Preliminary 2018 Reasonable Progress Visibility Target Values for §309(g) and §308 of the federal Regional Haze Rule

June 2003
Ralph Morris, ENVIRON & Tom Moore, WRAP

Introduction

In this document we present *preliminary* estimates of reasonable progress target values for visibility by 2018, in deciviews, for each of the mandatory federal Class I areas in the WRAP §309 Modeling domain (Figure 1). The *preliminary* 2018 reasonable progress visibility target values are obtained by assuming a linear glide path slope from current monitored visibility conditions to default natural conditions in 2064. The draft default natural conditions (EPA, 2001) and the latest monthly relative humidity adjustment factors (SAIC, 2003) are used in calculating the visibility glide slopes and 2018 visibility target values.

Development of 2018 Visibility Target Values

The Regional Haze Rule (RHR) (EPA, 1999) requires that reasonable progress be demonstrated toward natural visibility conditions on the monitored Worst 20% of sample days, and no worsening of visibility for the monitored Best 20% of sample days be allowed at each mandatory federal Class I area. The emission reductions needed to achieve the Worst and Best 20% metric are to be documented in §309(g) or §308 regional haze implementation plans (RHIP) required of states (optional for tribes). The first RHIPs demonstrating reasonable progress and no deterioration are due from states in the 2007-08 timeframe. The first target year for demonstration of reasonable progress is 2018. The RHR requires use of the five-year baseline period of 2000-2004. The latest five-year baseline surrogate period of 1997-2001 with available IMPROVE data is used to anchor the glide path slopes from the current observed visibility for the Worst 20% and Best 20% days, starting in 2004 to natural conditions in 2064. The point along the linear glide path slope from the current observed visibility to natural conditions in 2064 at the year 2018 becomes the first reasonable progress visibility target value. There are approximately 40 Class I areas with five or more years of IMPROVE measurement data available in the WRAP modeling domain for the period 1997-2001. In addition, the expansion of the IMPROVE network from 1999 through 2001 results in additional Class I areas having only one or two years worth of IMPROVE measurement data available. For Class I areas without any IMPROVE monitors, IMPROVE data from the most representative monitoring site is mapped to the Class I area. Table 1 lists the mapping of IMPROVE monitoring site PM data to each Class I area.

Figure 1. WRAP §309 Modeling Domain

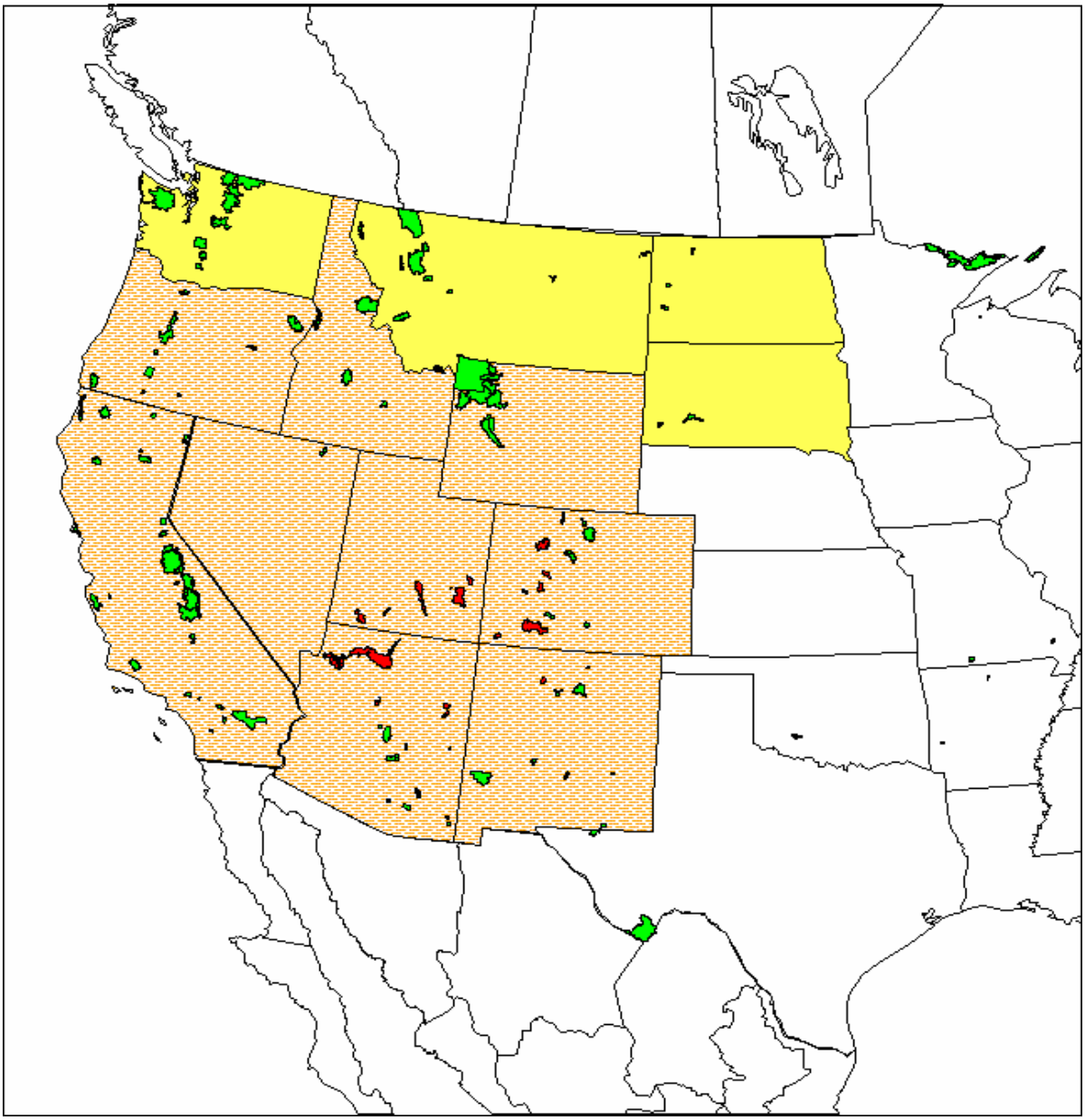

Table 1. Mapping of IMPROVE monitoring site PM data to Class I areas in the WRAP western US modeling domain.

Class I area Site ID	IMPROVE Monitor Site	Class I area Site Name	State
AGTI	AGTI	Agua Tibia Wilderness	CA
ALLA	SNPA	Alpine Lakes Wilderness	WA
ANAC	SULA	Anaconda-Pintler Wilderness	MT
ARCH	CANY	Arches NP	UT
BADL	BADL	Badlands NM	SD
BAND	BAND	Bandelier NM	NM
BIBE	BIBE	Big Bend NP	TX

