyon National Park, looking southwest toward Alton and St. George, Utah. This area is a popular scenic overlook for visitors, offering spectacular vistas of the surrounding area. An IMPROVE 35mm camera system was previously housed at the site, and the park has also operated particulate and visibility studies from this location in the past. During installation, some of the existing infrastructure was resurrected to augment the nighttime camera system, including a more standard NPS-owned digital camera system that will collect daytime images which are similar to the historic 35mm images that were previously collected at the site.



Bryce Canyon visibility monitoring site.

Some of the features that were optimized for the nighttime camera system included:

- A system design that reduces noise and interference caused by the power and heat generated by the camera, allowing the images to be better calibrated to characterize radiance fields.
- The use of a wide angle lens and very high resolution images. These features are intended to support a variety of potential analyses, including looking at the effects of aerosols and clouds on the light domes.
- Configuration for remote operation, including an independent solar power system and low power components.

The nighttime camera system will be configured to capture hourly images, and images will likely be available in the near future on the NPS Webcamera site (*http://www.nature.nps.gov/air/WebCams/index.cfm*) along with images from other NPS sites.

For more information contact Scott Cismoski at Air Resource Specialists. Telephone: 970-484-7941. E-mail: scismoski@air-resource.com

Park City, Utah

Steering Committee Meeting 2013

The 2013 IMPROVE Steering Committee will be held in Park City, Utah on October 8-9, 2013. On October 9, a joint platform meeting will be held with the National Atmospheric Deposition Program.

Meeting minutes and presentations from this meeting will be available on the IMPROVE Web site at http://vista.cira.improve/Activities/activities.htm. Past meeting minutes and presentations are also available on the IMPROVE Web site.

***Monitoring update** continued on page 6....*

Feature article

The WRAP Regional Haze Rule Progress Report Support Document

(by C. Archuleta[1], T. Moore[2], E. Vanden Hoek[1], and J. Adlhoch[1]
[1]Air Resource Specialists, Inc.; Fort Collins, CO and [2]WESTAR Council, Western Regional Air Partnership; Seattle, WA)

A primary purpose of visibility monitoring for the IMPROVE Network is to measure visibility conditions in support of the United States Environmental Protection Agency's (EPA's) 1999 Regional Haze Rule (RHR), which protects visibility conditions in the nation's largest national parks and wilderness areas. For the RHR, visibility impairment is tracked using a Haze Index in units of deciviews (dv), which is related to the sum of visibility impairment from individual aerosol species as measured by IMPROVE Network monitors.

Pursuant to the RHR, states are required to submit implementation plans which summarize existing conditions and identify goals and strategies for visibility improvement. States are required to revise these implementation plans every ten years, and submit progress reports at interim points between implementation plan submittals. The first RHR implementation plans were due in 2007, and the first interim progress reports come due at various times in the 2012-2018 timeframe.

In preparation for the submittal of the first of these interim progress reports, the Western Regional Air Partnership (WRAP), in cooperation with representatives from the fifteen member states in the WRAP region, recently prepared a technical support document intended to provide the technical basis for western states to assess progress towards goals as defined in their initial RHR implementation plans. Specific regulatory questions addressed in the WRAP support document include:

- What are the current visibility conditions for the most impaired (worst) and least impaired (best) days?
- What is the difference between current visibility conditions and baseline conditions for the most impaired and least impaired days?
- What is the change in emissions that occurred between the baseline period and the progress period?

To measure progress towards natural conditions, all States were required to analyze data to set a 2018 reasonable progress goal towards the default natural conditions value for each Class I area in the state, using the 2000-2004 baseline period monitoring data collected by the IMPROVE network as a starting place. The RHR also specifies that progress over time is determined by assessing "current conditions," and that progress be tracked against the 2000-2004 baseline period using corresponding averages over successive five-year periods (i.e., 2005-2009, 2010-2014, etc.). In support of the interim progress assessments, the WRAP technical support document includes regional, state, and Class I area (CIA) specific summaries that characterize changes in conditions between the baseline (2000-2004) and first successive progress period (2005-2009) for both the 20% best and 20% worst visibility days.

