

Note: This presentation contains substantial additional information in the notes section of PowerPoint that can be seen in the bottom panel of the “Normal” view mode, and can be printed by selecting “Notes Pages” from the “Print what” selection of the “Print” menu (go to “Files” on the top tool bar and select “Print”). You can also use “Preview” for the “Notes Pages” to more easily read the notes on your computer monitor.

These notes were prepared

1. to aid those hearing the presentation by relieving them of the burden of taking as many notes;
2. to allow those who haven't heard the presentation to understand it by providing the additional information that is spoken during presentations; and
3. to provide a more complete documentation of the natural haze levels II approach for anyone who may want to understand it

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Overall Goal

- Estimate 20% best and 20% worst natural haze levels for visibility-protected class I areas using the new IMPROVE algorithm for estimating light extinction from aerosol species concentrations.
 - Needed for Regional Haze Rule (RHR) rate of progress glide slopes where the new IMPROVE algorithm is used to characterize current haze levels
 - Should minimize the technical problems identified in the RHR default natural haze levels that were developed using the original IMPROVE algorithm

Default Natural Haze Levels Approach

- Typical haze level estimates for East and West
 - Typical light extinction by applying the original IMPROVE algorithm to Trijonis natural species concentration estimates for East and West
 - Convert to haze index (deciview units)
- 20% best and 20% worst haze estimate for East and West
 - Best = typical – 1.28(standard deviation)
 - Worst = typical + 1.28(standard deviation)
 - Standard deviation is 3dv for the East and 2dv for the West (corresponds to the 10th and 90th percentile)

