Appendix B-SIP Analysis of Clean Air Corridors (CACS)

Introduction:

The Clean Air Act Amendments of 1990 specifically require that visibility transport commissions address "the establishment of clean air corridors, in which additional restrictions on increases in emissions may be appropriate to protect visibility in affected Class I Areas."' The Grand Canyon Visibility Transport Commission (GCTVC) in its recommendations found that clean air corridors exist and that, generally, clean air comes to the Colorado Plateau from the northwest.

Analysis of CACS:

Using one of the proposed corridor alignments examined by the Meteorology Subcommittee, a corridor that would protect the 30% cleanest days on the Colorado Plateau, BBC Research and Consulting conducted an economic and demographic evaluation of the corridor to determine whether emissions increases expected by 2040 would approach 25%.

According to its projections, emissions are not expected to increase 25% by 2040. 3 The boundaries of the corridor defined in the report are shown in Figure 25. The WRAP adopts this boundary because of the extensive demographic, economic, and air quality impact analysis performed on this corridor and the subsequent review and approval, including the consensus reached by the Grand Canyon Visibility Transport Commission. This is a slight modification of the boundary used in the BBC Report. The grid cells used by the GCVTC did not follow state or county boundaries, and for ease of administration, the WRAP has removed small areas of southern Washington and southwestern Montana from the corridor.

These areas are far from the Colorado Plateau and it is unlikely that emissions increases in these small areas would affect the Class I Areas on the Plateau. Also, the WRAP boundary includes all of Box Elder, Tooele and Grand Counties in Utah, Wasco and Sherman Counties in Oregon, and Cassia and Lemhi Counties in Idaho; these counties were not included within the BBC boundary. Several dozen tribal reservations are located within or close to the Clean Air Corridor; those are depicted next.

An alternative analysis of clean air corridors for the Grand Canyon was performed (Green, et al., 1996). This analysis was based on an analysis of back trajectories during times when low concentrations were measured on the IMPROVE aerosol monitor at Grand Canyon National Park. The clean air corridor defined from this analysis is shown in Figure 26. An overlay of the boundaries of these two potential definitions of the corridors (Figure 27) indicates that the corridor from the BBC report is mostly a subset of the boundaries of Green, et al. The exception is the westernmost edge of Nevada and small area in south - central

Oregon.

1 42 U.S.C. 2169B(d)(2)(A).

2 Grand Canyon Visibility Transport Commission. "Recommendations for Improving Western Vistas". Western Governors'Association. Denver, CO. June 1996. 3 BBC Report, page 111-5

