INTERAGENCY MONITORING OF PROTECTED VISUAL ENVIRONMENTS

IMPROVE

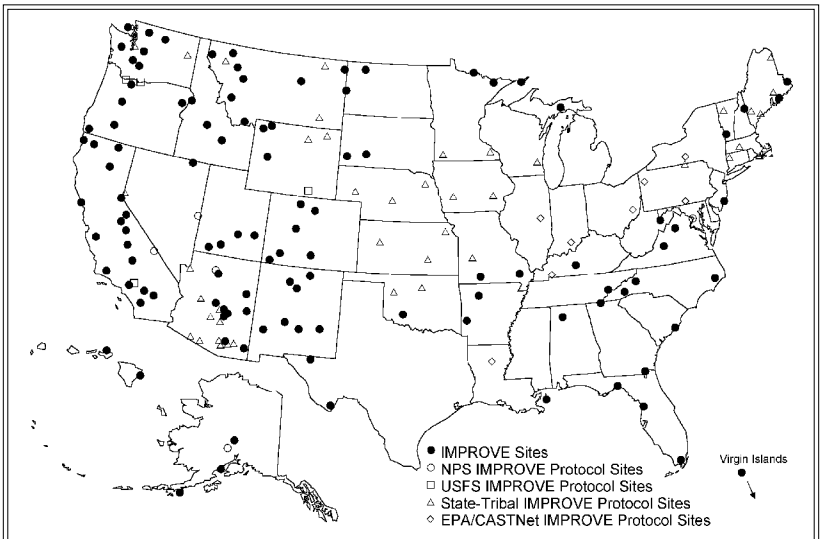
1st Quarter 2003 | The IMPROVE Newsletter | Volume 12 / Number 1

Monitoring update

Network operation status

The IMPROVE Program monitoring network consisted of 110 aerosol samplers, 17 transmissometers, 8 nephelometers, and 7 camera systems during 1st Quarter 2003 (January, February, and March). In addition, 52 aerosol samplers, 4 transmissometers, 25 nephelometers, and 9 cameras operated according to IMPROVE Protocols. Preliminary data collection statistics for the quarter are:

- Aerosol (channel A only) 96% collection
- Aerosol (all modules) 94% completeness
- Optical (transmissometer) 92% collection
- Optical (nephelometer) 96% collection
- Scene (photographic) 98% collection



IMPROVE and IMPROVE Protocol Sites
1st Quarter 2003

Also supporting the program were 8 Web camera systems and 3 interpretive displays. Web camera systems now operate at: Acadia NP, Big Bend NP, Grand Canyon NP, Great Smoky Mountains NP, Joshua Tree NP, Mammoth Cave NP, Sequoia-Kings Canyon NPs, and Theodore Roosevelt NP. Each system displays a real-time scenic image of the area along with visibility and meteorological parameters. Interpretive exhibits operate at: Acadia NP, Big Bend NP, and Great Smoky Mountains NP. An exhibit is planned for Sequoia-Kings Canyon National Parks this summer.

During the quarter, the 35 mm film camera at Big Bend National Park, Texas, ended operation. It operated since June 1997, and has been replaced with a high-resolution Web camera system. Three IMPROVE aerosol samplers were installed, and will operate according to IMPROVE Protocol at Organ Pipe Cactus National Monument, AZ; Meadview, AZ; and Martha's Vineyard, MA. An Optec NGN-2 nephelometer was installed in Washington D.C. in April. The instrument was installed adjacent to the IMPROVE aerosol sampler and became part of the IMPROVE Protocol optical network.

The Central States Regional Air Planning Association (CENRAP) is installing four Optec NGN-2 nephelometers at IMPROVE and IMPROVE Protocol sites this spring and summer. IMPROVE sites selected to receive the instruments are the Upper Buffalo Wilderness, in Arkansas, and the Wichita Mountains Wildlife Refuge, in Oklahoma. IMPROVE Protocol sites selected to receive nephelometers are in Kansas and Nebraska. Meteorological stations will also be installed at these sites if they don't already have acceptable stations.