BLCA	WEMI	Black Canyon of Gunnison NP	CO
BODE	SACR	Bosque del Apache Wilderness	NM
BOMA	MONT	Bob Marshall Wilderness	MT
BOWA	BOWA	Boundary Waters Canoe Area	MN
BRCA	BRCA	Bryce Canyon NP	UT
BRID	BRID	Bridger Wilderness in Bridger-Teton Forest	WY
CACR	CACR	Caney Creek Wilderness	AR
CAMO	CAMO	Cabinet Mountains Wilderness	MT
CANY	CANY	Canyonlands NP	UT
CARE	CANY	Capitol Reef NP	UT
CARI	LAVO	Caribou Wilderness	CA
CAVE	GUMO	Carlsbad Caverns NP	NM
CHIR	CHIR	Chiricahua NM	AZ
CHWI	CHIR	Chiricahua Wilderness	AZ
CRLA	CRLA	Crater Lake NP	OR
CRMO	CRMO	Craters of The Moon Wilderness	ID
CUCA	SAGO	Cucamonga Wilderness	CA
DESO	MOKE	Desolation Wilderness	CA
DIPE	CRLA	Diamond Peak Wilderness	OR
DOLA	KICA	Dome Land Wilderness	CA
EACA	STAR	Eagle Cap Wilderness	OR
EANE	WHRI	Eagles Nest Wilderness	CO
EMIG	YOSE	Emigrant Wilderness	CA
FITZ	BRID	Fitzpatrick Wilderness	WY
FLTO	WHRI	Flat Tops Wilderness	CO
GALI	CHIR	Galiuro Wilderness	AZ
GAOF	GAMO	Gates of the Mountain Wilderness	MT
GEMO	CRLA	Gearhart Mountain Wilderness	OR
GILA	GILA	Gila Wilderness	NM
GLAC	GLAC	Glacier NP	MT
GLPE	NOCA	Glacier Peak Wilderness	WA
GORO	MORA	Goat Rocks Wilderness	WA
GRCA	GRCA	Grand Canyon NP	AZ
GRSA	GRSA	Great Sand Dunes NM	CO
GRTE	YELL	Grand Teton NP	WY
GUMO	GUMO	Guadalupe Mountains NP	TX
HECA	HECA	Hells Canyon Wilderness	ID
HERC	UPBU	Hercules-Glades Wilderness	MO
HOOV	YOSE	Hoover Wilderness	CA
ISRO	ISRO	Isle Royale NP	MI
JARB	JARB	Jarbidge Wilderness	NV
JOMU	KICA	John Muir Wilderness	CA
JOTR	JOSH	Joshua Tree NP	CA
KAIS	KICA	Kaiser Wilderness	CA
KALM	KALM	Kalmiopsis Wilderness	OR
KICA	SEQU	Kings Canyon NP	CA
LABE	LABE	Lava Beds Wilderness	CA
LAGA	WEMI	La Garita Wilderness	CO
LAVO	LAVO	Lassen Volcanic NP	CA

LOST	LOST	Lostwood Wilderness	ND
MABE	WHRI	Maroon Bells-Snowmass Wilderness	CO
MAMO	TRIN	Marble Mountain Wilderness	CA
MAZA	IKBA	Mazatzal Wilderness	AZ
MELA	MELA	Medicine Lake Wilderness	MT
MEVE	MEVE	Mesa Verde NP	CO
MIMO	MONT	Mission Mountain Wilderness	MT
MINA	KICA	Minarets (in Ansel Adams Wilderness)	CA
MING	MING	Mingo Wilderness	MO
MOAD	MORA	Mount Adams Wilderness	WA
MOBA	GILA	Mount Baldy Wilderness	AZ
MOHO	MOHO	Mount Hood Wilderness	OR
MOJE	THIS	Mount Jefferson Wilderness	OR
MOKE	BLIS	Mokelumne Wilderness	CA
MOLA	CRLA	Mountain Lakes Wilderness	OR
MORA	MORA	Mount Rainier NP	WA
MOWA	THIS	Mount Washington Wilderness	OR
MOZI	MOZI	Mount Zirkel Wilderness	CO
NOAB	WASH	North Absaroka Wilderness	WY
NOCA	NOCA	North Cascades NP	WA
OLYM	ALLA	Olympic NP	WA
PASA	PASA	Pasayten Wilderness	WA
PECO	BAND	Pecos Wilderness	NM
PEFO	PEFO	Petrified Forest NP	AZ
PIMO	IKBA	Pine Mountain Wilderness	AZ
PINN	PINN	Pinnacles NM	CA
PORE	PORE	Point Reyes NS	CA
RAWA	MAZI	Rawah Wilderness	CO
REDW	REDW	Redwood NP	CA
RERO	YELL	Red Rock Lakes Wilderness	MT
ROMO	ROMO	Rocky Mountain NP	CO
SACR	SACR	Salt Creek Wilderness	NM
SAGA	SAGO	San Gabriel Wilderness	CA
SAGO	SAGO	San Gorgonio Wilderness	CA
SAGU	SAGU	Saguaro Wilderness	AZ
SAJA	SAGO	San Jacinto Wilderness	CA
SAPE	SAPE	San Pedro Parks Wilderness	NM
SARA	PINN	San Rafael Wilderness	CA
SAWT	SAWT	Sawtooth Wilderness	ID
SCAP	MONT	Scapegoat Wilderness	MT
SELW	SULA	Selway-Bitterroot Wilderness	ID
SEQU	SEQU	Sequoia NP	CA
SIAN	SIAN	Sierra Ancha Wilderness	AZ
SOWA	LABE	South Warner Wilderness	CA
STMO	STMO	Strawberry Mountain Wilderness	OR
SUPE	SIAN	Superstition Wilderness	AZ
SYCA	SYCA	Sycamore Canyon Wilderness	AZ
TETO	YELL	Teton Wilderness	WY
THLA	LAVO	Thousand Lakes Wilderness	CA

THRO	THRO	Theodore Roosevelt NP	ND
THIS	THIS	Three Sisters Wilderness	OR
ULBE	ULBE	UL Bend Wilderness	MT
UPBU	UPBU	Upper Buffalo Wilderness	AR
VENT	PINN	Ventana Wilderness	CA
VOYA	VOYA	Voyageurs NP	MN
WASH	WASH	Washakie Wilderness	WY
WEEL	WHRI	West Elk Wilderness	CO
WEMI	WEMI	Weminuche Wilderness	CO
WHMO	SCAR	White Mountain Wilderness	NM
WHPE	BAND	Wheeler Peak Wilderness	NM
WICA	WICA	Wind Cave NP	SD
WIMO	CACR	Wichita Mountains Wilderness	OK
YELL	YELL	Yellowstone NP	WY
YOBO	TRIN	Yolla Bolly Middle Eel Wilderness	CA
YOSE	YOSE	Yosemite NP	CA
ZION	ZION	Zion NP	UT

Five-year rolling averages of IMPROVE monitor data for the Worst 20% and Best 20% visibility days are available from the IMPROVE website:

http://vista.cira.colostate.edu/improve/Data/IMPROVE/IMPLoctable_Data.aspx

These data include the individual PM species components of extinction for the average of the Worst 20% and Best 20% days' visibility values, as approximated by the 90th and 10th percentile values for each monitoring site's distribution, calculated using the latest f(RH) factors (SAIC, 2003). Available data from each site (with at least 1 continuous year of data) has been applied to estimate *preliminary* baseline visibility conditions, whether or not the length of record meets the *future* 2000-2004 EPA data completeness requirements. The intent of this preliminary visibility target values analysis is to display the available data, as it could be hypothesized that a nearby location of a monitoring site with a shorter record is more representative of an individual Class I area's visibility, than is using more temporally complete data from a more distant monitoring site. The IMPROVE data for the Worst 20% and Best 20% days were processed with recently revised relative humidity numbers developed for EPA (SAIC, 2003). Slightly revised natural conditions estimates from EPA contractor were used based on comments on EPA draft guidance document "Natural Visibility Conditions Estimates" (EPA, 2001).

Figures 2 through 7 show example glide path slopes for 12 Class I areas from current (1997-2001) observed visibility for the Worst 20% days to natural visibility conditions in 2064 from which the 2018 target visibility goal is obtained assuming linear progress. Glide path slopes were calculated for each Class I area in the WRAP region and these 12 Class I areas were selected to help explain the calculations. Figure 2 displays the glide path slopes for the Arches and Canyonlands National Parks in Utah. Arches National Park is one of the remaining Class I areas that does not have an IMPROVE monitor, so the data from the IMPROVE monitor for the Worst 20% and Best 20% days at nearby Canyonlands National Park were mapped to Arches National Park. Shown in these plots are the observed five-year rolling average for the Worst 20% days visibility from 1989 to 2001 denoted by the black diamonds. The latest five-year rolling average visibility for 1997-2001 is then assumed to occur in 2004 and anchor the glide

path slope (purple squares) to the EPA default natural conditions in 2064 (green diamonds). Note that the natural visibility conditions for Canyonlands (7.01 dV) is slightly different from Arches (6.99 dV) reflecting slight differences in the f(RH) factors for the two national parks even thought the same Canyonlands observed IMPROVE PM data are used. However, the data for the observed five-year rolling average Worst 20% visibility days at the Canyonlands IMPROVE monitor have already been processed using the Canyonlands f(RH) data, thus the Arches f(RH) data could not be used for the 2004 starting point of the glide slope path. However, this should not appreciably affect the glide slope path target visibility goals (couple hundredths of dV at most). For both of these national parks, the 2018 target visibility goal is 10.89 dV.