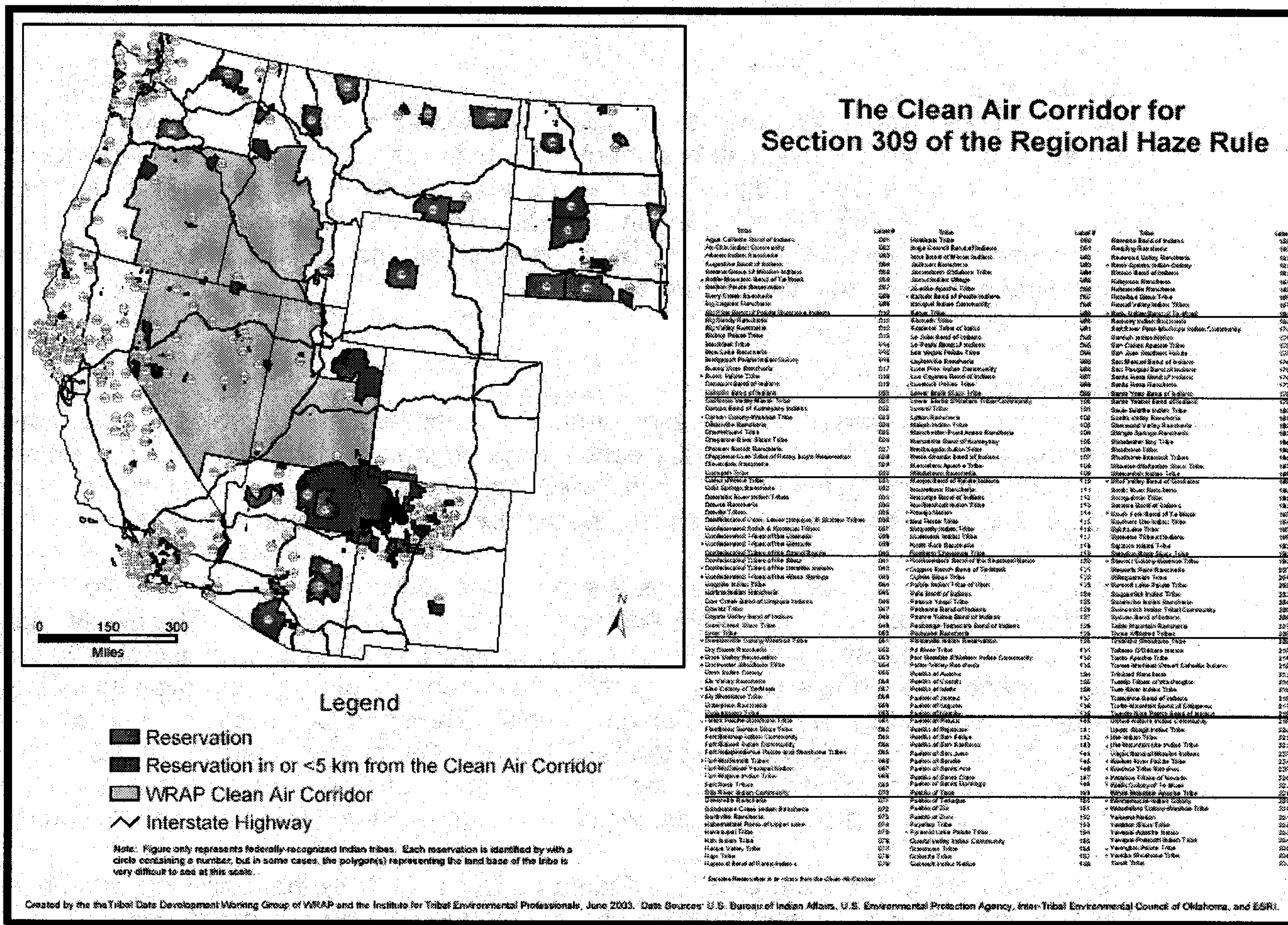
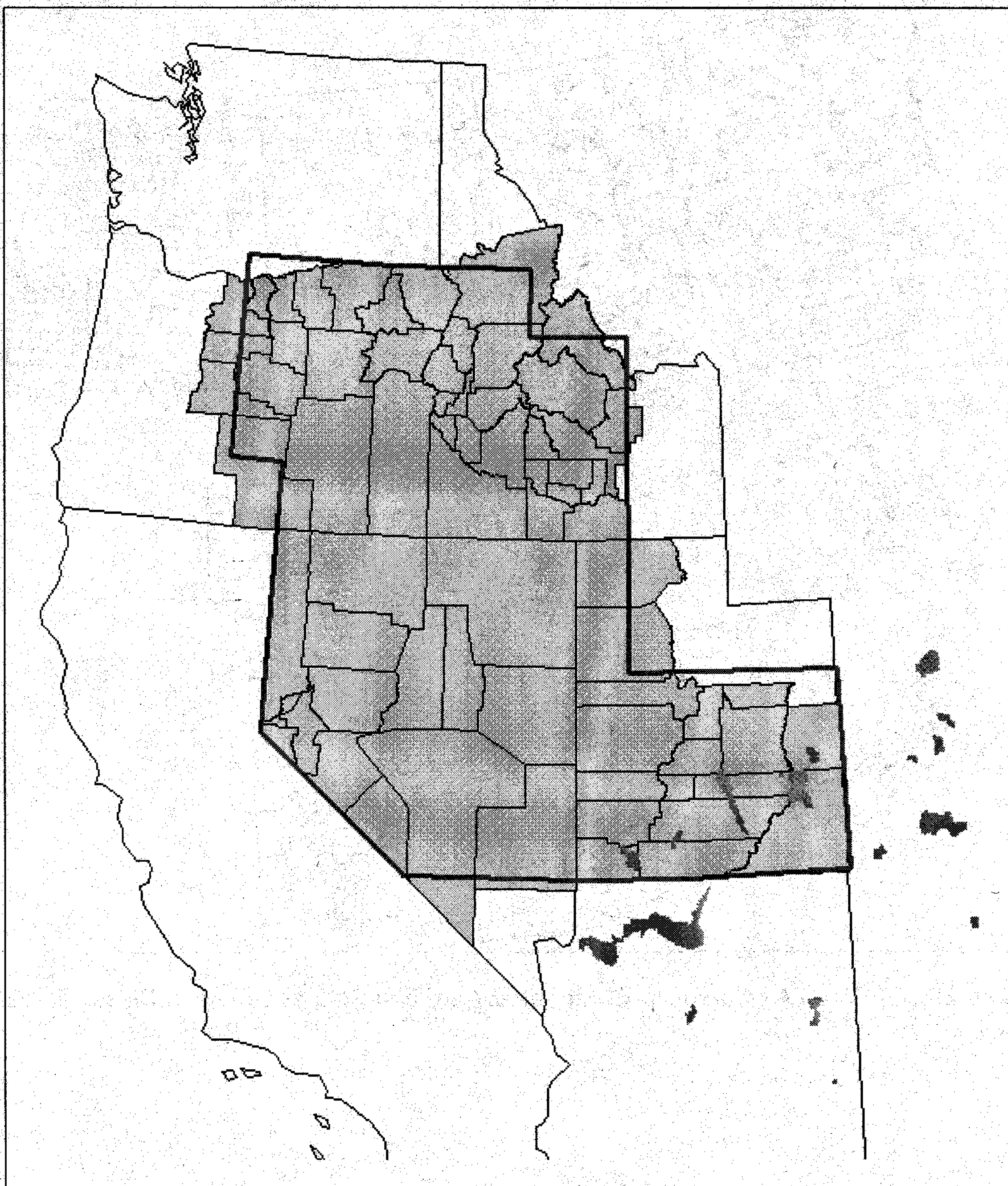

The Clean Air Corridor for
Section 309 of the Regional Haze Rule
0 150 300
Miles
N
Legend
Reservation
Reservation in or <5 km from the Clean Air Corridor
WRAP Clean Air Corridor
Interstate Highway
Note: Figure only represents federally-recognized Indian tribes. Each reservation is identified by with a circle containing a number, but in some cases, the polygon(s) representing the land base of the tribe is very difficult to see at this scale.
Created by the the Tribal Data Development Working Group of WRAP and the Institute for Tribal Environmental Professionals, June 2003. Data Sources: U.S. Bureau of Indian Affairs, U.S. Environmental Protection Agency, Inter-Tribal Environmental Council of Oklahoma, and ESRI.