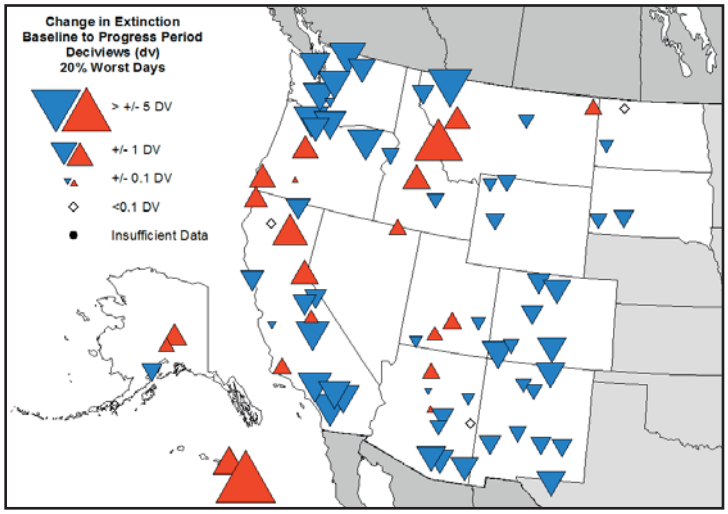


Figure 1. Change in deciview extinction between baseline period average (2000-2004) and the first progress period average (2005-2009) for the 20% worst visibility days.

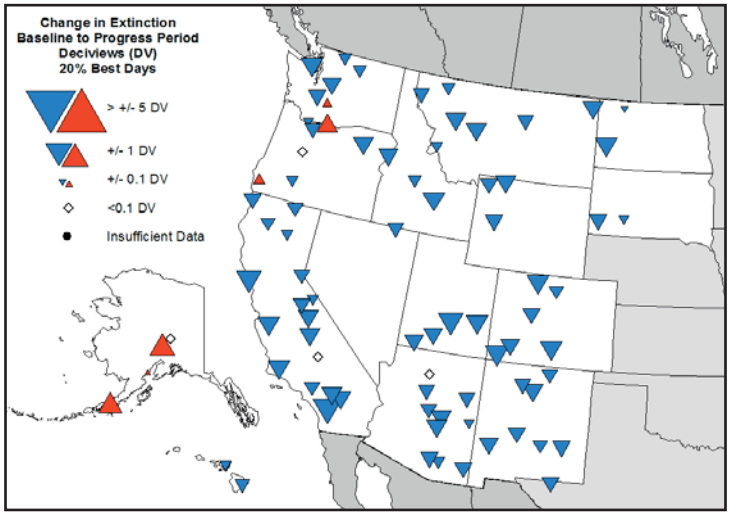


Figure 2. Change in deciview extinction between baseline period average (2000-2004) and the first progress period average (2005-2009) for the 20% best visibility days.

Figures 1 and 2 present maps showing the change in deciviews for each IMPROVE RHR tracking site in the WRAP region for both the 20% worst days and the 20% best days, respectively, between the 2000-2004 and 2005-2009 five-year average deciview metrics. Most WRAP CIAs showed improved visibility conditions on the worst days, and nearly all sites showed improvement on the best days. Although the RHR prescribes tracking visibility in terms of deciviews, the support document also looked at changes in individual aerosol species measured by the IMPROVE Network.