Figure 3 displays example glide slope paths for Bryce Canyon and Zion National Parks in southwestern Utah. A new IMPROVE monitor has only recently been installed at Zion National Park; previously data from Bryce Canyon IMPROVE monitor were mapped to Zion. As seen in the 12 years of rolling five-year average Worst 20% days visibility at Bryce Canyon, there appears to be very small year-to-year variability in this visibility metric, but more spatial variability as evident by the fact that the Zion values are approximately 2 dV higher than at Bryce Canyon.

Figure 4 displays the glide path slopes for the Grand Canyon National Park and Sycamore Wilderness Area. Sycamore Canyon has only recently obtained an IMPROVE monitor and in the past data from the Grand Canyon IMPROVE monitor was mapped to Sycamore Canyon. However, the observed visibility for the Worst 20% days at Sycamore Canyon appear to be approximately 3 dV higher than at the Grand Canyon whereas there is very little year-to-year variation in the visibility for the Worst 20% days at the Grand Canyon emphasizing the fact that it is more important to have the greater spatial coverage afforded by using 1-2 years of data at more sites than use of 5 years of data in the temporal averaging but performing more spatial mapping. The 2018 visibility target goals for the Worst 20% days at Grand Canyon and Sycamore Canyon are, respectively, 11.03 and 13.40 dV.

Figure 5 displays two more glide path slope values for the Worst 20% visibility days at Rocky Mountain and Yellowstone National Parks whose 2018 target visibility goals are 11.89 and 10.99 dV, respectively. The uniform rate of reasonable progress glide paths for Glacier and Mount Rainer National Parks are shown in Figure 6. Current visibility conditions for the Worst 20% at these two parks have worse observed visibility than those discussed earlier so consequently they have higher 2019 target visibility goals (16.74 and 16.21 dV).

The final example glide paths for Class I areas are for Yosemite National Park and San Gorgonio Wilderness Area in California (Figure 7). Visibility at Yosemite National Park appears to be getting worse, whereas improvements in visibility are seen at San Gorgonio. This may be partly due to large improvements seen in air quality in the Los Angeles basin over the last few years that are upwind of San Gorgonio, and less improvements in air quality in the California central valley that lies upwind of Yosemite.

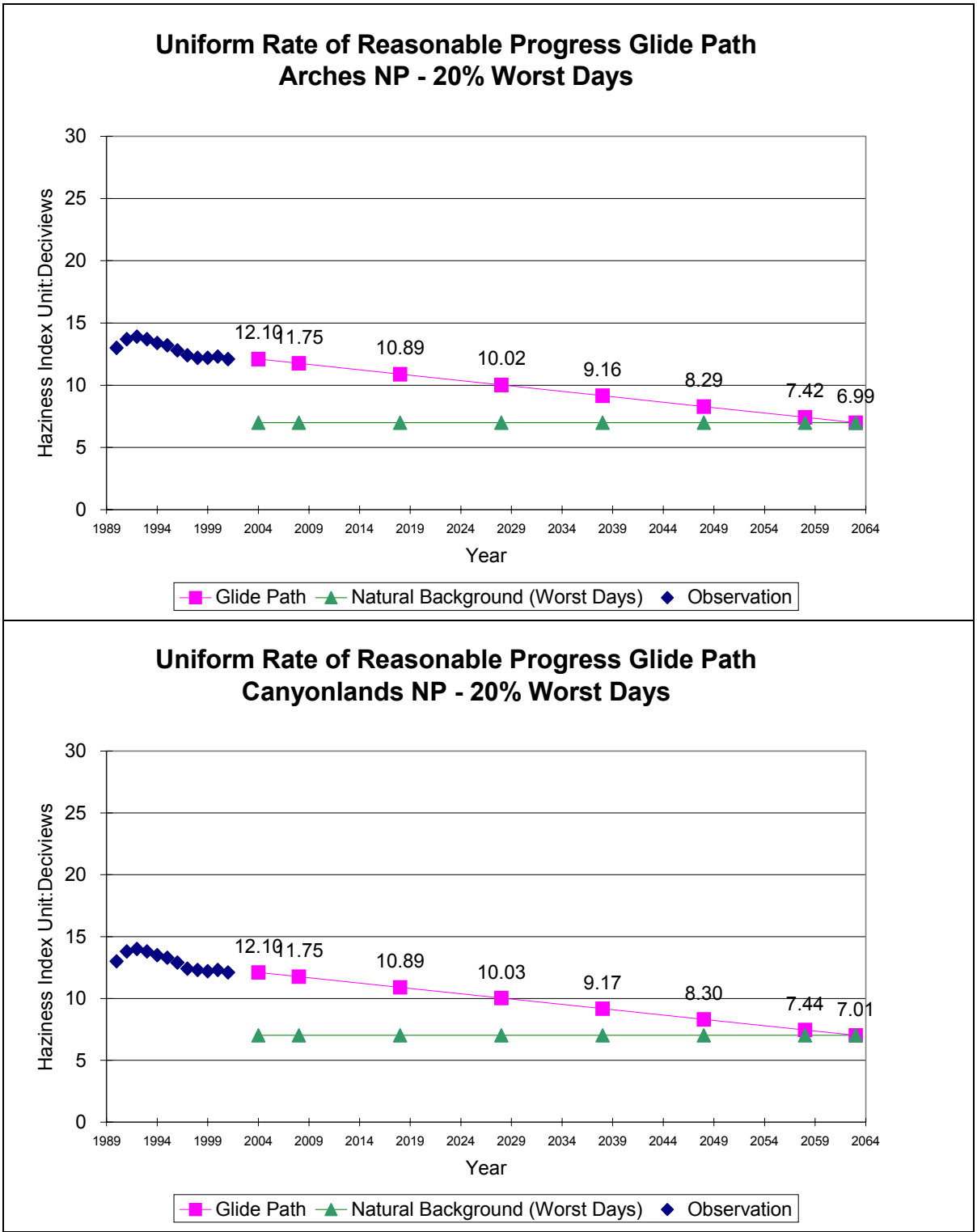

Figure 2. Example visibility glide path slopes for the Worst 20% days from the 1997-2001 five-year baseline surrogate period to EPA draft default natural visibility conditions in 2064 for Arches (top) and Canyonlands (bottom) National Parks showing observed visibility (black diamonds), 2064 default natural conditions (green diamonds) and visibility target values (purple squares)