Figure 25: Clean Air Corridor – WRAP (blue) – GCVTC/BBC (red) and Colorado Plateau Class I areas (green)



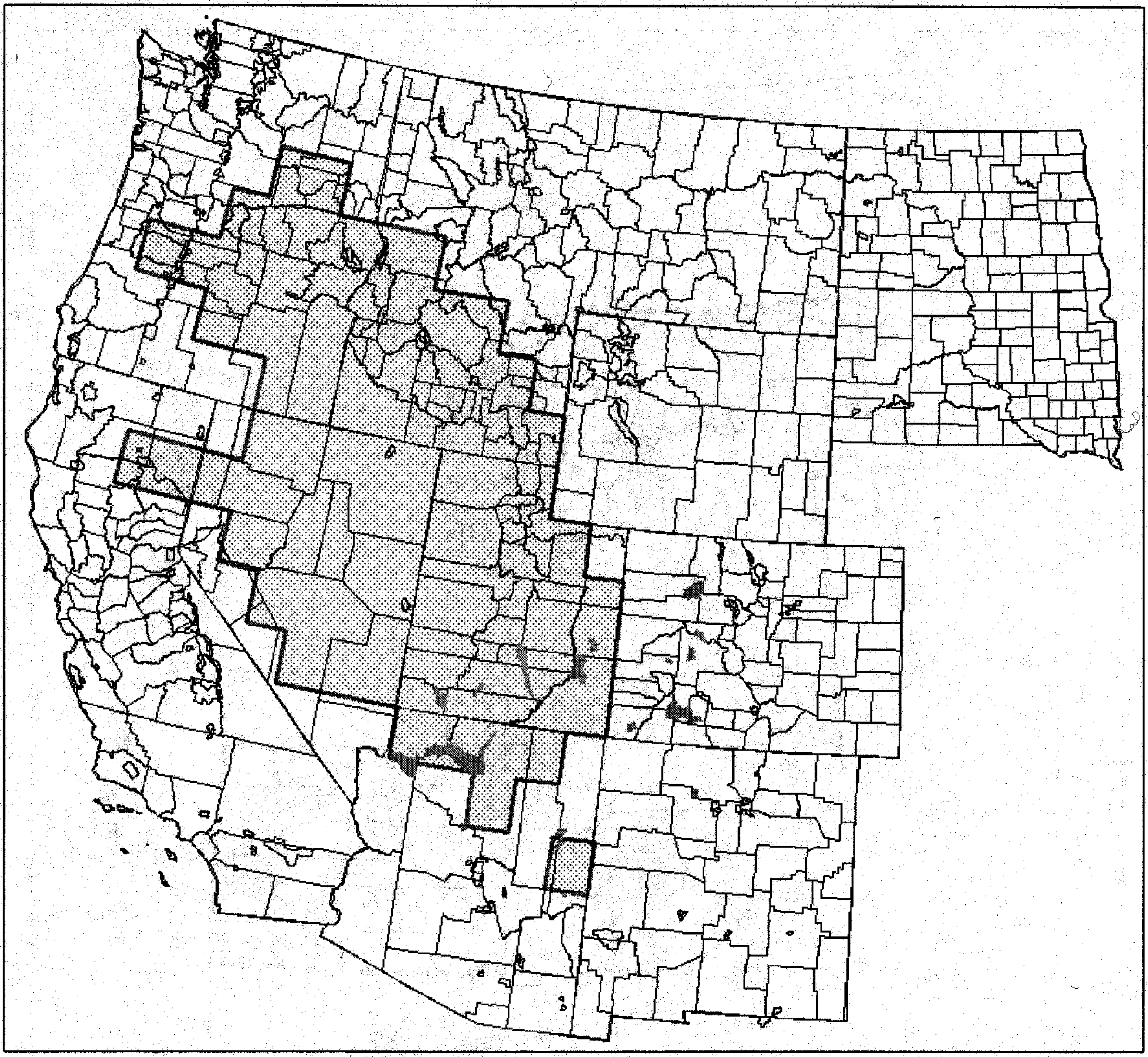


Figure 26: Clean Air Corridor – Green, et al. (red) and Colorado Plateau Class I areas (green)