Data availability status

Data are available on the IMPROVE Web site, at *http://vista.cira.colostate.edu/improve/Data/data.htm.* IMPROVE and other haze related data are also available on the VIEWS Web site, at *http://views.vista.cira.colostate.edu.* Aerosol data are available through October 2002. Transmissometer data are available through December 2001 and nephelometer data are available through September 2002.

Photographic slides and digital images are archived but are not routinely analyzed or reported. Complete photographic archives and slide spectrums (if completed) are available at Air Resource Specialists, Inc. Slide spectrums are also available on the IMPROVE Web site, under *Data*. Near real-time digital images from National Park Service Web camera sites can be viewed at *http://www2.nature.nps.gov/ard/cams/index.htm*. USDA Forest Service camera images from IMPROVE sites can be viewed at *http://www.fsvisimages.com.*

***Monitoring update** continued on page 3....*

Visibility news

National Park Service fills positions

John Vimont has been selected as the new Research and Monitoring Branch chief in the National Park Service's Air Resources Division. John has been a meteorologist for the agency since 1991. Prior to that, he worked with EPA and the state of New Mexico. He holds B.S. and M.S. degrees in Atmospheric Sciences, and brings a wealth of experience working with the scientific community and regulatory agencies. John replaces Mark Scruggs, who was promoted to Assistant Division Chief for Air Program Operations. Mark will continue to be involved with various monitoring programs.

Contact John Vimont at the NPS. Telephone: 303/969-2808. Fax: 303/969-2822. E-mail: john_vimont@nps.gov.

Bret Schichtel became a physical scientist for the National Park Service's Air Resources Division in January. He continues to work out of the Cooperative Institute for Research in the Atmosphere, at Colorado State University's Foothills Campus.

Contact Bret Schichtel at CIRA. Telephone: 970/491-8581. Fax: 970/491-8598. E-mail: schichtel@cira.colostate.edu.

IMPROVE 2003 calendar distributed

The IMPROVE Program sponsored a 12-month calendar to assist site operators in their data collection efforts. Personnel from the Cooperative Institute for Research in the Atmosphere (CIRA) designed and created the 11" x 15" wall-sized calendar, which features operators, monitoring sites, and instrumentation. The daily field portion of each month contains notes to alert operators when instrument maintenance is due such as filter changes, sampling days, etc. The calendar was distributed to all IMPROVE site operators in March, and contains the months March 2003 through February 2004.

To request a calendar contact Julie Winchester at CIRA. Telephone: 970/491-8443. Fax: 970/491-8598. E-mail: winchester@cira.colostate.edu.

Web camera installations expected to increase

Web camera systems are becoming increasingly popular, and are a valuable tool in disseminating visibility information to a large number of people. A number of new camera systems are expected to go online this summer and fall. They are:

- National-Capital Central. A Web-based camera system is expected to join the IMPROVE aerosol sampler and NGN-2 nephelometer in Washington DC. The system is sponsored by the National Park Service, and images and associated visibility data will be available at *http://www2.nature.nps.gov/ard/cams/index.htm.*
- Pacific Northwest. Three Web-based camera systems have been built and are being tested for installation in Olympic, North Cascades, and Mount Rainier National Parks. The three sites are being prepared for installations in mid-summer. The systems are sponsored by the National Park Service, and images and associated visibility data will be available at *http://www2.nature.nps.gov/ard/cams/index.htm.*
- The USDA Forest Service will convert remote digital camera systems at Pasayten (WA) and Mount Hood (OR) Wildernesses to Web-based camera systems this summer. Images will be available on the Internet at *http://www.fsvisimages.com.*
- The Northeast States for Coordinated Air Use Management (NESCAUM) is anticipating six new systems to join its CAMNET network by summer or fall. These systems (and sponsoring agencies) are:
  - Baltimore, MD (state of Maryland)
  - Blue Hill, MA (state of Massachusetts)
  - Moosehorn NWR, ME (USFWS)
  - Presque Isle, ME (Micmac Tribe)
  - Mohawk Mountain, CT (state of Connecticut)
  - Frostburg, MD (state of Maryland)

