Appalachian Mountain Club comments on the Policy Assessment for the Review of the Particulate Matter National Ambient Air Quality Standards—Second External Review Draft, Chapter 4—Review of the Secondary Standards for Visibility-Related Effects.

Docket ID No. EPA–HQ–OAR–2007–0492

August 30th, 2010

The Current Secondary PM standard is not sufficient

We agree with EPA staff that significant information brought forth in this review clearly calls into question the efficacy of the current secondary PM NAAQS in protecting the public welfare. We strongly support the Agency in its consideration to revise the secondary standard and urge the Administrator to consider a standard that accounts for national welfare effects of visual air quality impairment due to particle pollution.

Alternative Approach

EPA has provided extensive analysis of alternative metrics, levels, and forms for an urban-focused visibility secondary NAAQS. We support the use of a percent based acceptability criteria as a means to establish a level for consideration in setting a PM visibility NAAQS. However, we are concerned that EPA's secondary standard policy assessment is focused on urban areas alone. We understand the importance of first identifying a level of visibility necessary to protect the public welfare before setting the NAAQS and that EPA is relying on the 4 major urban visual air quality (VAQ) studies that have investigated what levels of visibility degradation are unacceptable and acceptable. There has been a similar rural based study (Hill et al., 2000[1]) that was conducted in New Hampshire (NH) using both Win Haze generated images and US Forest Service photograph scenes of the Great Gulf Wilderness, which found that 53 km or less was not acceptable to survey respondents. This study was modeled after the Denver Study by Ely et al., 1991 and while it's focus was on a Class I Wilderness area, in the context of the Regional Haze Rule, it is still representative of a rural scene and could be considered. AMC has also done further surveys of mountain scenes VAQ in "real-time" asking visitors to rate the view, and indicate acceptability, in comparison to a clear day photograph. A logit analysis was conducted on all of the AMC visibility surveys (see Appendix A for full report) and model 1 results are reported in Table 1. The 50% acceptability criteria ranged from 19.7 - 27.2 dv, with only one dataset greater than 21.3 dv, indicating that for rural scenes a 50% acceptability value of 20 dv may be most appropriate. This data also supports EPA's current draft Candidate Protection Levels (64-191 Mm^{-1}) as an independent study that found a slightly lower and tighter range of 62 - 142 Mm^{-1} for model 1 logistical regression fits.

[1] Hill et al., In Cole, David N, McCool, Stephen F. 2000. Proceedings: Wilderness Science in a Time of Change. Proc., RMRS-P-000. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Table I. Logit Model 1 Results using AMC Visibility Survey Data

	Great Gulf Win Haze	Great Gulf Photo Books	Galehead	Greenleaf	Lakes	Madison
75% acceptability	15.0	15.4	21.4	14.3	15.6	14.0
50% acceptablity	20.8	21.3	27.2	20.0	21.3	19.7
25% acceptablity	26.5	27.1	33.0	25.7	27.2	25.4
n Acceptable	1348	5531	486	337	432	110
n Unacceptable	947	3637	141	204	256	51
Total n	2295	9168	627	541	688	161

The Regional Haze Rule (RHR) should not be considered as the regulatory mechanism to remedy visual air quality impairment in non-Class I scenic rural regions across the nation. The first reasonable progress goal for the RHR in 2018 is expected to improve visual range in the Northeast Class I areas with a final targeted visibility of pristine condition by 2064. However struggling rural economies that rely on natural resources such as pristine views from road side vistas and mountain top peaks need relief in the near term that specifically protect the public welfare in non-Class I areas. Further, the affects on recreational experiences outdoors, for young and old, are negative when visibility is degraded- contrasting the healthy goals of the Obama Administration in its America's Great Outdoors (AGO) Initiative. Class I area monitoring can, however, inform the condition of visibility in rural scenic America. The latest assessment by the National Park Service shows that on the haziest of days from 1998-2007 visibility trends are unchanged or is only weakly improved. Looking at 2003-2007 the NPS considers visibility conditions in most parks across the nation moderate to significant concern.