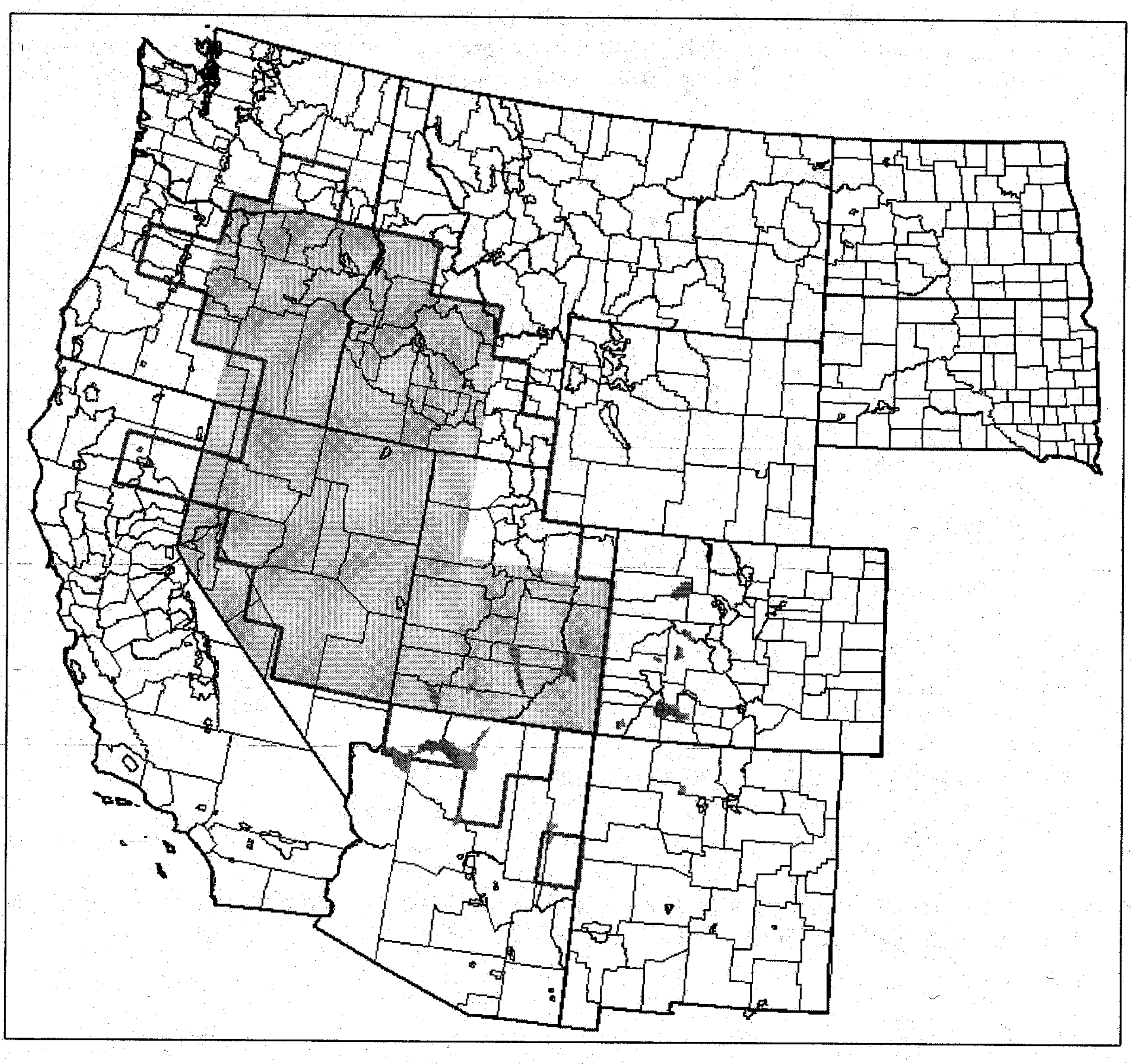


Figure 27: Comparison of Clean Air Corridor Boundaries – GCVTC/BBC report (Blue), Green, et al. (Red), and Colorado Plateau Class I areas (green)

Changes in Modeled Emissions:
Emission changes within the clean air corridor between the 1996 base year and the projection year of 2018, including the SO_2 Annex Milestones case, are shown in Table 32. The WRAP Regional Modeling Center reports the following with respect to changes in emissions from 1996 to 2018:

PM_{10} and $PM_{2.5}$ emissions are expected to increase about 7% and 18%, respectively. NO_x and VOC, however, are expected to decrease about 15% and 26%, respectively. SO_2 emissions are expected to increase about 5% within the corridor, even with the declining milestones of the backstop market trading program. Overall, SO_2 emissions are expected to decline by 17% in the 13-state GCVTC region by 2018, and the fact that the projections show a 5% increase in SO_2 within the clean air corridor is a result of non-road sources burning high-sulfur diesel fuel. This source of SO_2 is expected to be drastically reduced (e.g., from a fuel sulfur content of more than 3,000 ppm to 15 ppm) before 2018 according to announcements by EPA to develop new engine certification standards for non-road vehicles and equipment. Thus, 5% should be viewed as an upper bound on the possible increase.

Table 32: Changes in CAC Emissions by 2018 (including milestones) from 1996

		Point	Area	On Road	Non Road	Paved	Unpaved	Total
SO_2	1996	51,413	9,260	2,065	10,838	0	0	73,576
	2018	45,330	10,614	413	21,596	0	0	77,954
	2018-1996	-6,082	1,354	-1,652	10,758	0	0	4,378
NO_x	1996	85,782	12,935	93,581	64,462	0	0	256,762
	2018	109,863	17,576	28,692	62,557	0	0	218,689
	2018-1996	24,080	4,641	-64,889	-1,905	0	0	-38,072
PM_{10}	1996	27,055	142,776	3,872	5,952	5,740	47,733	233,128
	2018	32,748	154,966	2,640	6,763	12,402	38,828	248,347
	2018-1996	5,692	12,190	-1,232	811	6,662	-8,904	15,219
$PM_{2.5}$	1996	11,987	41,595	3,495	5,487	1,435	7,160	71,160
	2018	14,583	52,069	2,058	6,228	3,101	5,824	83,863
	2018-1996	2,595	10,474	-1,438	740	1,665	-1,336	12,702
VOC	1996	5,993	95,921	69,899	38,535	0	0	210,349
	2018	7,921	95,515	22,651	29,233	0	0	155,321
	2018-1996	1,927	-406	-47,248	-9,301	0	0	-55,029

The projected changes in emissions, within the clean air corridor, are show spatially in Figures 28 through 32 for SO_2, NO_2, VOC, PM_{10}, and $PM_{2.5}$.