  Some of these sites currently operate an IMPROVE aerosol sampler. NESCAUM is also working with other agencies to further expand the network next year, to a total of 12 to 14 sites. As each system is installed, its real-time digital images and associated visibility and air quality data will be available on the Internet at *http://www.hazecam.net.*

For more information contact Scott Cismoski at Air Resource Specialists, Inc. Telephone: 970/484-7941. Fax: 970/484-3423. E-mail: scismoski@air-resource.com.

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

Outstanding sites

Data collection begins with those who operate, service, and maintain monitoring instrumentation. IMPROVE managers and contractors thank all site operators, for their efforts in operating the IMPROVE and IMPROVE Protocol networks. Sites that achieved 100% data collection for 1st Quarter 2003 are:

Aerosol

Acadia
Addison Pinnacle
Badlands
Bondville
Boundary Waters
Bridger
Bridgton
Brigantine
Bryce Canyon
Cadiz
Caney Creek
Canyonlands
Cape Romain
Casco Bay
Cedar Bluff
Chassahowitzka
Cherokee
Chiricahua
Columbia Gorge East
Connecticut Hill
Crater Lake
Crescent Lake
Death Valley
Dolly Sods
Dome Land
Ellis
Flathead
Fort Peck
Gates of the Mountains
Gila
Glacier
Grand Canyon
Great Gulf
Great Sand Dunes
Great Smoky Mountains
Guadalupe Mountains
Hawaii Volcanoes
Hercules-Glades
Hillside
Indian Gardens
James River
Jarbidge
Joshua Tree
Kalmiopsis
Livonia
Lostwood
Lye Brook
Mammoth Cave
Meadview
Mohawk Mountain
Monture
Mount Baldy
Mount Hood
Mount Zirkel
North Cascades
Okefenokee
Pasayten
Pinnacles
Proctor Research Center
Quabbin Reservoir
Quaker City
Queen Valley (Superstitions)
Sac and Fox
Saguaro
Saguaro West
San Gabriel
Seney
Sikes
Simeonof
Snoqualmie Pass
Starkey
Sula
Sycamore Canyon
Tallgrass
Theodore Roosevelt
Three Sisters
Thunder Basin
Tonto
UL Bend
Upper Buffalo
Virgin Islands
Voyageurs
Weminuche
White Mountain
White Pass
White River
Wichita Mountain
Wind Cave
Yosemite

Transmissometer

Grand Canyon (In-Canyon)
Petrified Forest
Rocky Mountain

Nephelometer

Acadia
Mammoth Cave
Seney

Photographic

Bosque del Apache
Bryce Canyon
San Juan Islands
Wichita Mountain

Operators of distinction

Bondville, Illinois, has been home to an extensive air quality site for nearly 20 years. The IMPROVE Program joined other monitoring networks there in 2001, when it began operating an aerosol sampler. Site Technician Mike Snider ensures all instrumentation at the site operates smoothly, and because of his diligent servicing and troubleshooting efforts, the Bondville IMPROVE aerosol sampler usually attains excellent data collection.

The Bondville Environmental and Atmospheric Research Site (BEARS) is a 14-acre plot in central Illinois, where national monitoring networks evaluate equipment and methods to measure climate, meteorological, precipitation, and air quality parameters. It is operated by the Illinois State Water Survey on a University of Illinois Foundation farm.