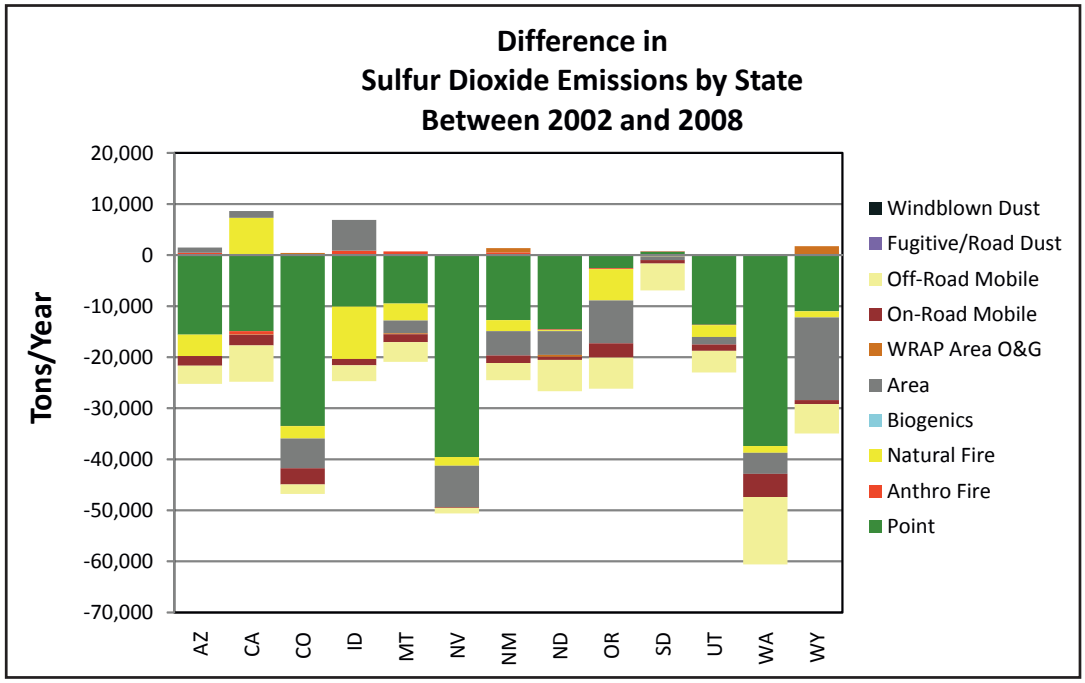


Figure 3. Differences between 2008 and 2002 sulfur dioxide emissions inventory totals for the contiguous WRAP states (2008 minus 2002).

Comparisons of baseline and progress period emissions inventories are also presented in the progress report. An example comparison showing net decreases in sulfur dioxide inventories for all WRAP region states is showing in Figure 3.

Comparisons of current to baseline inventories for the WRAP region progress report was complicated by the fact that a number of changes and enhancements had occurred between development of the two period inventories, such that the differences were sometimes more reflective of changes in inventory methodology than changes in actual emissions. For this reason, changes in the IMPROVE monitoring summaries were often more representative of progress than emission inventory comparisons. Some specific observations were as follows:

Some specific observations were as follows:

- Most sites that did not show improved deciview conditions on the worst days were affected by large particulate organic matter measurements related to wildland fire.
- Ammonium nitrate, in most cases, showed the largest decreases in five-year averages and the largest decreasing annual trends. This was consistent with mobile source inventory comparisons which showed large decreases in oxides of nitrogen, which are among the precursors for ammonium nitrate particulate formation.
- In many of the plains states, annual averages showed decreasing trends, but 5-year averages increased due to high outlier measurements. Sulfur dioxide emissions, which are precursors for ammonium sulfate particle formation, showed decreases in most cases, especially from electric generating units (EGUs) and other point sources.
- In Hawaii, dramatic increases in ammonium sulfate measurements were related to natural emissions, with increased volcanic emissions accounting for most of the sulfur dioxide inventoried.

More detailed regional, state, and CIA specific summaries are provided in the full report on the WRAP Web site:

http://www.wrapair2.org/RHRPR.aspx

These summaries are also supported by interactive tools available from the online WRAP Technical Support System (TSS):

http://vista.cira.colostate.edu/tss/

For more information, contact Tom Moore at WESTAR Council, WRAP Air Quality Program. Telephone: 970-491-8837. E-mail: tmoore@westar.gov or Cassie Archuleta at Air Resource Specialists. Telephone: 970-484-7941. E-mail: carchuleta@air-resource.com

Monitoring update *continued from page 1 ....*

Operators of distinction

Many recognize August 7, 1977, as an important day in air quality as this was the date that the U.S. Congress made significant amendments to the Clean Air Act, designating many national forests and wilderness areas as mandatory Class I areas, affording these areas visibility protection status. But what many may not know is that the Northern Cheyenne Reservation in southeastern Montana was actually designated as a Class I area two days earlier on August 5, 1977. As sovereign entities, Indian Tribes have the right under the Clean Air Act to have the EPA classify their lands as Class I areas. Although the Reservation is not technically a federally mandated Class I area with visibility protection status, the Northern Cheyenne Nation is among the few Tribes with Class I area status, which does afford them Prevention of Significant Deterioration (PSD) protection.

Northern Cheyenne air quality staff Jay Littlewolf (left) and Scott Williams (right) at the Northern Cheyenne (NOCH1) IMPROVE Site.

The IMPROVE program provides the monitoring data that supports visibility assessments in mandatory Class I areas, and the Northern Cheyenne Tribe has monitored visibility impairment using an IMPROVE aerosol monitor at the Northern Cheyenne site (NOCH1) since 2002. Air quality monitoring efforts on the reservation are largely in place due to a dedicated staff, which is led by Jay Littlewolf, who administers the Tribe's air quality monitoring program. Working closely with Jay is Scott Williams, who calibrates and maintains equipment as well as reports data for the Tribe. Jay has been a part of the air quality team since 1989, while Scott joined in 1996. While a bit removed from their respective college degrees (Jay has a degree in Film & TV production from Montana State, and Scott has a degree in Computer Science from the University of Idaho), the two take pride in having an important stake in air quality on the Reservation.