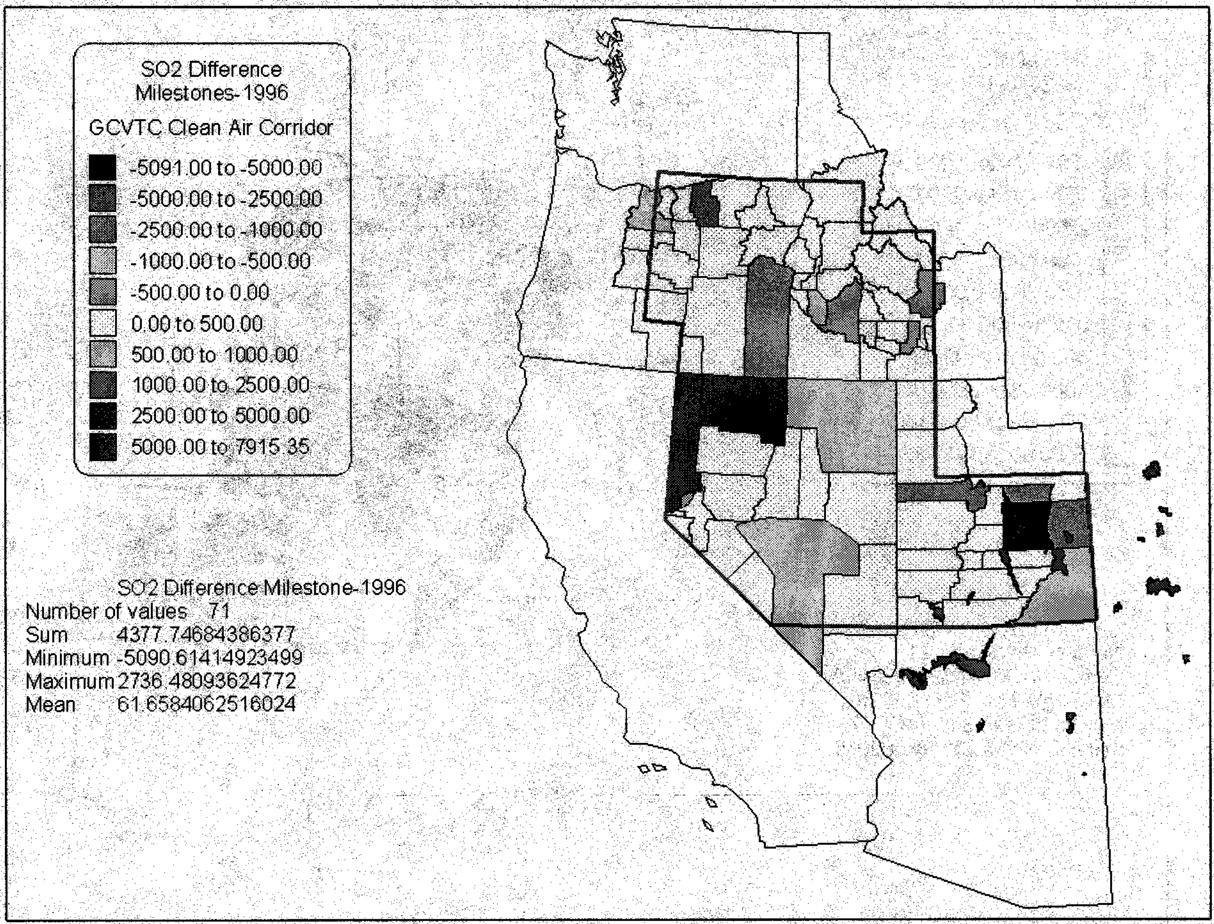


Figure 28: SO_2 emission difference, by county, 2018 projections with WRAP SO_2 Annex Milestones and 1996 base