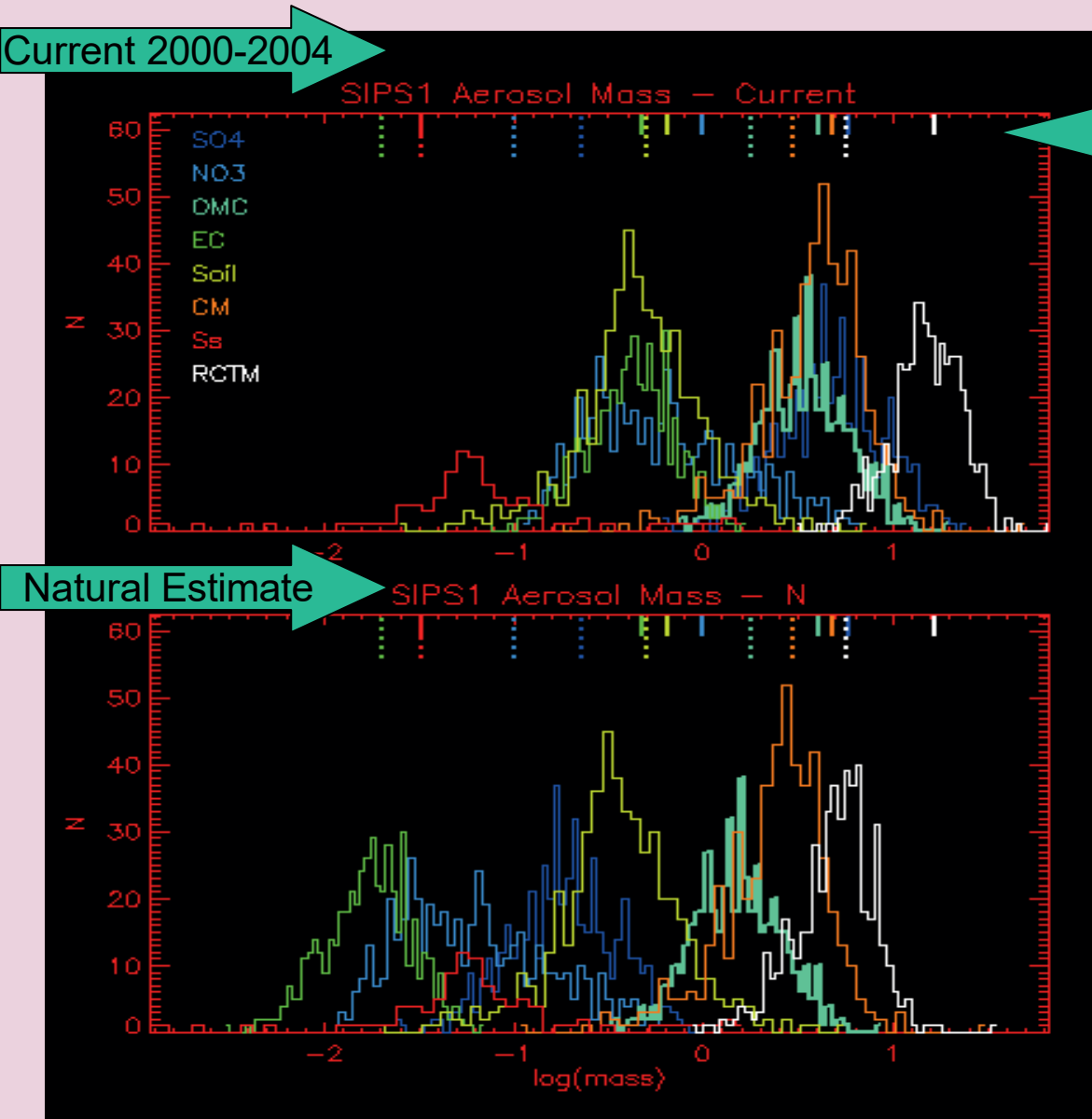
Criticism of the Default Approach

- Limitations of the original IMPROVE algorithm
 - Biased light extinction estimates at the extremes
 - Uses an outdated organic compound mass to carbon mass ratio
 - No sea salt (important at a few sites)
 - Rayleigh scattering of 10Mm^{-1} used for all site
- Flawed assumptions used to estimate 20% best and worst conditions
 - Haze index for natural conditions are not likely to be normally distributed due to inclusion of Rayleigh scattering
 - 10th and 90th percentiles don't correspond to the best and worst conditions if the distribution were normal

Natural Haze Levels II Approach

- Adjust each of the measured major species concentrations to the Trijonis natural concentration estimates
 - Multiply each species concentration at a site by the site-specific ratio of the (Trijonis natural estimate) divided by the (annual mean concentration) for the species for the 5 year baseline period
 - If the annual mean concentration for a species is smaller than the Trijonis natural estimate, make no adjustment
 - Current sea salt levels are taken to be natural levels
- Apply the new IMPROVE algorithm to the Trijonis-adjusted species concentrations at each site to produce a distribution of natural light extinction values
- Convert to deciview and calculate the mean of the 20% best and 20% worst haze levels