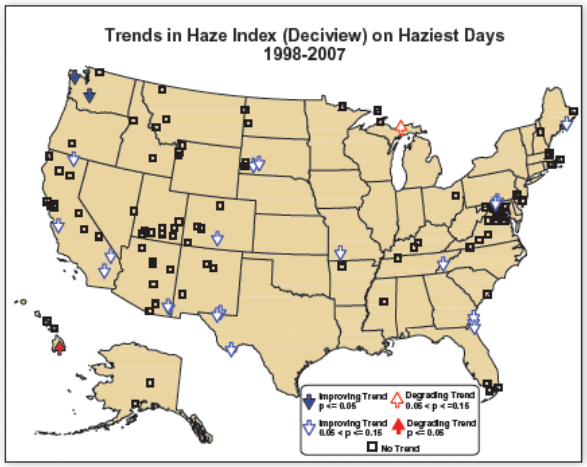

Figure 2. Trends in haze index on the haziest days, 1998-2007.

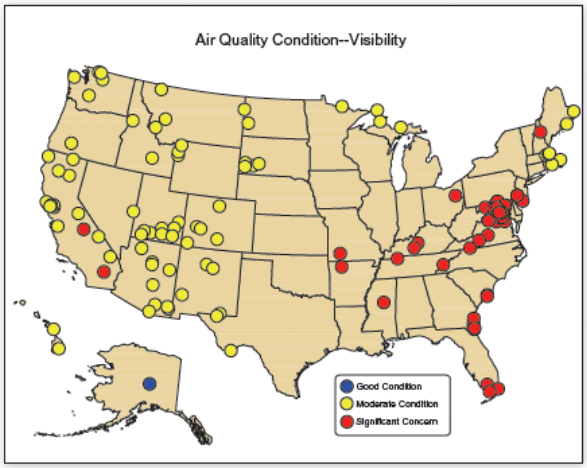

Figure 7. Air quality condition assessments for visibility. Condition assessments were derived from interpolations of average visibility conditions, 2003-2007.

http://www.nature.nps.gov/air/Pubs/pdf/AQ_Trends_In_Parks_2008_Final_Web.pdf
Air Quality in National Parks. 2008 Annual Performance & Progress Report
Natural Resource Report NPS/NRPC/ARD/NRR—2009/151

Indicator Form

Of the three potential indicators: a $PM_{2.5}$ Mass Indicator, a Speciated $PM_{2.5}$ Mass-calculated Light Extinction Indicator, and a Directly Measured $PM_{2.5}$ Light Extinction Indicator we agree with CASAC's that the latter is preferable. However, we also understand the consideration of the delay in implementation without a Federal Reference Method for directly measured

extinction in place. As an interim step we support a Speciated $PM_{2.5}$ Mass-calculated Light Extinction Indicator but with the stipulation that EPA commit to expedite methodology development and the FRM approval process for direct light extinction measurements.

Indicator Levels

EPA staff provide 3 Candidate Protection Levels (64, 112, 191 Mm^{-1}) for speciated $PM_{2.5}$ mass-calculated light extinction, and alternative levels of 10, 20, and 30 $\mu g/m^3$ for $PM_{2.5}$ mass concentration. These levels were chosen based on the urban visibility studies using the 50% acceptability criteria. We urge EPA to consider rural locations in setting the CPL as described above. We reiterate that the Regional Haze Rule does not protect the public welfare in regards to visual air quality outside Class I Areas. Generally we support a day-time hourly maximum form of the standard at the 98^{th} percentile level.

We appreciate the opportunity to comment of this Second External Review Draft, Chapter 4—Review of the Secondary Standards for Visibility-Related Effects of the Policy Assessment for the Review of the Particulate Matter National Ambient Air Quality Standards.

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Staff Scientist
Appalachian Mountain Club

APPENDIX A

AMC Visibility Surveys

Great Gulf Visibility Surveys

Methods for the two Great Gulf visibility surveys are described in detail in Hill et al., 2000 (http://www.wilderness.net/library/documents/Hill_5-x.pdf). The first survey was done using Great Gulf scene photographs in booklets at three sites; Tuckerman Ravine trailhead at the AMC's Pinkham Notch Visitor Center in the White Mountain National Forest, a self serve site at the summit of Mount Washington in the Mount Washington Observatory facility, and AMC's Cardigan Lodge in central New Hampshire. The 5 X 7 photogrpahs of the Great Gulf Wilderness scene were viewed individually by flipping through individual photos. Participants were asked to rated 5 warm up and then 23 photos on a scale of 1-5 (where 1 is clear and 5 is most hazy) and then asked to go back through the same suite of 23 photos, and rate each as either "acceptable" or "unacceptable". The second survey was conducted similar to the first but with modeled images using the WinHaze Visual Air Quality Modeler (Air Resource Specialists, Fort Collins Colorado) and laptop computer for data collection, eliminating paper surveys and photographs.