Mike has performed routine servicing and troubleshooting for most of the projects since 1986. " I visit the site daily to ensure the aerosol and precipitation equipment is working correctly, and make adjustments to the monitors when necessary," said Mike. "Because of the amount of equipment, much troubleshooting and weekly contact to program sponsors is necessary to keep the equipment operating as much as possible." When not performing general maintenance Mike can usually be found in the onsite laboratory performing chemistry analyses, or he's out managing a 25-unit rain gauge network for the Army Corps of Engineers water diversion program. "This program takes a lot of my time," said Mike. "The precipitation network is located over a 5-mile grid in and around Chicago."

While air quality is Mike's vocation, singing is his avocation. Another is bicycling. Mike, with his wife and a "bunch of dogs," lives about one mile from the Bondville station. "It can be a mixed blessing sometimes," said Mike.

Mike Snider, with the Illinois State Water Survey, services a National Acid Deposition Program Belfort Recording Rain Gauge. Mike also services an IMPROVE aerosol sampler at the Bondville site.

Feature article

Visibility survey and index for metropolitan Phoenix

(by Jeavons, Toenjes, Garner, and Sundblom)

Introduction and background

In March 2000, Arizona Governor Jane Hull convened the Brown Cloud Summit to examine methods to improve visibility in the Phoenix Metropolitan Area. Based upon the Summit's recommendation, the Arizona Department of Environmental Quality (ADEQ) established the Visibility Index Oversight Committee (Committee) to develop a visibility index through a public survey process.

The visibility survey for the Phoenix Metropolitan Area was designed to accomplish three primary objectives. A representative cross-section of residents would be asked for their feedback in order to:

- Determine what visible air qualities are desirable.
- Determine what visible range is acceptable.
- Determine how often the visual air quality and acceptable visual ranges should be expected to occur.

Survey approach

Drawing in part from past experience with a similar visibility survey in the Denver Metropolitan Area, the BBC Research & Consulting (BBC) study team retained by ADEQ designed a survey instrument to accomplish the visibility survey objectives.[1] The survey was administered with a representative sample of residents. The 385 survey participants attended group sessions (of no more than 20 participants each), viewed 21 images that showed varying visibility levels on photographic slides, and completed a written questionnaire commenting on the slides. There were three primary parts to the survey instrument. The first was designed to capture individuals' ratings of the level of visual air quality in each slide on a 7-point scale of very poor to excellent. The second asked respondents to indicate if the visible air quality in each slide was acceptable or not. The third asked respondents to indicate the number of days in which a given level of visible air quality would be acceptable.

Participants in the Phoenix Visibility Survey were asked to evaluate the visibility conditions depicted in 21 unique images. Each image provided the same vista, a southwesterly perspective on downtown Phoenix, with South Mountain in the background at a distance of about 25 miles. The images varied, however, in terms of the visibility conditions they depicted. Visibility conditions in the images ranged from very little visibility impairment at 15 deciviews, to substantial visibility impairment at 35 deciviews.[2] The range of visibility conditions depicted across the 21 slides essentially reflected the range of actual visibility conditions that are experienced in Phoenix throughout the year.

Air Resource Specialists, Inc. created the images used in this visibility survey using their WinHaze software. The principal advantage of modeled images relative to actual slides taken at different times is that the modeled images do not vary in terms of extraneous elements - such as cloud cover, sun angle, precipitation, vista color, birds, jet trails, etc. Prior research has shown that variations in some of these elements can have an impact on how viewers evaluate visual air quality.[3] The modeled images used in the Phoenix Visibility Survey portray visibility conditions under relatively uniform, regional haze conditions. At certain times of the year, particularly during the winter months, Phoenix sometimes experiences haze with a distinct layering, sometimes referred to as an urban plume. Basing the survey on images portraying regional haze-type conditions may provide better information for establishing a visibility index for the region as a whole. It is not known from this study, however, whether Phoenix residents would provide a different evaluation of visibility conditions if presented with images portraying a distinctly layered haze. Prior visibility research on perceptions of uniform regional haze versus urban plumes is also inconclusive.[4]