Trijonis-Adjusted Specie Frequency Distributions

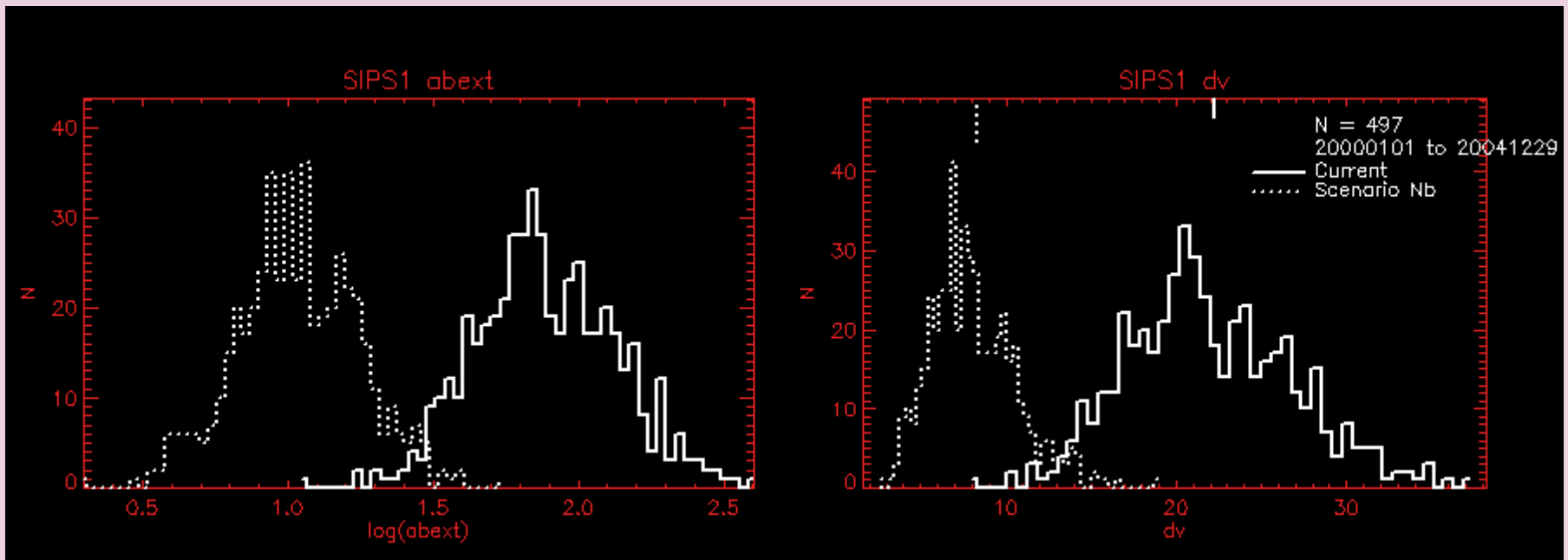


Hanging bars
Solid - current mean
Dashed - natural estimate mean

- Sipsey Alabama
- Each aerosol species mass concentration frequency distribution scaled to estimate d natural mass concentrations
- If current species mean is less than natural estimate, the that species is not scaled
- Geometric shape of species distributions is unchanged

Current and Natural Haze Frequency Distributions

- Sipsey Alabama
- Natural scenario joint distribution shape is derived from scaling current aerosol species mass concentrations to natural condition estimates
- Allows estimation of best and worst 20% dv or aerosol species extinction