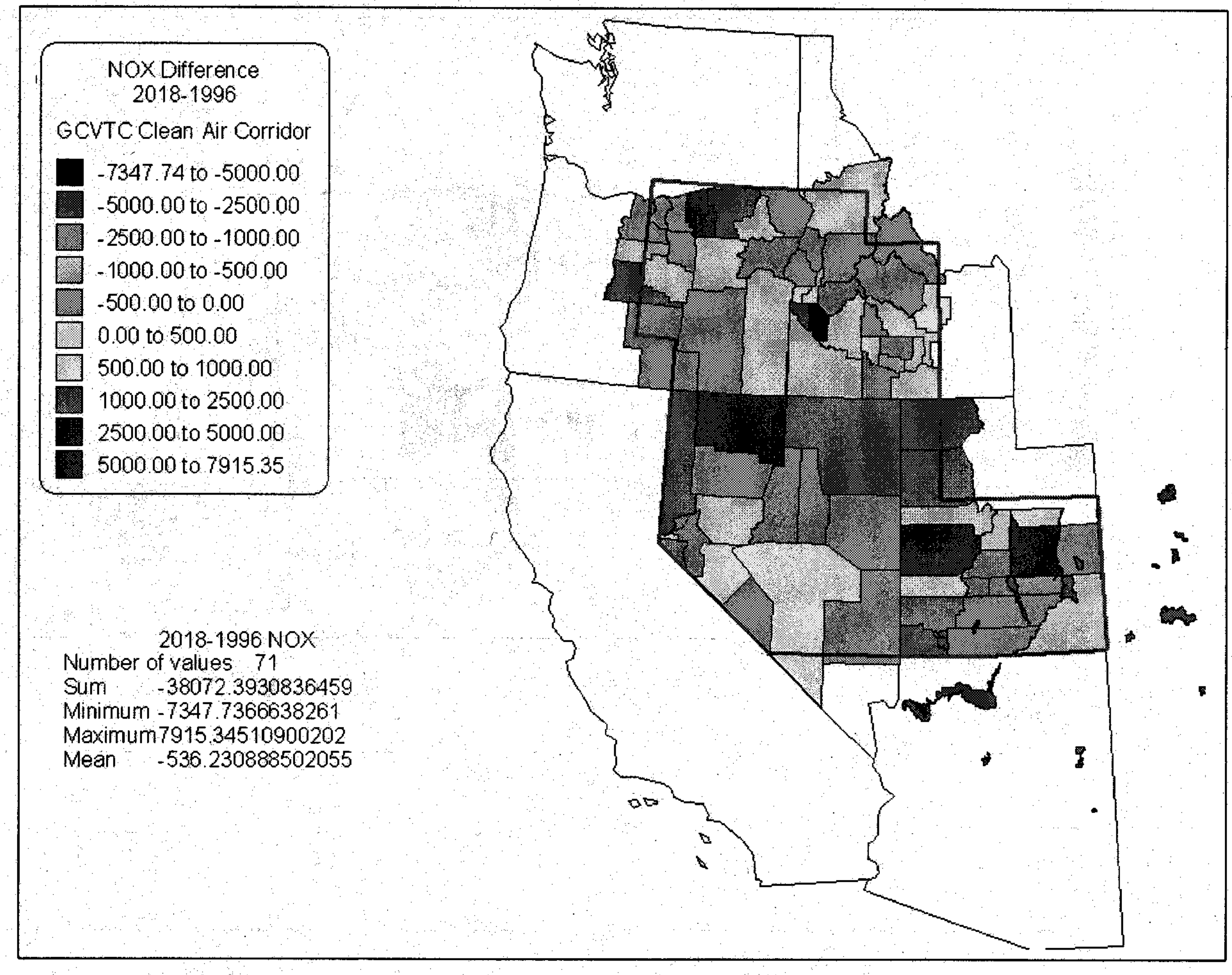


Figure 29: NO_X emission difference, by county, 2018 projections and 1996 base

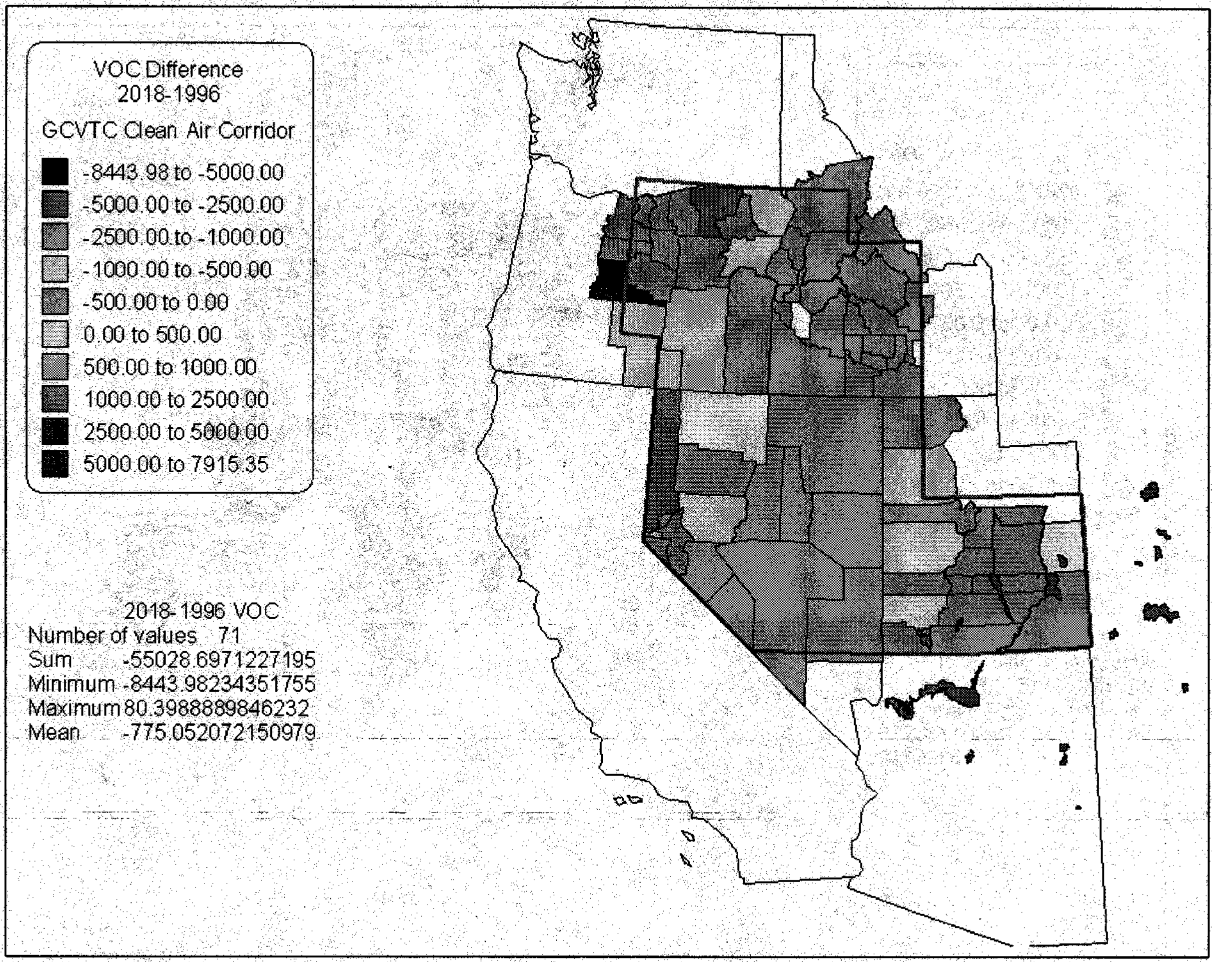