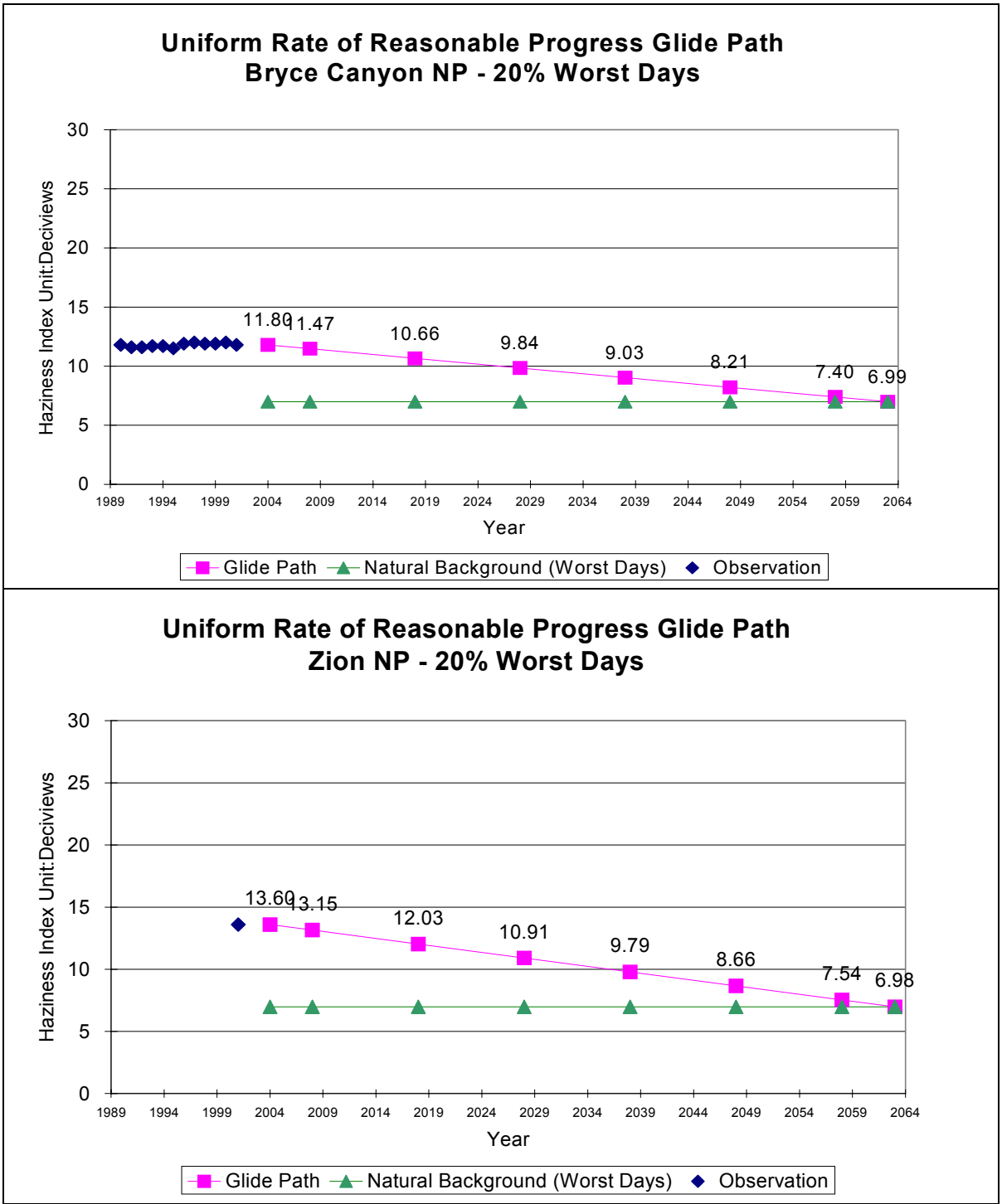

Figure 3. Example visibility glide path slopes for the Worst 20% days from the 1997-2001 five-year baseline surrogate period to EPA draft default natural visibility conditions in 2064 for Bryce Canyon (top) and Zion (bottom) National Parks showing observed visibility (black diamonds), 2064 default natural conditions (green diamonds) and visibility target values (purple squares).

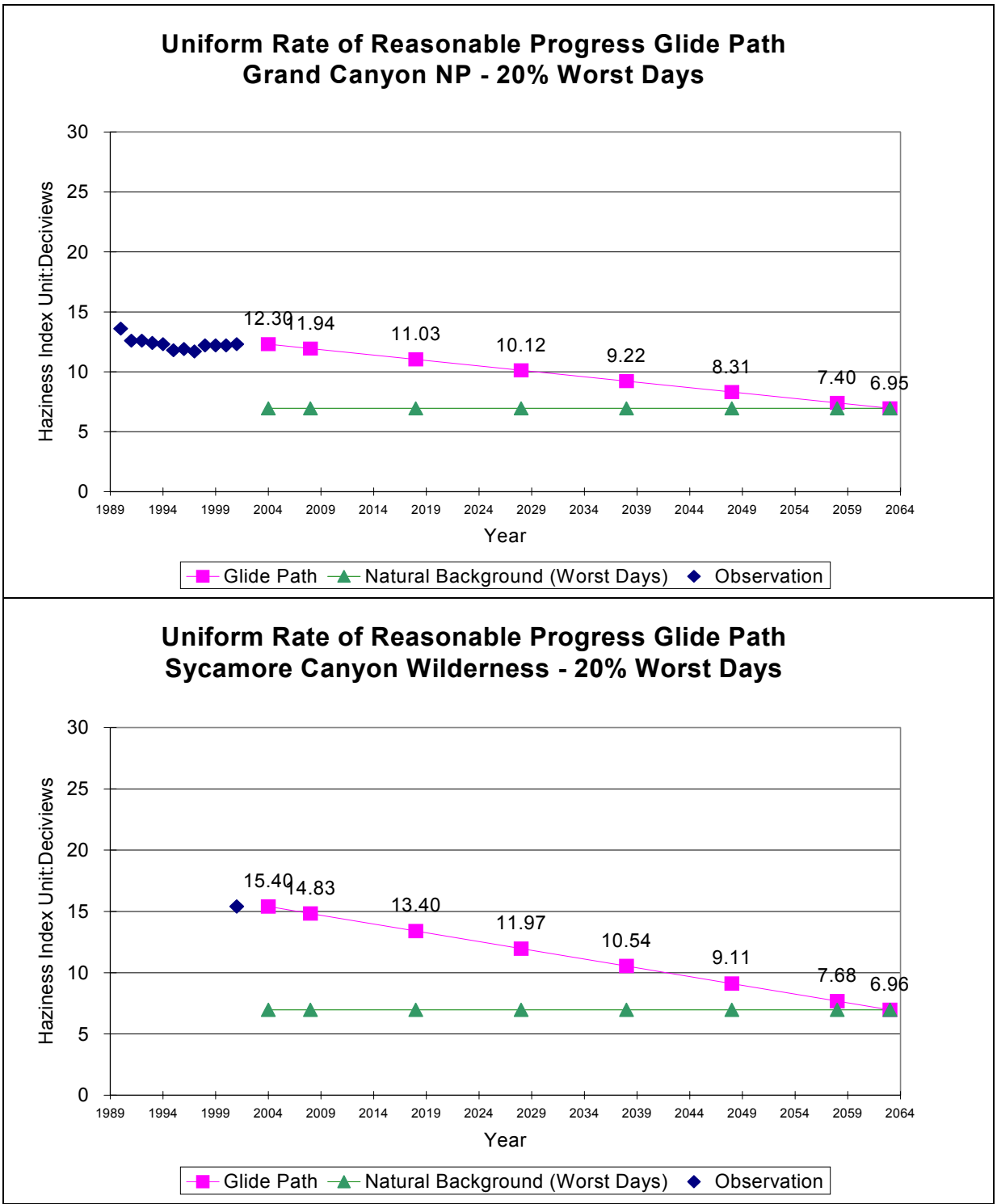

Figure 4. Example visibility glide path slopes for the Worst 20% days from the 1997-2001 five-year baseline surrogate period to EPA default natural visibility conditions in 2064 for Grand Canyon (top) and Sycamore Canyon (bottom) Class I areas showing observed visibility (black diamonds), 2064 default natural conditions (green diamonds) and visibility target values (purple squares).