Natural Haze Levels II

Param: dv
 Value: Worst 20%
 File: NdvG90_Final.csv

151 Contoured Sites

104 IMPROVE \triangle

47 Protocol \diamond

7 sites off the map

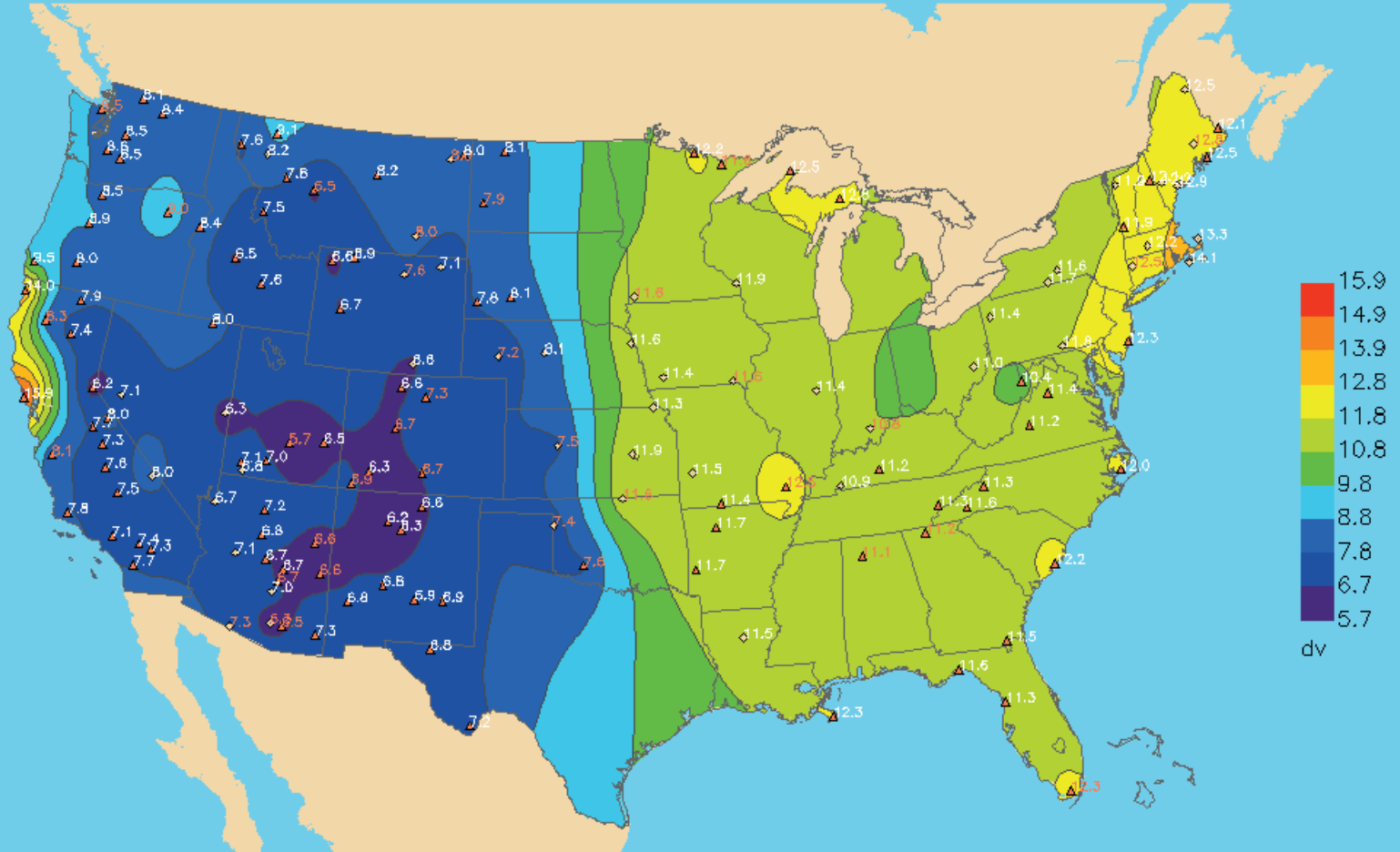
Site	Prog	N	ng90
DENA1	IMPROVE	5	7.4
HALE1	IMPROVE	4	7.5
HAVO1	IMPROVE	4	7.2
SIME1	IMPROVE	3	15.7
TRCR1	Protocol	3	8.5
TUXE1	IMPROVE	3	11.5
VIS1	IMPROVE	4	10.8

6 urban sites removed from map

Site	Prog	N	ng90
COGO1	Protocol	3	8.9
COR11	Protocol	3	8.7
PHOE1	Protocol	3	7.2
PUSO1	Protocol	3	10.5
SPOK1	Protocol	3	8.3
WASH1	Protocol	5	11.9

17 sites with insufficient data

Site	Prog	N	ng90
AMBL1	Protocol	0	0.0
ATLA1	Protocol	0	0.0
BALT1	Protocol	0	0.0
BIRM1	Protocol	0	0.0
CHIC1	Protocol	0	0.0
DETR1	Protocol	0	0.0
DOUG1	Protocol	0	0.0
FRES1	Protocol	0	0.0
FRRE1	Protocol	0	0.0
HOUS1	Protocol	0	0.0
INCA1	Protocol	0	0.0
LOPE1	Protocol	0	0.0
NEYD1	Protocol	0	0.0
PETE1	Protocol	0	0.0
PIIT1	Protocol	0	0.0
RUB11	Protocol	0	0.0
SHM11	Protocol	0	0.0