View Guides

AMC has been surveying our backcountry facility visitors on the acceptability of the views in the mountains through our Mountain Watch program since 2007. Mountain Watch is an educational hands-on environmental monitoring program based in the mountains of the northeast where participants volunteer to contribute observations to a long-term database. Monitoring initiatives are focused on tracking long-term trends in, and the ecological response to, climate change and air pollution. Impacts to natural resource values that directly impact an outdoor recreationists experience, such as poor visibility, is one focal area.

View guides were developed for 4 vista locations; Lake of the Cloud hut, Madison hut, Greenleaf hut, and Galehead hut, see Figure 1 a-d. At all locations we asked the visitor to record their name, date, time of day, and to estimate the visual range (furthest discernable peak), "rate today's visibility" on a scale of 1 to 7 with 1 being poor and 7 being excellent, and to check whether today's haze level was "acceptable" or " unacceptable". Figure 2 shows the data requested from participants and some of the background information provided.

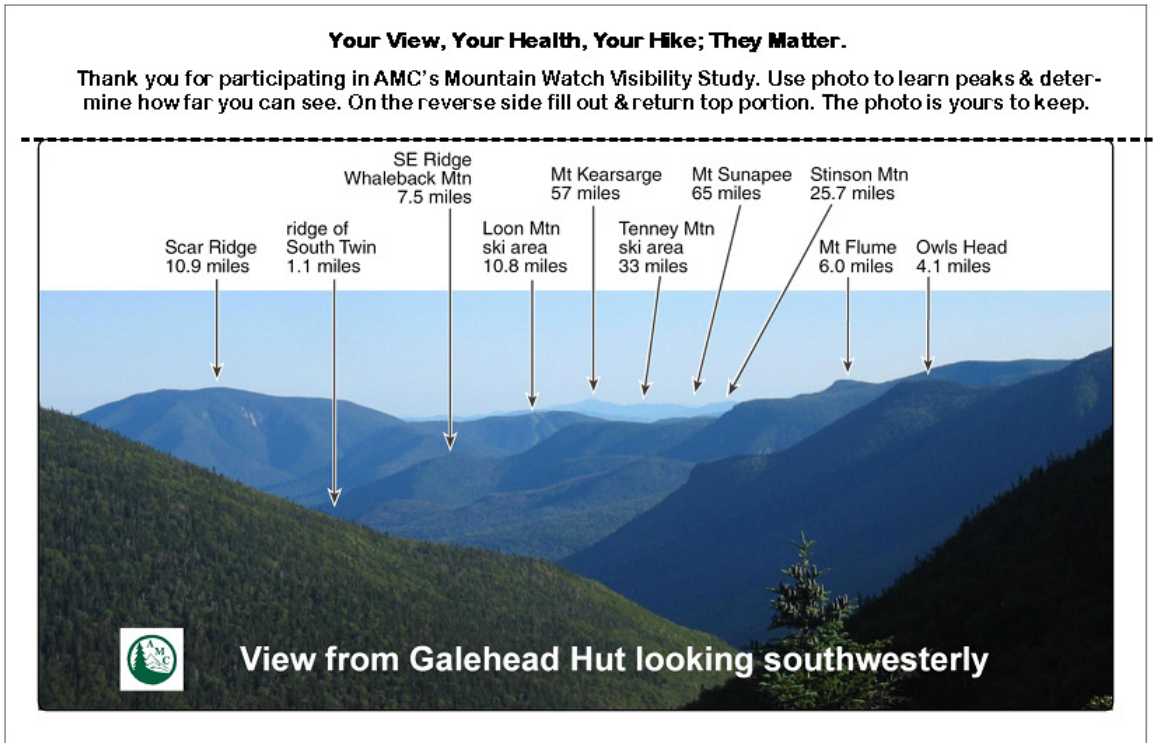
It should be noted that while we attempted to provide view guides with evenly distributed distances for labeled peaks that this was not always possible and some mid-field markers could not be found. Therefore each site has some bias in estimating visual range related to the peaks marked on the view guide and furthest discernible peak marked ranged from 64 to 80 miles. Participants filled out the cards after a facility staff Naturalist gave an evening program related to air quality and visibility impairment, from encouragement by staff with a short explanation, or from a self-serve display. AMC staff were instructed not to have the view guides filled out when it was raining or they were "in the clouds". While we recognize that this approach to collecting information on visual range and opinions about haze levels is coarse and it is to be expected that more error could be introduced in this type of setting than in a controlled study, we expected that comparing this type of information to the more detailed analysis above along with a large volume of responses could reduce the overall errors that may be introduced by a less controlled study. A summary of average visual range and rating values are shown in Table 1 by location and split by acceptable and unacceptable.