[1] The BBC study team acknowledges the valuable assistance provided by Dan Ely, a Researcher with the Colorado Department of Public Health and Environment. Dan provided helpful insights throughout the survey effort based on his experience designing, conducting, and analyzing a visibility survey for the Denver Metropolitan Area. The study team also received strong guidance from ADEQ staff including project manager Michael Sundblom and Mike George, as well as the Phoenix Area Visibility Index Oversight Committee, chaired by Leandra Lewis and including Diane McCarthy, Richard Bark, Dave Berry, Molly Greene, Yvonne Hunter, Gaye Knight, Jay Kaprosy, Tom Moore, Karen Rasmussen, and Nancy Wrona.

[2] The deciview scale, developed in the early 1990s, is analogous to the decibel scale for rating sound. The deciview scale is near zero for a perfectly pristine atmosphere and increases as visibility degrades. Each incremental deciview unit represents approximately 10 percent change in light extinction, which is a small but usually perceptible scenic change. (See The IMPROVE Newsletter, Winter 1993).

[3] See, for example, Brookshire, D.S. and Schulze, W.D., "The Economic Benefits of Preserving Visibility in the National Parklands of the Southwest," *Natural Resources Journal*, January 1983.

[4] As noted in Introduction to Visibility, Section 8, page 63: "The results indicate that plumes, if positioned in the sky in such a way as to not obscure the vista, have a minimal impact on VAQ. However, dark plumes were rated lower or perceived to have a greater impact on visual air quality than light-colored plumes..."

The study team administered 27 sessions in carefully controlled environments. The sessions included a total of 385 participants at six separate locations in the Phoenix Metropolitan Area. Participants were recruited to be demographically representative of four regions of the area, and three sessions were conducted in Spanish. Upon conclusion of the surveys, data were entered and statistically analyzed. Various statistical techniques were employed, to determine the influence of different demographic characteristics on survey responses, and to examine the reliability of the survey results. Implications of survey findings to the development of a visibility index were then identified and discussed.

Table 1. Frequency of ratings for each image.

	Visible Air Quality Rating							
Deciview	Very Poor VAQ 1	2	3	4	5	6	Excellent VAQ 7	Total
15	0.5%	2.6%	1.3%	10.6%	24.0%	32.5%	28.5%	100%
16	0.5	2.4	4.7	11.1	28.2	33.4	19.7	100
17	0.3	2.4	6.6	15.2	26.5	30.2	18.9	100
18	1.0	2.1	6.5	24.5	28.6	27.1	10.2	100
19	0.8	2.9	12.3	24.6	27.7	23.3	8.4	100
20	0.8	5.8	15.5	24.1	26.9	20.2	6.6	100
21	0.8	6.1	25.6	28.2	23.2	13.2	2.9	100
22	2.1	8.6	27.0	29.1	20.2	11.0	2.1	100
23	3.4	13.7	30.5	27.4	18.4	6.1	0.5	100
24	3.4	18.9	33.1	27.0	12.3	4.5	0.8	100
25	3.7	31.6	33.7	18.9	8.7	3.4	0.0	100
26	9.6	36.0	28.6	15.4	8.5	1.9	0.0	100
27	16.5	37.0	26.5	12.9	5.5	1.6	0.0	100
28	19.4	35.2	23.6	13.4	6.8	1.6	0.0	100
29	34.9	33.3	18.6	6.3	5.2	1.6	0.0	100
30	39.2	36.1	14.5	7.6	2.4	0.3	0.0	100
31	47.8	28.2	13.8	5.5	3.4	1.0	0.3	100
32	53.3	29.2	11.0	3.7	1.3	1.6	0.0	100
33	59.6	26.8	8.1	2.6	1.6	0.8	0.5	100
34	64.6	23.9	8.1	1.6	0.8	1.0	0.0	100
35	67.2%	24.6%	4.5%	0.8%	1.3%	0.3%	1.3%	100%