Figure 30: VOC emission difference, by county, 2018 projections and 1996 base

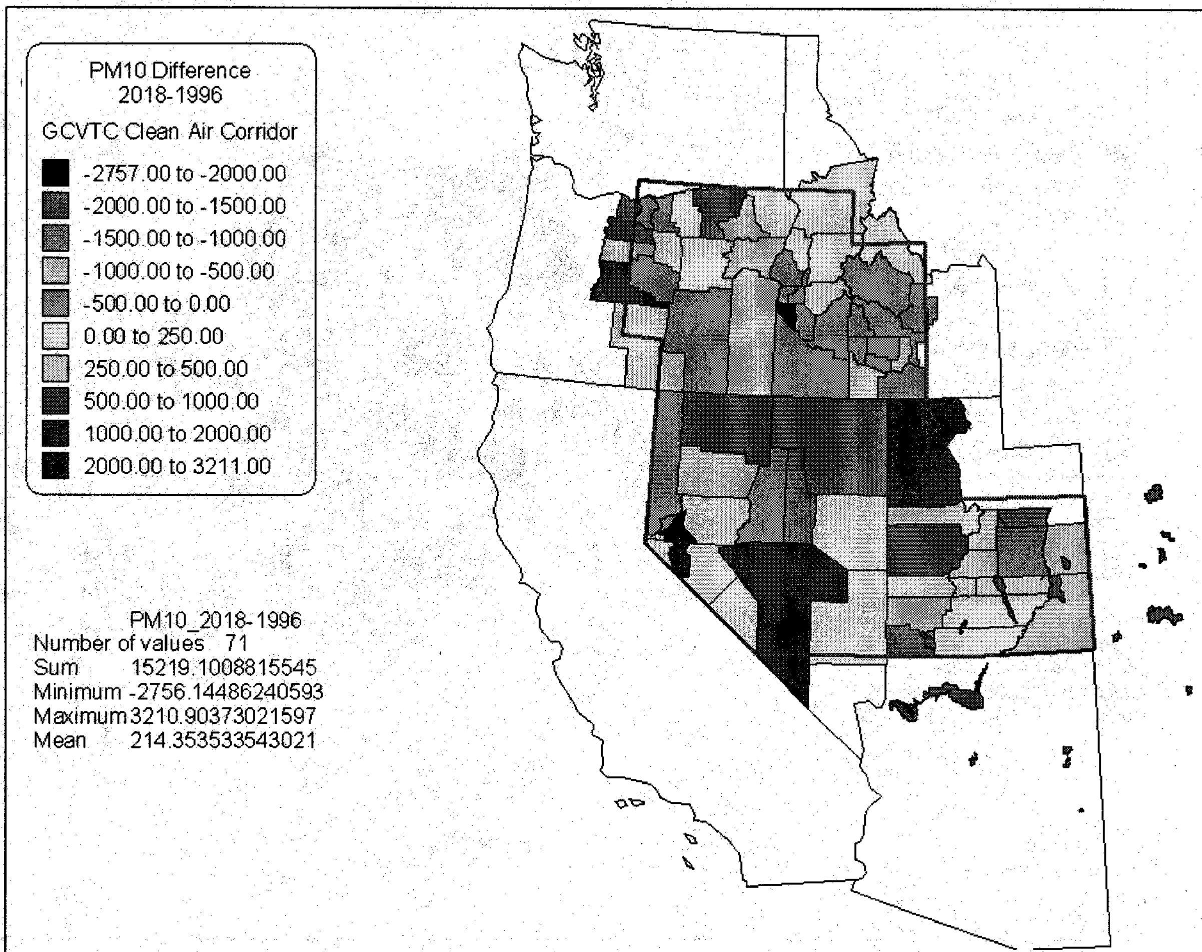


Figure 31: PM_{10} emission difference, by county, 2018 projections and 1996 base