Table 1. Summary of View Guide Average Visual Range and Ratings by Acceptable and Unacceptable responses by location

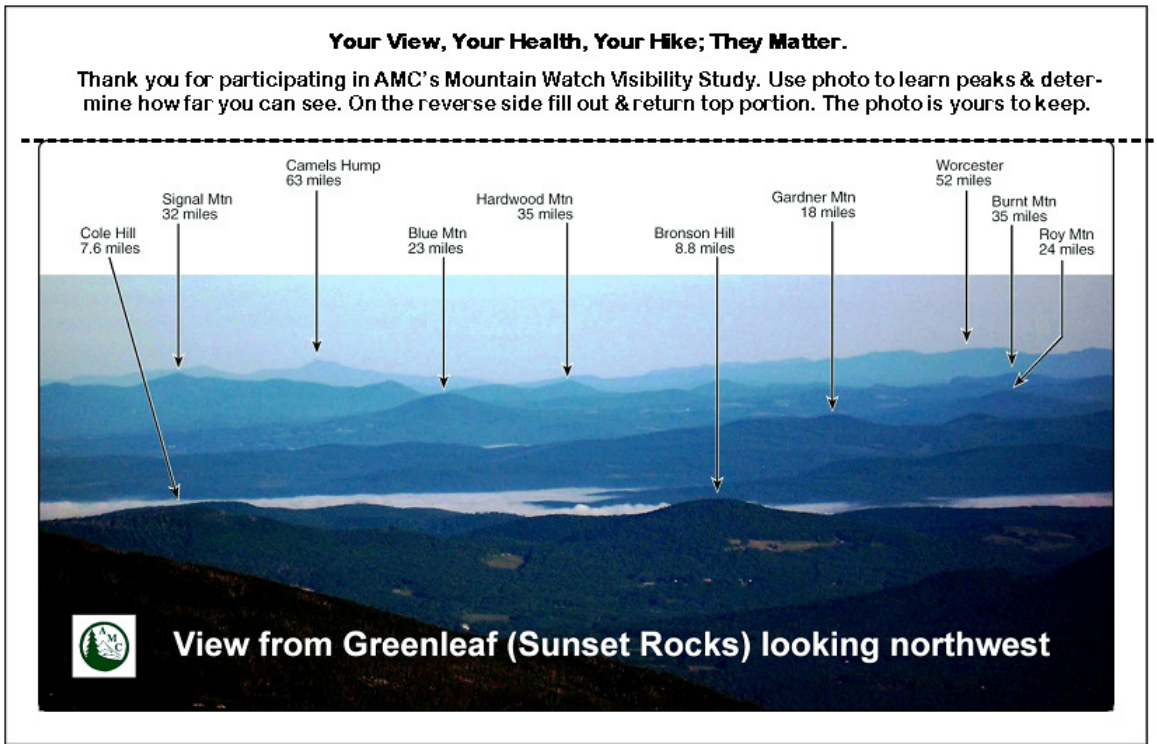
Location	Maximum Distance Marked	*Acceptable*		*Unacceptable*	
		Avg. Visual Range (miles)	Avg. Rating (1-7)	Avg. Visual Range (miles)	Avg. Rating (1-7)
Galehead	65	50.9	5.9	26.2	4.0
Greenleaf	64	58.3	5.7	33.9	3.2
Lakes	80	65.9	5.6	27.7	3.1
Madison	75	67.4	5.9	37.2	3.5

Figure 1 a) Galehead, b) Greenleaf, c) Lakes of the Clouds, d) Madison

a)