Default Natural Haze Levels

Param: dv
 Value: Worst 20% Default
 File: QIA nc=mean+1.28s.txt

151 Contoured Sites

104 IMPROVE \blacktriangle

47 Protocol \blacklozenge

7 sites off the map

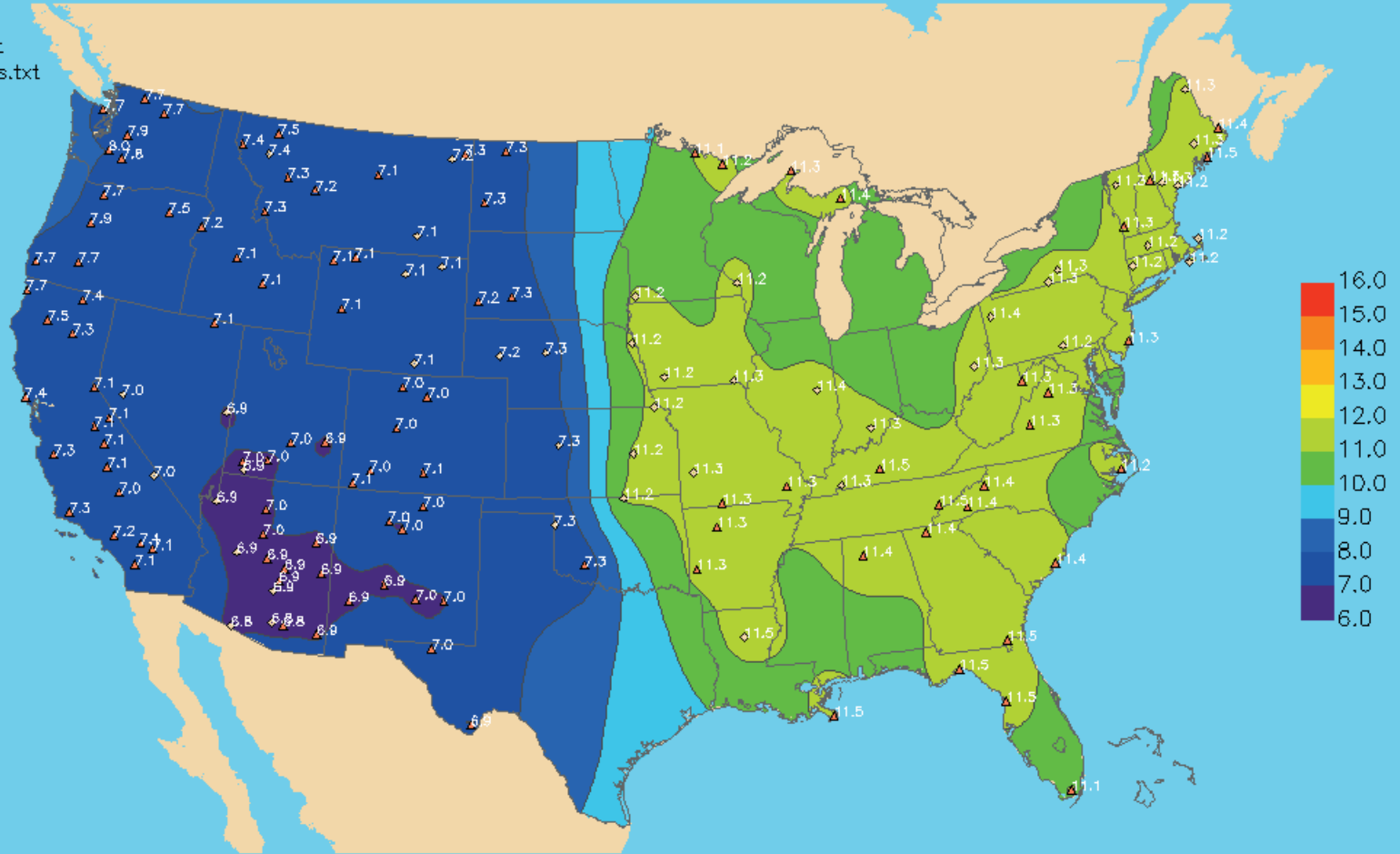
Site	Prog	N	ng90default
DENA1	IMPROVE	1	7.2
HALE1	IMPROVE	1	7.2
HAVO1	IMPROVE	1	7.4
SIME1	IMPROVE	1	7.9
TRCR1	Protocol	1	7.5
TUXE1	IMPROVE	1	7.6
VIIS1	IMPROVE	1	11.0

6 urban sites removed from map

Site	Prog	N	ng90default
COGO1	Protocol	1	7.7
CORI1	Protocol	1	7.7
PHOE1	Protocol	1	6.8
PUSO1	Protocol	1	7.7
SPOK1	Protocol	1	7.5
WASH1	Protocol	1	11.2