Air quality related values, including visibility and health impacts, are important considerations for the Tribe. The Northern Cheyenne Reservation hosts scenic vistas and a myriad of wildlife, including antelope, bears, bobcats, coyotes, deer, elk, prairie dogs, raptors, and songbirds. The Northern Cheyenne Reservation is comprised of nearly 450,000 acres, with Tribal headquarters situated in Lame Deer. There are approximate 10,000 Tribal members, with nearly half living on the Reservation. While many Reservations are fragmented due to past land allotments, the Northern Cheyenne Reservation is unique in that 99% of land within its boundaries is owned by the Tribe or Tribal members.

Unlike states, Tribes are not required to comply with RHR mandates, but the Northern Cheyenne Tribe is able to use their IMPROVE data to determine if regional haze implementation plans developed by nearby states are sufficient to address regional haze issues on the reservation, and the Tribe always has the option of creating a Tribal implementation plan. In addition to IMPROVE sampling, monitoring on the Northern Cheyenne Reservation includes Webcam-based visibility monitoring as well as mercury deposition, particulate, and gas monitoring (NO_X and SO_2) which is conducted cooperatively with local industry.

Over the years, as air quality efforts on the reservation have evolved, Jay and Scott have witnessed significant changes in data collection, with data initially recorded on pen and paper chart recorders, then data being recording on 3.5" floppy disks, to data now being stored on laptops with much more user friendly access. Two key issues affecting air quality on Tribal lands are railroad emissions and coal mining in Colstrip, Montana, about 20 miles north of the Reservation. Natural disasters such as forest fires have also had major impacts on the Reservation over the years and have left much scarring on the once timber-rich landscape. In fact, the nearly 250,000 acre Ash Creek Fire in 2012, barely missed the IMPROVE monitoring station. Jay also noted that the Reservation has been experiencing a drought for the past 25 years.

In their spare time, Jay enjoys watching weather and news on television and is also a big fan of the History Channel, while Scott enjoys his "old man activities" of running track and playing basketball.

Visibility news *continued from page 3 ....*

IMPROVE cost savings measures

At the October 2012 IMPROVE Steering Committee meeting, it was noted that the IMPROVE program needed to reduce operating costs to be more in line with the effective funding for the network. Funding gaps have occurred, in large part, due to largely unvarying EPA funding despite some increases in the routine operational costs of the network. Because of this, the IMPROVE Steering Committee formed a budget working group to draft recommendations to address the budget shortfall. The budget working group drafted a proposal identifying some cost savings measures, which were unanimously endorsed by the IMPROVE Steering Committee. The proposal was submitted to the larger IMPROVE community in February 2013, and most cost savings measures were adopted as of April 1, 2013. The major changes to the network included:

- Suspension of the IMPROVE newsletter
- Suspension of the IMPROVE calendar
- Discontinuation of IMPROVE funding for the DEVA1 and INGA1 sites

Other cost savings measures will be less obvious, including some reductions in collocated sites and reductions in site maintenance efforts. For these measures, significant emphasis was placed on trying to not directly affect EPA guidance or State Regional Haze Implementation Plans and to not unduly affect data integrity. Detailed supplementary documents, including analyses of several cost saving scenarios, a discussion of how the IMPROVE data interfaces with the Regional Haze Rule and guidance documents, and a description of the ancillary uses of IMPROVE data, are posted on this public FTP site:

FTP://vista.cira.colostate.edu//Public/IMPROVE_RHR_Budgets/Scenarios

Although the implemented cost savings measures are not ideal, the IMPROVE program will continue in its mission to produce high quality data supporting visibility protection in Class I areas.

For more information, contact IMPROVE Steering Committee Chair Scott Copeland. Telephone: 307-335-2154. E-mail: scott.copeland@colostate.edu.

IMPROVE STEERING COMMITTEE

IMPROVE Steering Committee members represent their respective agencies and meet periodically to establish and evaluate program goals and actions. IMPROVE-related questions within agencies should be directed to the agency's Steering Committee representative.

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Associate Membership in the IMPROVE Steering Committee requires operation of at least one IMPROVE protocol site, openly share data, and participate in technical review and oversight of the IMPROVE Program. Associate and International Associate Member representatives are:

STATE OF ARIZONA

ENVIRONMENT CANADA

REPUBLIC OF KOREA
MINISTRY OF ENVIRONMENT