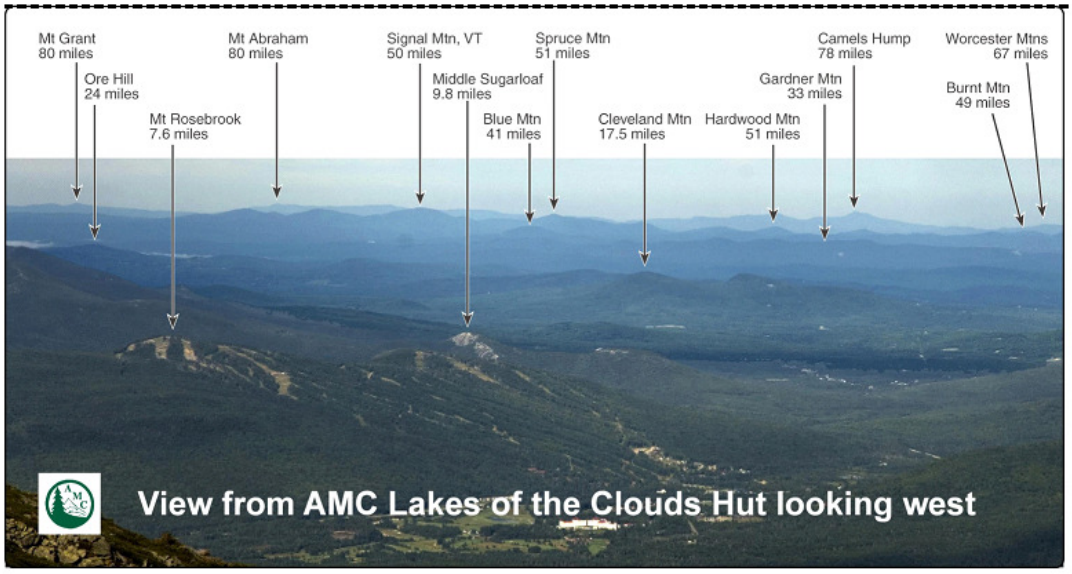
b)



c)

Your View, Your Health, Your Hike; They Matter.

Thank you for participating in AMC's Mountain Watch Visibility Study. Use photo to learn peaks & determine how far you can see. On the reverse side fill out & return top portion. The photo is yours to keep.



d)