17 sites with insufficient data

Site	Prog	N	ng90default
AMBL1	Protocol	0	7.5
ATLA1	Protocol	0	11.3
BALT1	Protocol	0	11.2
BIRM1	Protocol	0	11.4
CHIC1	Protocol	0	11.2
DETR1	Protocol	0	11.3
DOUG1	Protocol	0	6.9
FRES1	Protocol	0	7.2
FRRE1	Protocol	0	11.3
HOUS1	Protocol	0	11.5
INCA1	Protocol	0	7.0
LOPE1	Protocol	0	7.1
NEYD1	Protocol	0	11.2
PETE1	Protocol	0	7.9
PIIT1	Protocol	0	11.3
RUBM1	Protocol	0	7.1
SHM1	Protocol	0	7.0



Natural Haze Levels II, 10-Year Rate of Progress Glide Path

Param: dv
Value: g90gp
File: dvg90gpNIA.txt

150 Contoured Sites
103 IMPROVE \triangle
47 Protocol \diamond

7 sites off the map

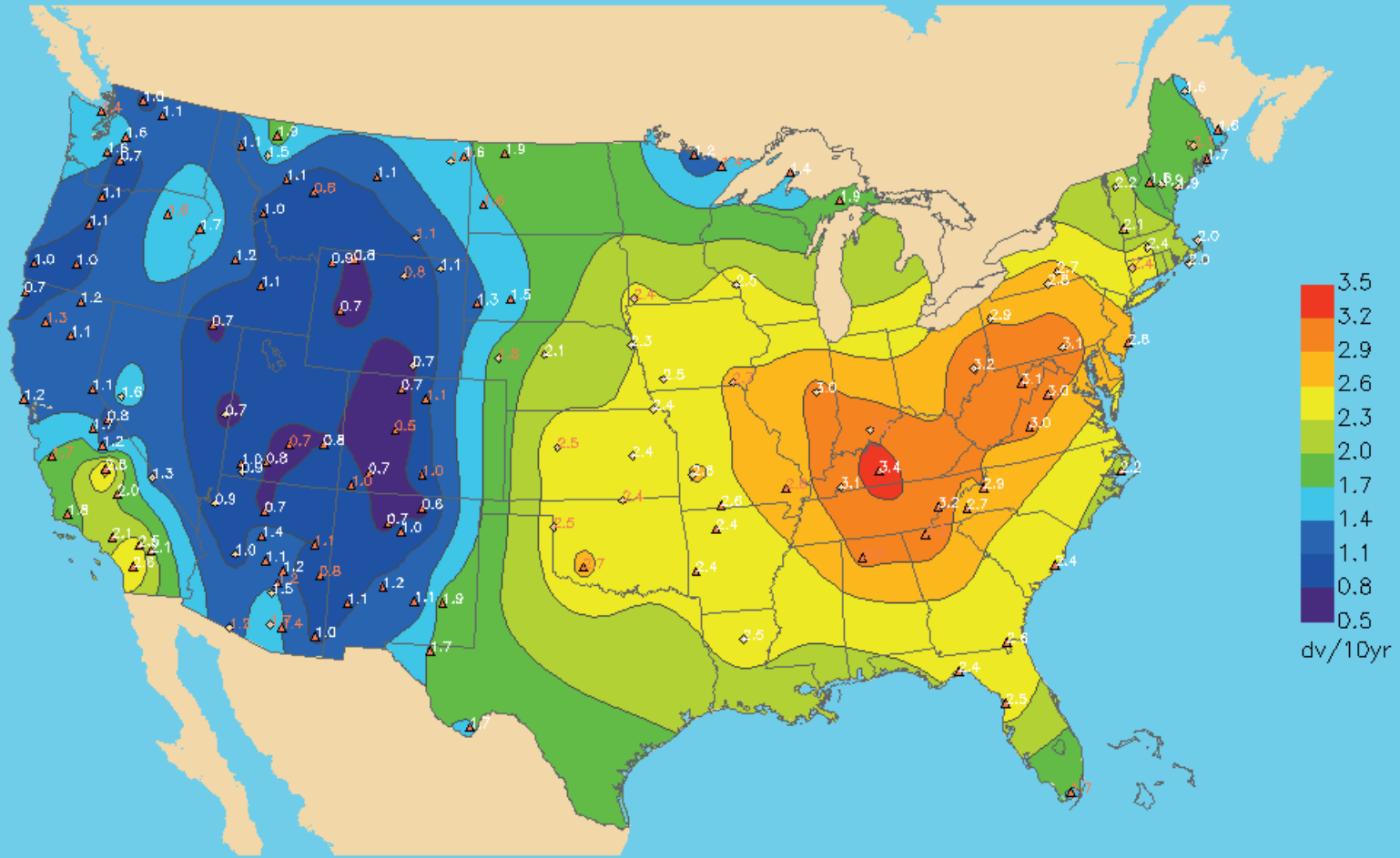
Site	Prog	N	g90gp
DENA1	IMPROVE	5	0.4
HALE1	IMPROVE	4	1.0
HAVO1	IMPROVE	4	1.9
SIME1	IMPROVE	3	0.5
TRCR1	Protocol	3	0.5
TUXE1	IMPROVE	3	0.4
VIIS1	IMPROVE	4	1.0