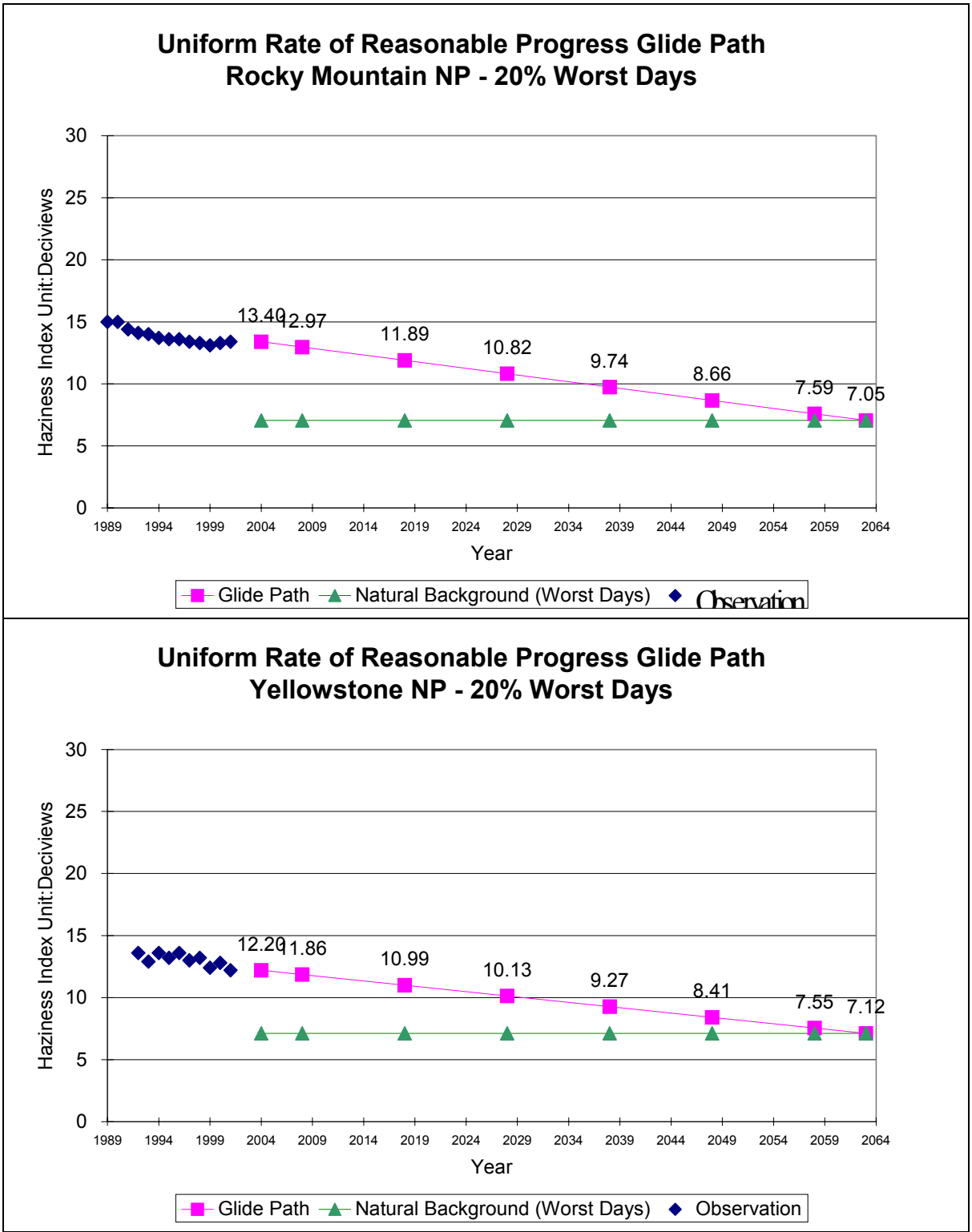

Figure 5. Example visibility glide path slopes for the Worst 20% days from the 1997-2001 five-year baseline surrogate period to EPA draft default natural visibility conditions in 2064 for Rocky Mountain (top) and Yellowstone (bottom) National Parks showing observed visibility (black diamonds), 2064 default natural conditions (green diamonds) and visibility target values (purple squares).

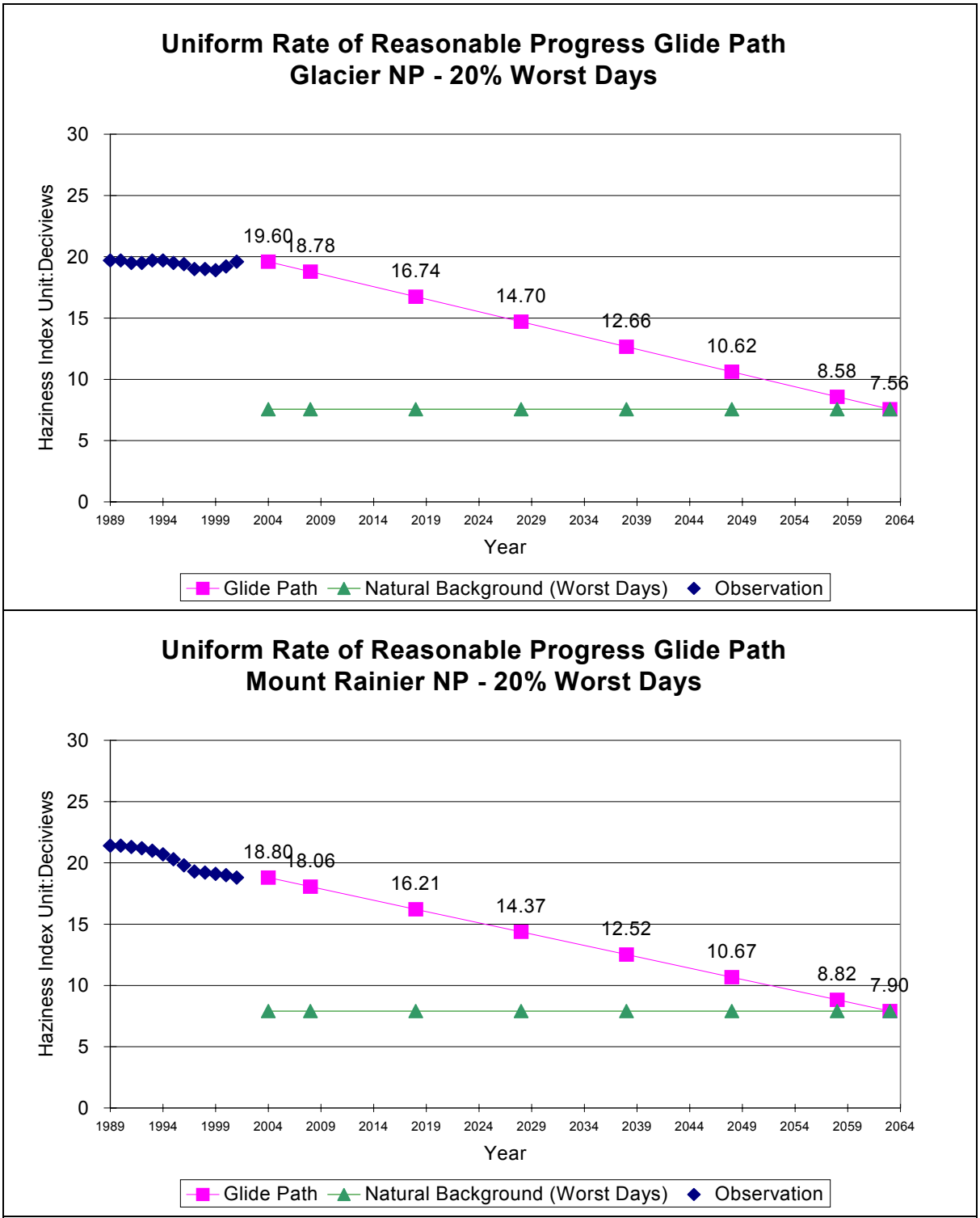

Figure 6. Example visibility glide path slopes for the Worst 20% days from the 1997-2001 five-year baseline surrogate period to EPA draft default natural visibility conditions in 2064 for Glacier (top) and Mount Rainier (bottom) National Parks showing observed visibility (black diamonds), 2064 default natural conditions (green diamonds) and visibility target values (purple squares).