Survey results

In the first part of the survey, respondents were asked to rate the visibility shown in each slide on a scale of 1 to 7, with one being "very poor" and seven being "excellent." Table 1, at right, shows the frequency of ratings that each image received, with the modal rating shaded. The mode suggests that:

- Participants consider visual air quality to be near "excellent" (6 or 7) for deciviews 15 through 17.
- As deciview level increases, participants become steadily less satisfied with visual air quality.
- The mode shifts from the positive side of the rating scale (5, 6, or 7) to average (4) at deciview 21, and falls below average (ratings 1, 2, and 3) at deciview 23.

To identify the demographic factors that may influence visual air quality ratings in the Phoenix area, the study team employed standard statistical hypothesis tests (e.g., Chi-square tests of means). A host of respondent characteristics were tested, including respondent age, gender, ethnicity, income level, education, location of residence, and length of residence in the area. In general, ratings were quite consistent across demographic groups, with a few exceptions. When rating relatively clear air quality, younger participants were more likely to give high ratings than were older participants. Mean image ratings among 18 to 34 year olds for views between 15 and 23 deciviews tended to be approximately 1/2 to 1 full rating category higher (on the seven category scale) than among those 55 and older and these differences were statistically significant at the 95% confidence level. Residents living in the northeastern portion of the Phoenix area (including Scottsdale, Fountain Hills, and other suburbs) tended to give ratings approximately 1/2 rating category lower for most views than residents of other regions and these differences were also statistically significant over most of the deciview range.

In the course of both the first and second parts of the survey, participants were shown four duplicate slides. These repeated slides allowed examination of the internal consistency of responses by individual respondents. When rating visual air quality on the scale of 1 to 7, participants were remarkably consistent in scoring the reliability slides. In 84 percent of the cases, the rating given to the reliability slide was the same, or within ± 1 category, as the rating initially given to the image showing the same visibility condition.

In the second survey exercise, participants provided feedback on whether they thought the visible air quality shown in 25 random-order slides was acceptable or unacceptable. As shown in Figure 1 on the following page, participants' acceptance of visible air quality drops precipitously as deciview level increases. Overall, this exercise demonstrated that:

- At least 90 percent of all participants found visible air quality acceptable between 15 and 20 deciviews;
- At 24 deciviews, nearly half of all participants thought the visible air quality was unacceptable; and
- By 26 deciviews, almost three-quarters of participants said the visible air quality was unacceptable.