6 urban sites removed from map

Site	Prog	N	g90gp
COG01	Protocol	3	2.2
COR11	Protocol	3	2.5
PHOE1	Protocol	3	3.1
PUS01	Protocol	3	2.8
SPOK1	Protocol	3	2.4
WASH1	Protocol	5	3.1

18 sites with insufficient data

Site	Prog	N	g90gp
AMBL1	Protocol	0	0.0
ATLA1	Protocol	0	0.0
BALT1	Protocol	0	0.0
BIRM1	Protocol	0	0.0
BRET1	IMPROVE	0	0.0
CHIC1	Protocol	0	0.0
DETR1	Protocol	0	0.0
DOUG1	Protocol	0	0.0
FRES1	Protocol	0	0.0
FRRE1	Protocol	0	0.0
HOU51	Protocol	0	0.0
INGA1	Protocol	0	0.0
LOPE1	Protocol	0	0.0
NEYD1	Protocol	0	0.0
PETE1	Protocol	0	0.0
PITT1	Protocol	0	0.0
RUB11	Protocol	0	0.0
SHM11	Protocol	0	0.0



Default Natural Haze Levels, 10-Year Rate of Progress Glide Path

Param: dv
Value: g90gp
File: dvg90gp0IA.txt

148 Contoured Sites
103 IMPROVE \triangle
45 Protocol \diamond

7 sites off the map

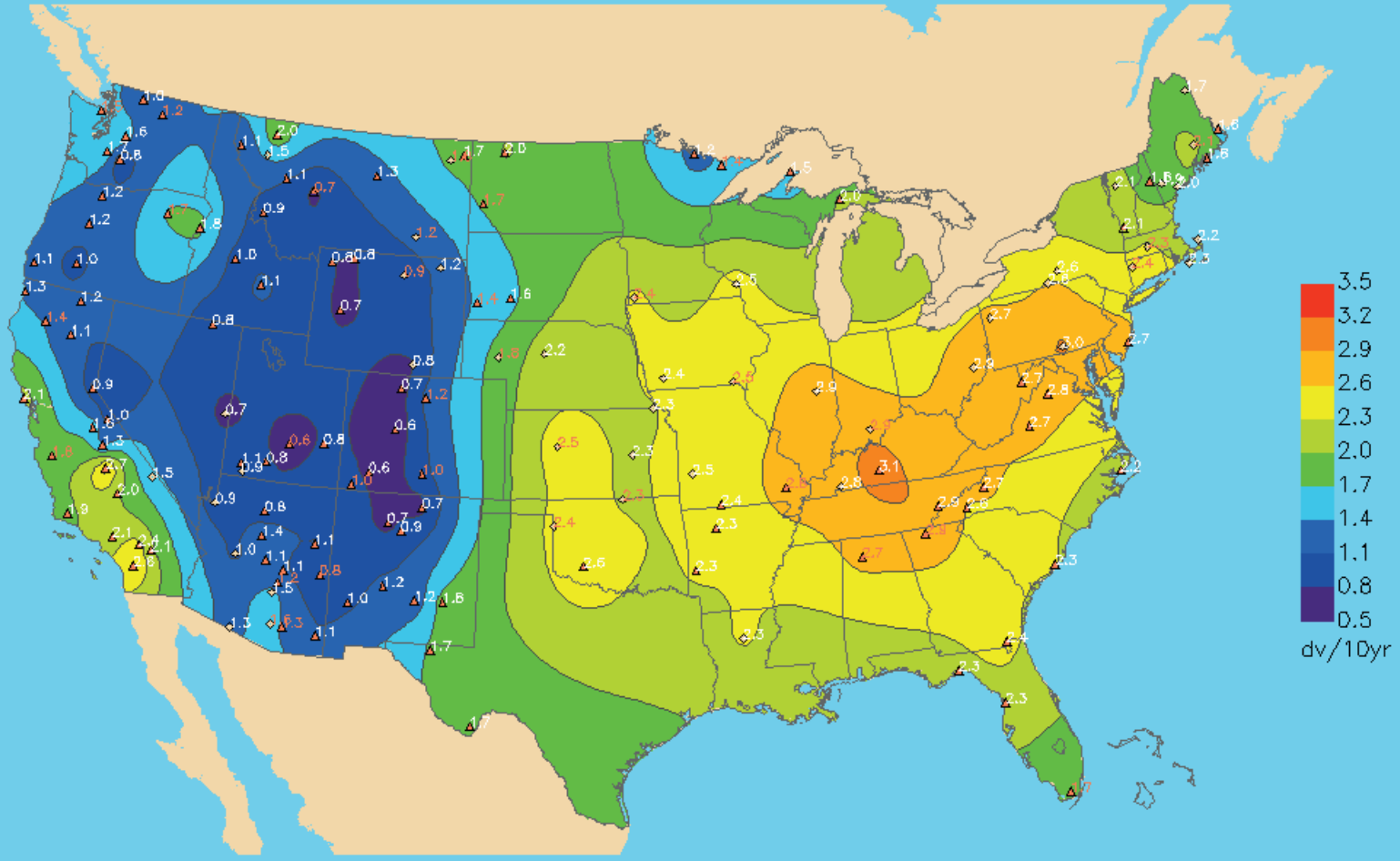