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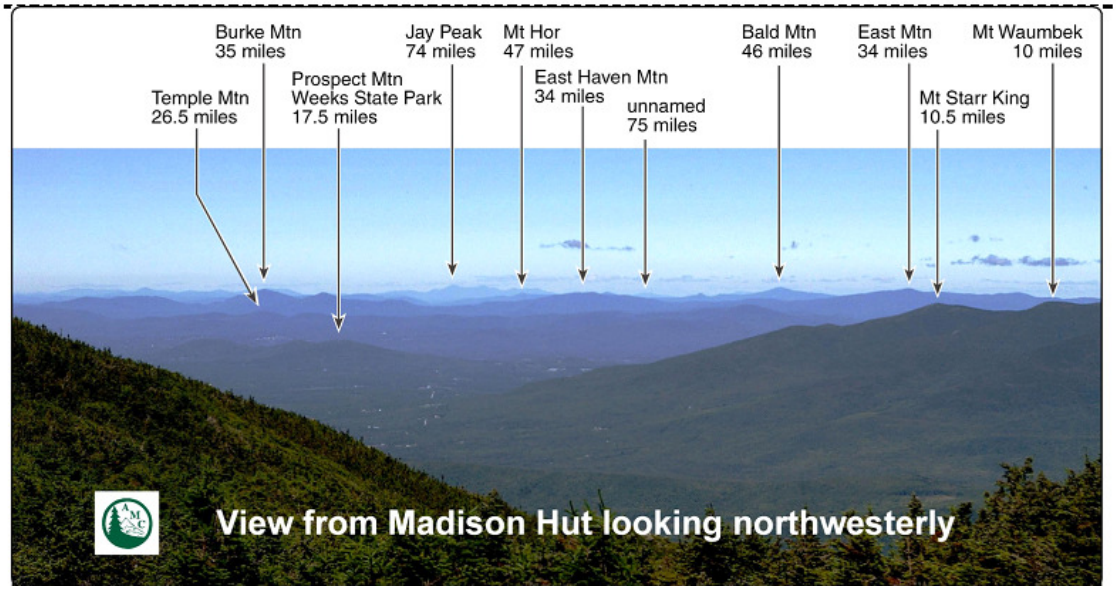
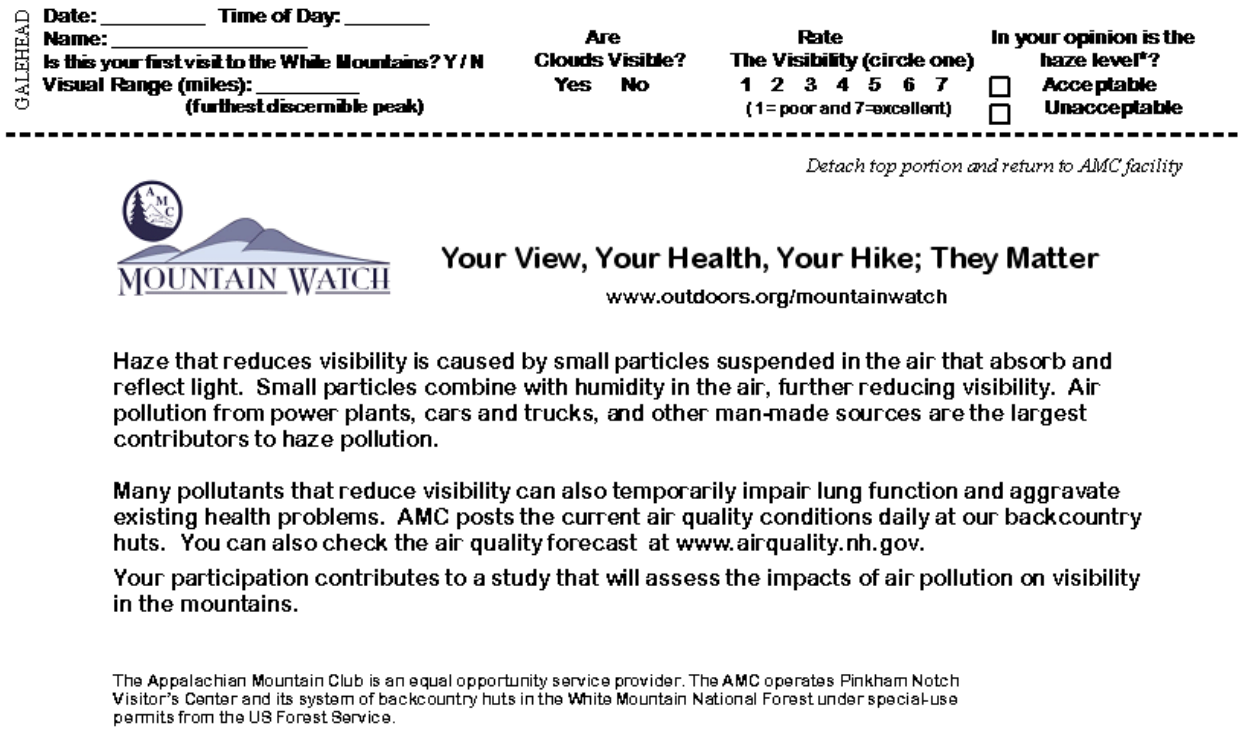


Figure 2. View Guide datasheet



GALEHEAD

Date: _____ Time of Day: _____
Name: _____
Is this your first visit to the White Mountains? Y / N
Visual Range (miles): _____
(furthest discernible peak)

Are Clouds Visible? Yes No

Rate The Visibility (circle one)
1 2 3 4 5 6 7
(1 = poor and 7=excellent)

In your opinion is the haze level*?
☐ Acceptable
☐ Unacceptable

Detach top portion and return to AMC facility

MOUNTAIN WATCH

Your View, Your Health, Your Hike; They Matter

www.outdoors.org/mountainwatch

Haze that reduces visibility is caused by small particles suspended in the air that absorb and reflect light. Small particles combine with humidity in the air, further reducing visibility. Air pollution from power plants, cars and trucks, and other man-made sources are the largest contributors to haze pollution.

Many pollutants that reduce visibility can also temporarily impair lung function and aggravate existing health problems. AMC posts the current air quality conditions daily at our backcountry huts. You can also check the air quality forecast at www.airquality.nh.gov.