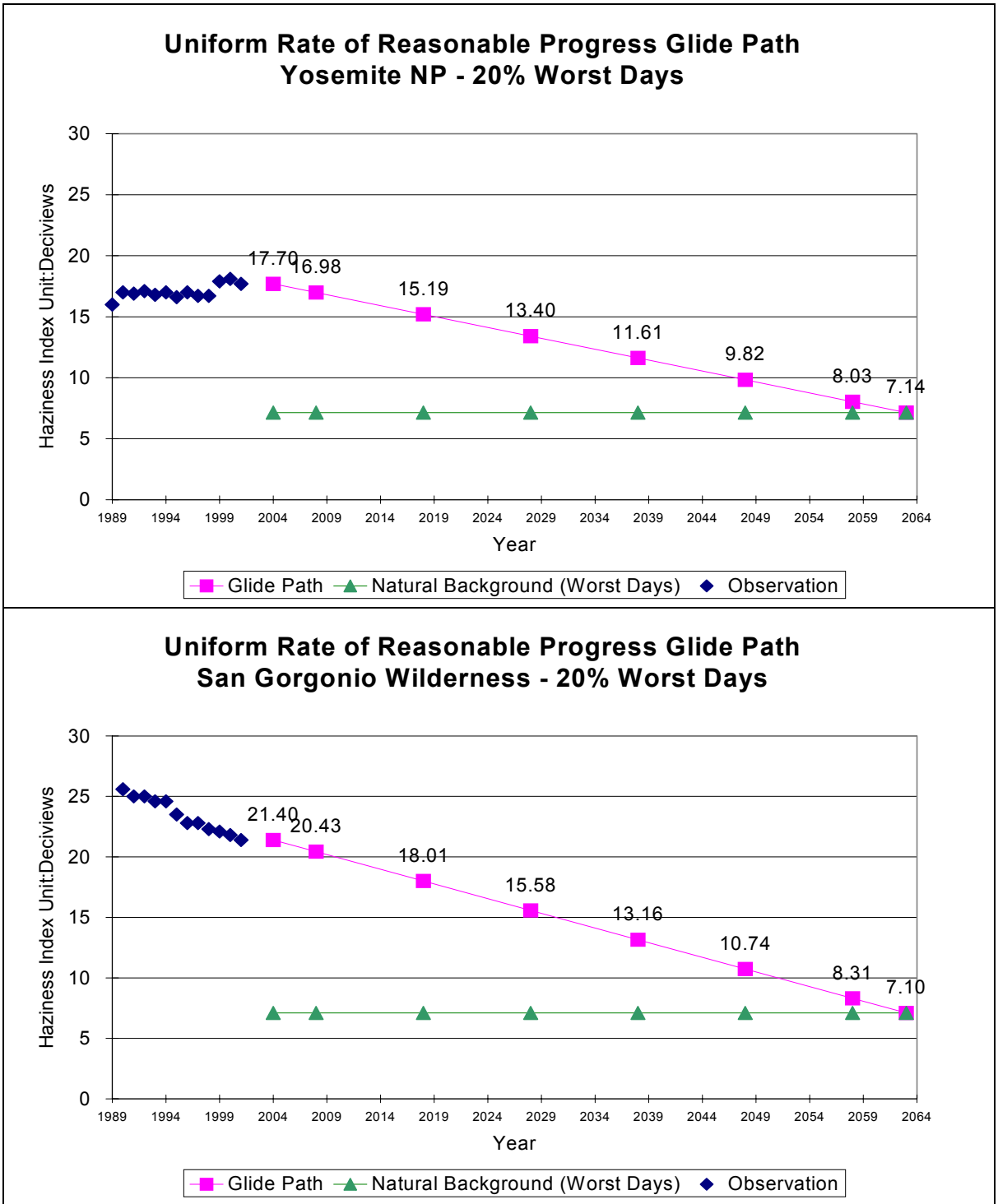

Figure 7. Example visibility glide path slopes for the Worst 20% days from the 1997-2001 five-year baseline surrogate period to EPA draft default natural visibility conditions in 2064 for Yosemite National Park (top) and San Gorgonio Wilderness Area (bottom) showing observed visibility (black diamonds), 2064 default natural conditions (green diamonds) and visibility target values (purple squares).

Preliminary Estimates of Reasonable Progress at All Western US Class I Areas

Using the 1997-2001 observed PM concentrations for the Worst 20% and Best 20% days, visibility was projected at each western Class I area using the procedures discussed above, and the linear glide path slope gives 2018 target visibility values representing preliminary estimates of reasonable progress.

Table 2 displays the monitored current visibility and 2018 reasonable progress target values on the Worst 20% visibility days. Listed in Table 2 for all Class I areas in the western US WRAP domain are columns containing the following information:

- Observed average visibility in dV for the Worst 20% days from the five year 1997-2001 baseline period;
- The 2018 reasonable progress visibility target value (dV) obtained from the linear glide paths from current visibility to EPA default natural conditions in 2064; and
- The differences in the visibility from 1997-2001 to the 2018 reasonable progress visibility target value (i.e., glide path slope).

Table 2. 1997-2001 Average 20% Worst Days' Visibility Monitoring Data and *Preliminary* Estimates of Reasonable Progress Visibility Targets for §309(g) and §308 at western US Class I Areas.

Class I Area	State	Monitoring Data Results and 2018 *Preliminary* Reasonable Progress Visibility Target Values		
		1997-2001 Monitored Visibility Data Worst 20% Days (dV)	2018 *Preliminary* RP Visibility Target Values Worst 20% Days (dV)	Difference between 1997-2001 observed and *Preliminary* 2018 RP Estimates (dV)
Caney Creek Wilderness	**AR**	25.7	21.82	3.88
Upper Buffalo Wilderness	**AR**	25.3	21.52	3.78
Chiricahua NM	**AZ**	13.7	11.87	1.83
Chiricahua Wilderness	**AZ**	13.7	11.87	1.83
Galiuro Wilderness	**AZ**	13.4	11.64	1.76
Grand Canyon NP	**AZ**	12.3	10.86	1.44
Mazatzal Wilderness	**AZ**	12.5	10.99	1.51
Mount Baldy Wilderness	**AZ**	14.3	12.32	1.98
Petrified Forest NP	**AZ**	13.0	11.37	1.63
Pine Mountain Wilderness	**AZ**	12.5	10.99	1.51
Saguaro Wilderness	**AZ**	13.7	11.85	1.85
Sierra Ancha Wilderness	**AZ**	12.7	11.14	1.56
Superstition Wilderness	**AZ**	12.7	11.13	1.57
Sycamore Canyon Wilderness	**AZ**	15.4	13.12	2.28
Agua Tibia Wilderness	**CA**	22.7	18.51	4.19
Caribou Wilderness	**CA**	15.3	13.14	2.16

Class I Area	State	Monitoring Data Results and 2018 *Preliminary* Reasonable Progress Visibility Target Values		
		1997-2001 Monitored Visibility Data Worst 20% Days (dV)	2018 *Preliminary* RP Visibility Target Values Worst 20% Days (dV)	Difference between 1997-2001 observed and *Preliminary* 2018 RP Estimates (dV)
Cucamonga Wilderness	**CA**	21.4	17.56	3.84
Desolation Wilderness	**CA**	13.9	12.07	1.83
Dome Land Wilderness	**CA**	23.8	19.29	4.51
Emigrant Wilderness	**CA**	17.7	14.85	2.85
Hoover Wilderness	**CA**	17.7	14.85	2.85
John Muir Wilderness	**CA**	23.8	19.30	4.50
Joshua Tree NP	**CA**	19.4	16.08	3.32
Kaiser Wilderness	**CA**	23.8	19.30	4.50
Kings Canyon NP	**CA**	23.8	19.30	4.50
Lava Beds Wilderness	**CA**	14.3	12.46	1.84
Lassen Volcanic NP	**CA**	15.3	13.14	2.16
Marble Mountain Wilderness	**CA**	18.3	15.43	2.87
Minarets in Ansel Adams WA	**CA**	23.8	19.30	4.50
Mokelumne Wilderness	**CA**	13.9	12.08	1.82
Pinnacles NM	**CA**	18.7	15.63	3.07
Point Reyes NS	**CA**	20.7	17.11	3.59
Redwood NP	**CA**	17.3	14.74	2.56
San Gabriel Wilderness	**CA**	21.4	17.56	3.84
San Gorgonio Wilderness	**CA**	21.4	17.54	3.86
San Jacinto Wilderness	**CA**	21.6	17.69	3.91
San Rafael Wilderness	**CA**	18.7	15.62	3.08
Sequoia NP	**CA**	23.8	19.30	4.50
South Warner Wilderness	**CA**	13.8	12.05	1.75
Thousand Lakes Wilderness	**CA**	15.4	13.22	2.18
Ventana Wilderness	**CA**	18.6	15.56	3.04
Yolla Bolly Middle Eel WA	**CA**	17.7	14.92	2.78
Yosemite NP	**CA**	17.7	14.85	2.85
Black Canyon of Gunnison NP	**CO**	11.3	10.16	1.14
Eagles Nest Wilderness	**CO**	10.6	9.65	0.95
Flat Tops Wilderness	**CO**	10.5	9.57	0.93
Great Sand Dunes NM	**CO**	12.9	11.33	1.57
La Garita Wilderness	**CO**	11.4	10.23	1.17
Maroon Bells-Snowmass WA	**CO**	10.6	9.65	0.95
Mesa Verde NP	**CO**	13.1	11.48	1.62
Mount Zirkel Wilderness	**CO**	11.3	10.16	1.14
Rawah Wilderness	**CO**	11.3	10.16	1.14
Rocky Mountain NP	**CO**	13.4	11.69	1.71