Site	Prog	N	g90gp
DENA1	IMPROVE	5	0.4
HALE1	IMPROVE	4	1.1
HAVO1	IMPROVE	4	1.9
SIME1	IMPROVE	3	1.1
TRCR1	Protocol	3	0.8
TUXE1	IMPROVE	3	0.7
VISI1	IMPROVE	4	0.8

6 urban sites removed from map

Site	Prog	N	g90gp
COGO1	Protocol	3	2.4
COR11	Protocol	3	2.7
PHOE1	Protocol	3	2.9
PUSO1	Protocol	3	3.0
SPOK1	Protocol	3	2.3
WASH1	Protocol	5	2.9

20 sites with insufficient data

Site	Prog	N	g90gp
AMBL1	Protocol	0	0.0
ATLA1	Protocol	0	0.0
BALT1	Protocol	0	0.0
BIRM1	Protocol	0	0.0
BRET1	IMPROVE	0	0.0
CHIC1	Protocol	0	0.0
DETR1	Protocol	0	0.0
DOUG1	Protocol	0	0.0
FRES1	Protocol	0	0.0
FRRE1	Protocol	0	0.0
HOUS1	Protocol	0	0.0
INGA1	Protocol	0	0.0
LOPE1	Protocol	0	0.0
NEYO1	Protocol	0	0.0
OMAH1	Protocol	0	0.0
PETE1	Protocol	0	0.0
PITT1	Protocol	0	0.0
RUBH1	Protocol	0	0.0



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