Your participation contributes to a study that will assess the impacts of air pollution on visibility in the mountains.

The Appalachian Mountain Club is an equal opportunity service provider. The AMC operates Pinkham Notch Visitor's Center and its system of backcountry huts in the White Mountain National Forest under special-use permits from the US Forest Service.

Logit Results

Using Systat 12 a model 1 and model 2 logit analysis was done following the methodology described by the Memorandum dated 2/3/10, subject : Statistical analysis of existing urban visibility preference studies, from Stratus Consulting Inc. We were unable to conduct a Monte Carlo estimation for developing Krinsky-Robb confidence intervals. Model 1 results are shown below in Tables 2 and 3 and Figure 3. The View Guide method allows us to survey broad spectrum of the backcountry visiting public in real world visibility conditions however it also is subject to significant uneven distribution of data points across dv values, likely contributing to more error in the regression fits. This is apparent when looking at the 7 data points >20 dv at 100% in Figure 3 which are all n = 1.

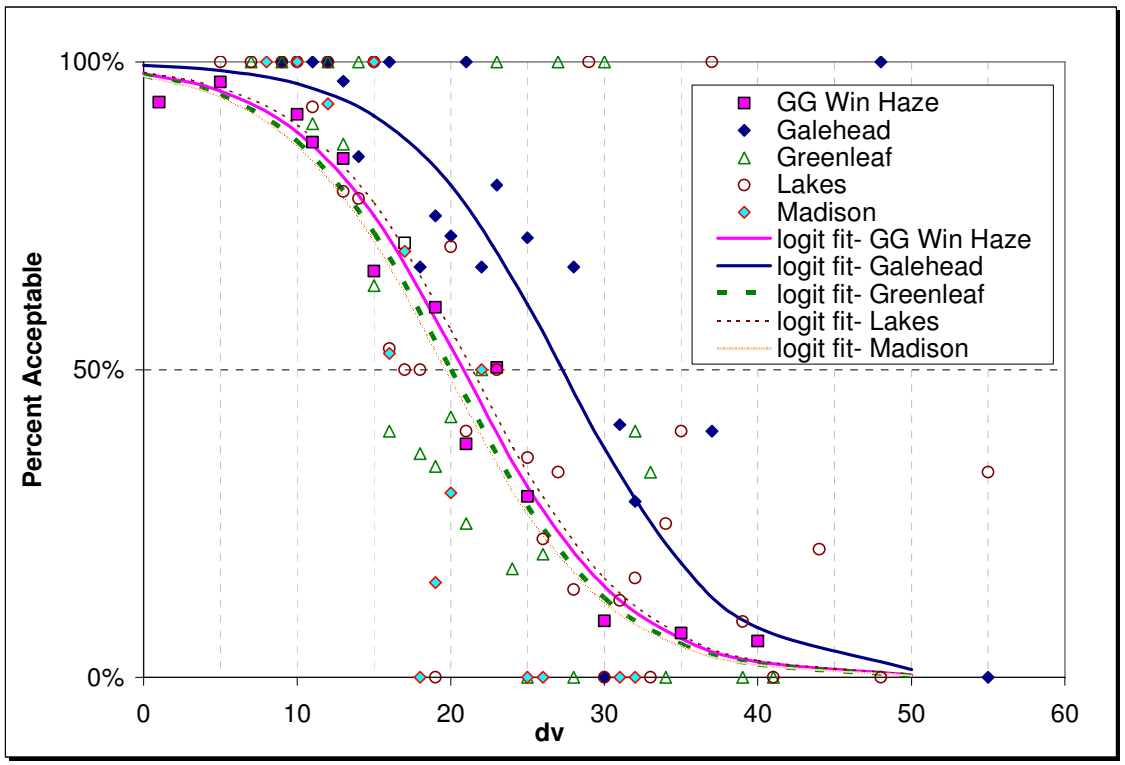
Table 2.