Class I Area	State	Monitoring Data Results and 2018 *Preliminary* Reasonable Progress Visibility Target Values		
		1997-2001 Monitored Visibility Data Worst 20% Days (dV)	2018 *Preliminary* RP Visibility Target Values Worst 20% Days (dV)	Difference between 1997-2001 observed and *Preliminary* 2018 RP Estimates (dV)
West Elk Wilderness	**CO**	10.6	9.65	0.95
Weminuche Wilderness	**CO**	11.3	10.16	1.14
Craters of The Moon Wilderness	**ID**	14.9	12.80	2.10
Hells Canyon Wilderness	**ID**	19.2	15.99	3.21
Sawtooth Wilderness	**ID**	14.2	12.30	1.90
Selway-Bitterroot Wilderness	**ID**	12.5	11.10	1.40
Isle Royale NP	**MI**	21.3	18.58	2.72
Boundary Waters Canoe Area	**MN**	20.4	17.92	2.48
Voyageurs NP	**MN**	18.6	16.57	2.03
Hercules-Glades Wilderness	**MO**	25.3	21.51	3.79
Mingo Wilderness	**MO**	28.4	23.78	4.62
Anaconda-Pintler Wilderness	**MT**	12.4	11.02	1.38
Bob Marshall Wilderness	**MT**	15.2	13.08	2.12
Cabinet Mountains Wilderness	**MT**	14.0	12.23	1.77
Gates of the Mountain WA	**MT**	11.4	10.27	1.13
Glacier NP	**MT**	19.6	16.35	3.25
Medicine Lake Wilderness	**MT**	18.4	15.40	3.00
Mission Mountain Wilderness	**MT**	15.2	13.09	2.11
Red Rock Lakes Wilderness	**MT**	12.2	10.83	1.37
Scapegoat Wilderness	**MT**	15.0	12.92	2.08
UL Bend Wilderness	**MT**	16.1	13.69	2.41
Lostwood Wilderness	**ND**	20.1	16.65	3.45
Theodore Roosevelt NP	**ND**	18.5	15.48	3.02
Bandelier NM	**NM**	14.0	12.12	1.88
Bosque del Apache Wilderness	**NM**	17.8	14.88	2.92
Carlsbad Caverns NP	**NM**	17.4	14.60	2.80
Gila Wilderness	**NM**	14.3	12.32	1.98
Pecos Wilderness	**NM**	14.0	12.12	1.88
Salt Creek Wilderness	**NM**	17.8	14.88	2.92
San Pedro Parks Wilderness	**NM**	10.7	9.71	0.99
White Mountain Wilderness	**NM**	17.8	14.88	2.92
Wheeler Peak Wilderness	**NM**	14.0	12.13	1.87
Jarbidge Wilderness	**NV**	12.9	11.33	1.57
Wichita Mountains Wilderness	**OK**	25.7	21.75	3.95
Crater Lake NP	**OR**	13.4	11.86	1.54
Diamond Peak Wilderness	**OR**	13.5	11.95	1.55
Eagle Cap Wilderness	**OR**	19.0	15.85	3.15

Class I Area	State	Monitoring Data Results and 2018 *Preliminary* Reasonable Progress Visibility Target Values		
		1997-2001 Monitored Visibility Data Worst 20% Days (dV)	2018 *Preliminary* RP Visibility Target Values Worst 20% Days (dV)	Difference between 1997-2001 observed and *Preliminary* 2018 RP Estimates (dV)
Gearhart Mountain Wilderness	**OR**	12.9	11.43	1.47
Kalmiopsis Wilderness	**OR**	14.6	12.74	1.86
Mount Hood Wilderness	**OR**	14.0	12.32	1.68
Mount Jefferson Wilderness	**OR**	15.9	13.72	2.18
Mountain Lakes Wilderness	**OR**	13.1	11.61	1.49
Mount Washington Wilderness	**OR**	16.0	13.81	2.19
Strawberry Mountain Wilderness	**OR**	19.4	16.19	3.21
Three Sisters Wilderness	**OR**	16.0	13.81	2.19
Badlands NM	**SD**	17.4	14.67	2.73
Wind Cave NP	**SD**	15.9	13.56	2.34
Big Bend NP	**TX**	18.5	15.38	3.12
Guadalupe Mountains NP	**TX**	17.5	14.67	2.83
Arches NP	**UT**	12.1	10.72	1.38
Bryce Canyon NP	**UT**	11.8	10.50	1.30
Canyonlands NP	**UT**	12.1	10.73	1.37
Capitol Reef NP	**UT**	12.1	10.73	1.37
Zion NP	**UT**	13.6	11.81	1.79
Alpine Lakes Wilderness	**WA**	17.9	15.19	2.71
Glacier Peak Wilderness	**WA**	14.1	12.40	1.70
Goat Rocks Wilderness	**WA**	18.8	15.84	2.96
Mount Adams Wilderness	**WA**	18.8	15.83	2.97
Mount Rainier NP	**WA**	18.8	15.86	2.94
North Cascades NP	**WA**	14.1	12.39	1.71
Olympic NP	**WA**	17.9	15.20	2.70
Pasayten Wilderness	**WA**	16.1	13.85	2.25
Bridger Wilderness	**WY**	11.2	10.09	1.11
Fitzpatrick Wilderness	**WY**	11.2	10.09	1.11
Grand Teton NP	**WY**	12.1	10.75	1.35
North Absaroka Wilderness	**WY**	12.1	10.75	1.35
Teton Wilderness	**WY**	12.1	10.75	1.35
Washakie Wilderness	**WY**	12.1	10.75	1.35
Yellowstone NP	**WY**	12.2	10.83	1.37

Table 3 summarizes the 1997-2001 observed visibility and 2064 default natural visibility conditions at western Class I areas on the Best 20% visibility days.

Table 3. 1997-2001 Visibility Monitoring Data on the Average 20% Best Days and EPA Default Best Days' Natural Conditions Estimates expected in 2064, at western US Class I areas.