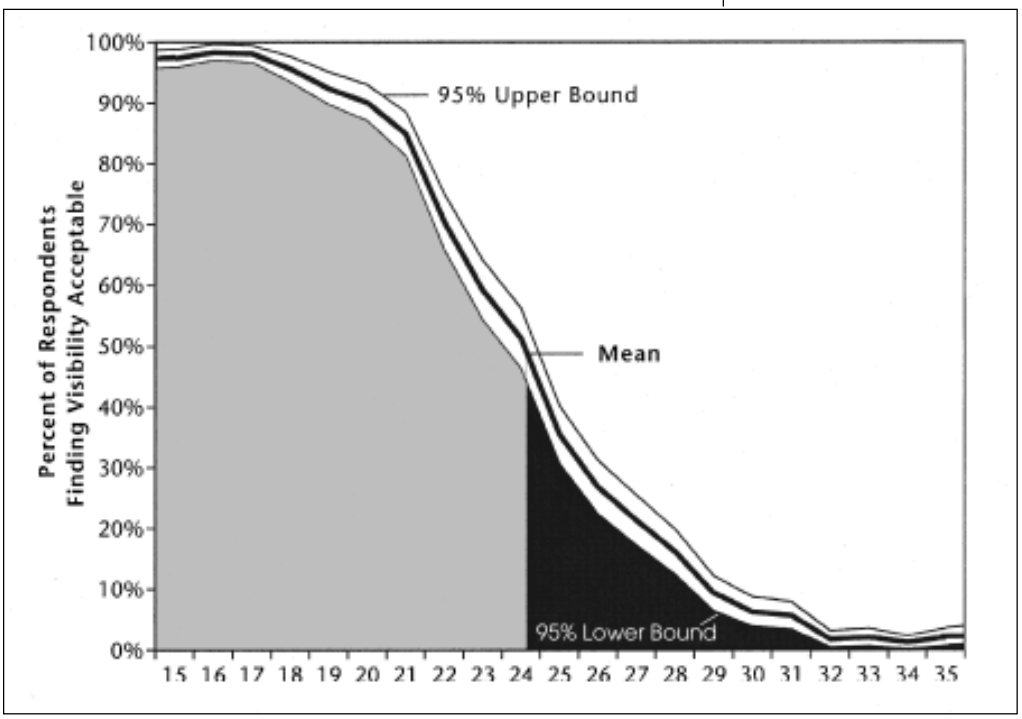


Figure 1. Survey of participants' acceptance of visible air quality compared to deciview level.

To understand the influence of underlying participant characteristics on acceptability ratings, the study team developed a logistic regression model and performed other statistical tests. Logistic regression models (logits) examine relationships between many factors and one variable of interest (dependent variable), all at the same time. A logit models these relationships by isolating the influence of individual factors (independent variables such as age, income, place of residency, etc.) on the probability of each slide being given an "acceptable" versus an "unacceptable" rating. The model estimates the following function:

Probability [Acceptable Rating] = f(deciview, age, income, gender, education, ethnicity, length of Phoenix residence, region of residence)

Acceptability ratings were generally consistent across demographic groups, though some demographic characteristics were associated with relatively minor, but statistically significant, variations. Women were more likely than men to consider a given level of visible air quality "acceptable." As participants age, they become less likely to give "acceptable" visual air quality ratings. Participants with household incomes of $100,000 or greater gave fewer "acceptable" ratings than did participants with household incomes between $75,000 and $100,000. As education level increased, participants were less likely to consider the visible air quality at a given deciview to be "acceptable." Once again, residents of the northeast portion of the Phoenix area were more critical of visibility conditions than other residents. Race and Hispanic origin did not have statistically significant impacts on participants' acceptability ratings.

Acceptability responses for the duplicated, "reliability" slides were compared with participants' initial acceptability responses for the same image. Ninety percent of participants' responses were the same for both the reliability and study slides (either Yes/Yes or No/No). This suggests that individual participants were highly consistent in their evaluation of visibility acceptability.

The final exercise participants completed was to consider the number of days of the year that a given visibility level was acceptable. Unlike the visibility ratings and acceptability tests, this exercise, designed to respond to the third objective of the Visibility Index Oversight Committee, is not known to have been undertaken in previous visibility survey research. Participants were shown seven random-order slides and could list any number of days between 0 and 365.

As deciview level increases, the mean number of acceptable visible air quality days fell dramatically. At deciview 15, participants thought visible air quality would be acceptable for nearly 90 percent of the year. By deciview 19, visible air quality was only acceptable for 60 percent of the year and only 30 percent of the year was acceptable at 23 deciviews.

In combination, the three types of information collected from the visibility survey provide an informative, reliable, and consistent description of the visibility perceptions of Phoenix area residents. Table 2 on the following page depicts results from the three portions of the survey side-by-side for selected deciviews.

Table 2. Results of all 3 portions of the survey for selected deciview levels.

Deciview	Percent Rating Above Average (5-7)	Percent Acceptable	Mean Number of Days Acceptable
19	59.0%	92.4%	227
21	38.7%	84.9%	190
23	24.7%	59.3%	113
25	11.9%	35.5%	58
27	7.0%	21.4%	26

Recommended visibility index

After reviewing the survey results the Committee discussed several components that would form the index. Each component and related discussion is described below.