Model 1 Logit output from Systat						
Parameter	Estimate	Standard Error	Z	p-value	95 % Confidence Interval	
1 CONSTANT*	3.958	0.088	44.902	0.000	3.786	4.131
2 DV	-0.191	0.004	-52.677	0.000	-0.198	-0.184
3 LOCATION$_GG_viz_books	0.102	0.061	1.660	0.097	-0.018	0.221
4 LOCATION$_Galehead	1.249	0.130	9.600	0.000	0.994	1.504
5 LOCATION$_Greenleaf	-0.136	0.114	-1.189	0.235	-0.359	0.088
6 LOCATION$_Lakes of the Clouds	0.123	0.118	1.041	0.298	-0.109	0.355
7 LOCATION$_Madison	-0.203	0.195	-1.039	0.299	-0.585	0.180
**Constant is Great Gulf Win Haze Visibility Study*						
McFadden's Rho-squared	*0.248*					
Cox and Snell R-square	*0.282*					
Naglekerke's R-square	*0.382*					
log likelyhhood chi2 test p value	*0.000*					

Table 3. Logit Model 1 dv estimates using AMC Visibility Survey Data

	Great Gulf Win Haze	**Great Gulf Photo Books**	**Galehead**	**Greenleaf**	**Lakes**	**Madison**
75% acceptability	15.0	15.4	21.4	14.3	15.6	14.0
50% acceptablity	20.8	21.3	27.2	20.0	21.3	19.7
25% acceptablity	26.5	27.1	33.0	25.7	27.2	25.4
n Acceptable	1348	5531	486	337	432	110
n Unacceptable	947	3637	141	204	256	51
Total n	2295	9168	627	541	688	161

Figure 3. AMC Visibility Survey data shown as percent acceptable vs. dv and logit model 1 fit regression lines. Great Gulf Photo Books data not shown.



Model 2 logit fits changed overall results, see Table 4 and 5, and increased standard error values. The results and error values for the Madison location changed the most, likely due to the low n for this location. For all other datasets the extinction range estimates from Model 2 shifted down to 48- 112 Mm-1. However, due to the increased error and dramatic shifts in view guide values there is less confidence in the fits with this less conservative version of the model. When all four locations with View Guide data are pooled the 50% value is 19.6 dv indicating a low end of the CPL should be approximately 60 Mm-1.

Table 4.

Model 2 Logit output from Systat						
Parameter	Estimate	Standard Error	Z	p-value	95 % Confidence Interval	
1 CONSTANT*	3.862	0.157	24.6	0.000	3.554	4.170
2 DV	-0.186	0.008	-23.8	0.000	-0.201	-0.170
3 LOCATION$_GG_viz_books	0.323	0.183	1.8	0.078	-0.036	0.682
4 LOCATION$_Galehead	0.488	0.367	1.3	0.184	-0.232	1.208
5 LOCATION$_Greenleaf	1.221	0.470	2.6	0.009	0.300	2.143
6 LOCATION$_Lakes of the Clouds	-0.654	0.284	-2.3	0.021	-1.210	-0.098
7 LOCATION$_Madison	4.317	1.223	3.5	0.000	1.920	6.714
8 DV*LOCATION$_GG_viz_books	-0.011	0.009	-1.3	0.206	-0.029	0.006
9 DV*LOCATION$_Galehead	0.034	0.016	2.1	0.040	0.002	0.066
10 DV*LOCATION$_Greenleaf	-0.079	0.026	-3.0	0.003	-0.130	-0.027
11 DV*LOCATION$_Lakes of the Clo	0.044	0.014	3.1	0.002	0.016	0.072
12 DV*LOCATION$_Madison	-0.288	0.076	-3.8	0.000	-0.437	-0.140
**Constant is Great Gulf Win Haze Visibility Study*						
McFadden's Rho-squared	*0.251*					
Cox and Snell R-square	*0.285*					
Naglekerke's R-square	*0.386*					
log likelyhhood chi2 test p value	*0.000*					

Table 5. Logit Model 2 dv estimates using AMC Visibility Survey Data

	Great Gulf Win Haze	**Great Gulf Photo Books**	**Galehead**	**Greenleaf**	**Lakes**	**Madison**	**All View Guides**
75% acceptability	14.9	16.4	17.6	21.0	11.5	36.6	13.7
50% acceptablity	20.8	22.4	23.5	27.0	17.5	42.5	19.6
25% acceptablity	26.8	28.4	29.4	32.7	23.3	48.4	25.6
n Acceptable	1348	5531	486	337	432	110	1365
n Unacceptable	947	3637	141	204	256	51	652
Total n	2295	9168	627	541	688	161	2017