Class I Area	State	Monitoring Data Results and EPA Natural Conditions Estimates	
		1997-2001 Monitored Visibility Data Best 20% Days (dV)	2064 Default EPA 20% Best Days' Natural Conditions Estimates (dV)
Caney Creek Wilderness	**AR**	12.60	3.65
Upper Buffalo Wilderness	**AR**	12.20	3.60
Chiricahua NM	**AZ**	6.10	1.80
Chiricahua Wilderness	**AZ**	6.10	1.79
Galiuro Wilderness	**AZ**	6.00	1.76
Grand Canyon NP	**AZ**	4.80	1.83
Mazatzal Wilderness	**AZ**	6.30	1.79
Mount Baldy Wilderness	**AZ**	5.50	1.83
Petrified Forest NP	**AZ**	6.50	1.85
Pine Mountain Wilderness	**AZ**	6.40	1.80
Saguaro Wilderness	**AZ**	6.10	1.72
Sierra Ancha Wilderness	**AZ**	6.70	1.80
Superstition Wilderness	**AZ**	6.70	1.76
Sycamore Canyon Wilderness	**AZ**	6.30	1.84
Agua Tibia Wilderness	**CA**	10.40	2.05
Caribou Wilderness	**CA**	3.60	2.17
Cucamonga Wilderness	**CA**	7.40	2.05
Desolation Wilderness	**CA**	3.30	2.01
Dome Land Wilderness	**CA**	9.20	1.95
Emigrant Wilderness	**CA**	4.40	2.02
Hoover Wilderness	**CA**	4.40	2.00
John Muir Wilderness	**CA**	9.20	2.02
Joshua Tree NP	**CA**	6.40	1.96
Kaiser Wilderness	**CA**	9.20	2.01
Kings Canyon NP	**CA**	9.20	2.01
Lava Beds Wilderness	**CA**	3.90	2.37
Lassen Volcanic NP	**CA**	3.60	2.19
Marble Mountain Wilderness	**CA**	3.90	2.54
Minarets in Ansel Adams WA	**CA**	9.20	2.00
Mokelumne Wilderness	**CA**	3.30	2.02
Pinnacles NM	**CA**	9.30	2.22
Point Reyes NS	**CA**	8.70	2.27
Redwood NP	**CA**	6.00	2.69
San Gabriel Wilderness	**CA**	7.40	2.05
San Gorgonio Wilderness	**CA**	7.40	1.98
San Jacinto Wilderness	**CA**	7.30	2.00

Class I Area	State	Monitoring Data Results and EPA Natural Conditions Estimates	
		1997-2001 Monitored Visibility Data Best 20% Days (dV)	2064 Default EPA 20% Best Days' Natural Conditions Estimates (dV)
San Rafael Wilderness	**CA**	9.30	2.16
Sequoia NP	**CA**	9.20	2.01
South Warner Wilderness	**CA**	3.70	2.20
Thousand Lakes Wilderness	**CA**	3.60	2.20
Ventana Wilderness	**CA**	9.20	2.20
Yolla Bolly Middle Eel WA	**CA**	3.60	2.29
Yosemite NP	**CA**	4.40	2.02
Black Canyon of Gunnison NP	**CO**	4.60	1.94
Eagles Nest Wilderness	**CO**	3.10	1.96
Flat Tops Wilderness	**CO**	3.10	1.95
Great Sand Dunes NM	**CO**	5.60	1.98
La Garita Wilderness	**CO**	4.60	1.94
Maroon Bells-Snowmass WA	**CO**	3.10	1.95
Mesa Verde NP	**CO**	5.50	1.97
Mount Zirkel Wilderness	**CO**	4.70	1.96
Rawah Wilderness	**CO**	4.70	1.96
Rocky Mountain NP	**CO**	4.10	1.93
West Elk Wilderness	**CO**	3.10	1.95
Weminuche Wilderness	**CO**	4.60	1.94
Craters of The Moon WA	**ID**	5.10	2.01
Hells Canyon Wilderness	**ID**	5.50	2.20
Sawtooth Wilderness	**ID**	5.10	2.03
Selway-Bitterroot WA	**ID**	3.40	2.20
Isle Royale NP	**MI**	6.10	3.54
Boundary Waters Canoe	**MN**	6.70	3.53
Voyageurs NP	**MN**	6.40	3.41
Hercules-Glades Wilderness	**MO**	12.20	3.59
Mingo Wilderness	**MO**	13.70	3.59
Anaconda-Pintler WA	**MT**	3.30	2.16
Bob Marshall Wilderness	**MT**	5.40	2.24
Cabinet Mountains WA	**MT**	4.70	2.31
Gates of the Mountain WA	**MT**	3.00	2.10
Glacier NP	**MT**	7.50	2.44
Medicine Lake Wilderness	**MT**	8.00	2.18
Mission Mountain WA	**MT**	5.40	2.27
Red Rock Lakes Wilderness	**MT**	4.00	2.02
Scapegoat Wilderness	**MT**	5.20	2.17
UL Bend Wilderness	**MT**	5.10	2.06

Class I Area	State	Monitoring Data Results and EPA Natural Conditions Estimates	
		1997-2001 Monitored Visibility Data Best 20% Days (dV)	2064 Default EPA 20% Best Days' Natural Conditions Estimates (dV)
Lostwood Wilderness	**ND**	8.70	2.21
Theodore Roosevelt NP	**ND**	7.80	2.19
Bandelier NM	**NM**	6.40	1.90
Bosque del Apache WA	**NM**	8.60	1.85
Carlsbad Caverns NP	**NM**	7.30	1.90
Gila Wilderness	**NM**	5.50	1.83
Pecos Wilderness	**NM**	6.40	1.92
Salt Creek Wilderness	**NM**	8.60	1.87
San Pedro Parks Wilderness	**NM**	4.00	1.91
White Mountain Wilderness	**NM**	8.60	1.86
Wheeler Peak Wilderness	**NM**	6.40	1.95
Jarbidge Wilderness	**NV**	3.10	1.98
Wichita Mountains WA	**OK**	12.60	3.39
Crater Lake NP	**OR**	3.70	2.59
Diamond Peak Wilderness	**OR**	3.70	2.65
Eagle Cap Wilderness	**OR**	5.40	2.22
Gearhart Mountain WA	**OR**	3.50	2.34
Kalmiopsis Wilderness	**OR**	5.00	2.59
Mount Hood Wilderness	**OR**	3.00	2.65
Mount Jefferson Wilderness	**OR**	3.20	2.69
Mountain Lakes Wilderness	**OR**	3.60	2.45
Mount Washington Wilderness	**OR**	3.30	2.77
Strawberry Mountain WA	**OR**	5.70	2.37
Three Sisters Wilderness	**OR**	3.30	2.75
Badlands NM	**SD**	7.20	2.18
Wind Cave NP	**SD**	5.90	2.12
Big Bend NP	**TX**	8.10	1.81
Guadalupe Mountains NP	**TX**	7.40	1.91
Arches NP	**UT**	5.50	1.87
Bryce Canyon NP	**UT**	4.30	1.87
Canyonlands NP	**UT**	5.60	1.89
Capitol Reef NP	**UT**	5.60	1.91
Zion NP	**UT**	5.90	1.86
Alpine Lakes Wilderness	**WA**	6.00	2.74
Glacier Peak Wilderness	**WA**	3.20	2.68
Goat Rocks Wilderness	**WA**	5.30	2.70
Mount Adams Wilderness	**WA**	5.30	2.66
Mount Rainier NP	**WA**	5.30	2.78

Class I Area	State	Monitoring Data Results and EPA Natural Conditions Estimates	
		1997-2001 Monitored Visibility Data Best 20% Days (dV)	2064 Default EPA 20% Best Days' Natural Conditions Estimates (dV)
North Cascades NP	**WA**	3.20	2.66
Olympic NP	**WA**	6.00	2.76
Pasayten Wilderness	**WA**	3.20	2.65
Bridger Wilderness	**WY**	4.00	1.96
Fitzpatrick Wilderness	**WY**	4.00	1.97
Grand Teton NP	**WY**	3.90	1.97
North Absaroka Wilderness	**WY**	3.90	1.97
Teton Wilderness	**WY**	3.90	1.97
Washakie Wilderness	**WY**	3.90	1.97
Yellowstone NP	**WY**	3.90	2.00

References

1) EPA, 1999: Regional Haze Rule and Preamble (64 Federal Register 35714), July 1.

2) EPA, 2001: "Draft Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule." Office of Air Quality Planning and Standards, Research Triangle Park, NC. September 27.

3) SAIC, 2003: "EPA Contract No. 68-D-98-113, Work Assignment No. 5-78, SAIC Project No. 1-0825-08-2566-000, Application/Utilization of GVS Techniques in Analyzing Particulate Matter (PM) and Regional Haze (RH) Policy and Control Issues". Letter from Richard Gardner, Science Applications International Corporation (SAIC) to Thomas E. Rosenthal, Integrated Policy & Strategies Group, OAQPS, AQSSD (MD-15), U.S. Environmental Protection Agency Research Triangle Park, North Carolina 27711, July 3.