The Committee concluded that using actual daylight hours was preferred over fixed clock hours (e.g., 6:00 a.m. to 6:00 p.m.). Members noted that actual daylight hours would range from 11 to 15 hours per day depending on the season and should be updated on a monthly basis. A fixed clock method would have utilized pre-dawn and post-sunset hours in the winter, and neglected early morning and early evening daylight hours during summer.

The use of rolling averages over block averages was discussed; the Committee concluded that rolling averages would be most feasible given selection of actual daylight hours.

The Committee agreed to using index categories (e.g., excellent to very poor) rather than a "bright line" approach. The members reasoned that an index category approach using a 5-category system (excellent, good, fair, poor, and very poor) is much easier for the general public to understand. It includes categories, which reflect what people actually see, and is a more intuitive method.

The Committee selected 4-hour averaging for the visibility index to provide timely information to the public and also provide a measurement period that can be most useful in longer term trend analysis. Members also came to a general agreement that the Arizona Department of Environmental Quality should proceed with data analysis and reporting as appropriate and feasible, but that the daily value used for comparison to the long-term trend should be based upon the worst 4-hour average.

Based upon the technical analysis of the survey results conducted by Air Pollution Evaluations and Solutions, the Committee selected the following category thresholds for the visibility index: 1-14 deciviews - excellent; 15-20 deciviews - good; 21-24 deciviews - fair; 25-28 deciviews - poor; and 29 or more deciviews - very poor.

The Committee recommended that the environmental goal of the index will be to show continued progress through 2018 by: 1) improving visibility to move days now in the poor/very poor categories up to the fair category, and 2) moving days classified as fair to the good/excellent categories. A progress assessment will be conducted every 5 years through 2018. The option provides a clear, long-term method to track visibility trends in the Phoenix metropolitan area.

Additionally, the Committee agreed that the index should not be used to affect short-term actions because other programs, such as the High Pollution Advisory Program, are currently in place in the Phoenix Metropolitan Area. Table 3 below summarizes the recommended visibility index.

Table 3. Recommended visibility index developed for the Phoenix Metropolitan Area.

Recommended Visibility Index	
1. Index Categories	
Category	**Deciview Range**
Excellent	14 or less
Good	15 to 20
Fair	21 to 24
Poor	25 to 28
Very Poor	29 or greater
2. Averaging	
4-Hour Rolling Average	
3. Statistic for Reporting Period	
Highest Daily Average Deciview Value, as measured by a transmissometer during daylight hours (adjusted monthly)	
4. Environmental Goal	
Show continued progress through 2018 Move days in the poor/very poor categories up to the fair category Move days in the fair category up to the good/excellent categories Progress assessment to be conducted every 5 years through 2018	

Deciview values for actual conditions will be measured by an Optec LPV-2 transmissometer, which has operated in central Phoenix since 1992. The Arizona Department of Environmental Quality collects 1-minute samples from the instrument.

For more information contact Douglas Jeavons, Managing Director at BBC Research & Consulting. Telephone: 303/321-2547. E-mail:djeavons@BBCResearch.com.

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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. Steering Committee representatives are:

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Associate Membership in the IMPROVE Steering Committee is designed to foster additional IMPROVE-comparable visibility monitoring that will aid in understanding Class I area visibility, without upsetting the balance of organizational interests obtained by the steering committee participants. Associate Member representatives are:

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PUBLISHED BY:
Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525

The IMPROVE Newsletter is published four times a year (February, May, August, & November) under National Park Service Contract CX-1270-96-006.

The IMPROVE Program was designed in response to the visibility provisions of the Clean Air Act of 1977, which affords visibility protection to 156 federal Class I areas. The program objectives are to provide data needed to: assess the impacts of new emission sources, identify existing human-made visibility impairments, and assess progress toward the national visibility goals as established by Congress.

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