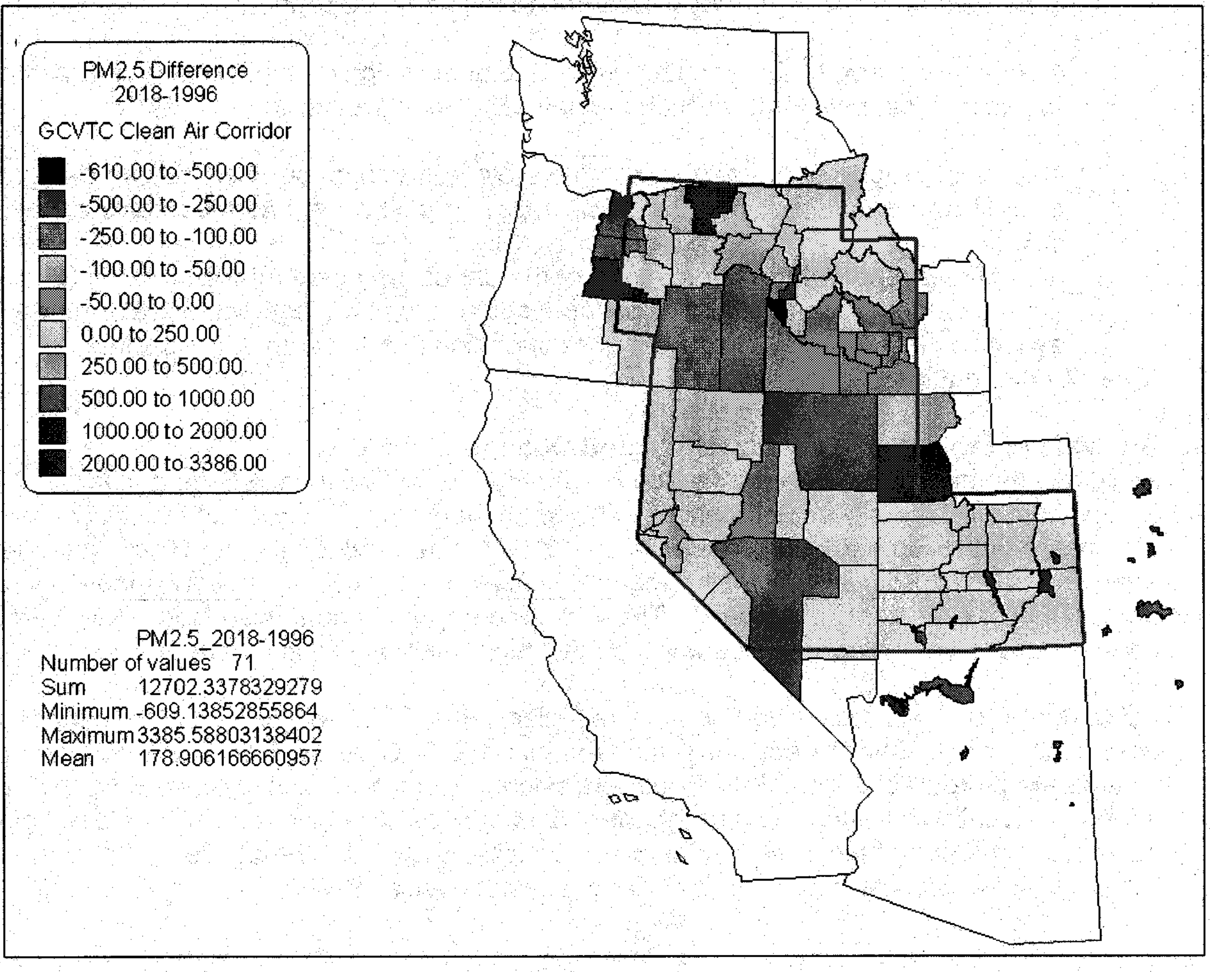


Figure 32: $PM_{2.5}$ emission difference, by county, 2018 projections and 1996 base

Emissions Tracking System:
The preamble of the RHR defines a Clean Air Corridor (CAC) as "a region that generally brings clean air to a receptor region", and also says "the requirement to track emissions will enable states to quickly determine if changes in patterns of emissions will reduce the number of clean air days (defined as the average of the 20% clearest days) in any of the 16 Class I Areas." The actual requirements state that the §309 SIP or TIP must describe and provide for implementation of comprehensive emission tracking strategies for CAC to ensure that the visibility does not degrade on the least-impaired days at any of the 16 Class I Areas.

Using the most recent emission inventory data available through the Emissions Data Management System (EDMS), the WRAP will produce a report for each five-year implementation plan revision (2007-8, 2013, and 2018) on the current and projected emissions in the CAC and in areas surrounding the corridor and compare these emissions to a 1996 baseline, as part of a larger source apportionment exercise managed by the Technical Oversight Committee (described in the next section).

The EDMS will have the capability to produce the following special reports in tabular and simple plots (i.e. bar graph and pie chart) formats and allow queries of the same information including presentation in GIS format, in addition to the standard reports:

- A summary report of the annual summed total emissions for all six source categories and all of the pollutants by county/state and tribal lands, as well as for the entire CAC.
- A summary report of the annual summed total emissions for all six source categories and all of the pollutants for the same types of political boundaries surrounding the CAC.
- A summary report of the comparison of the annual summed total emissions for all six source categories and all of the pollutants for the sar-ne types of political boundaries, as well as the entire CAC and the corresponding base year total emissions.

(See Documentation section below)

Analysis of Emissions Growth Within and Outside of the CAC As part of the next round of analysis and preparation for regional haze SIPS due in 2007-08, the Technical Oversight Committee will be conducting 2 separate visibility source apportionment exercises (described in the WRAP 2003-08 Strategic Plan), integrating analytical results from aerosol and meteorological monitoring, air quality modeling, and preparation of emissions inventories. These source apportionment exercises will identify the source regions and categories causing visibility impairment at Class I areas.

As part of those source apportionment exercises, the TOC will analyze the changes in emissions for the counties and tribal lands within the CAC, as well as those counties and tribal lands surrounding the CAC. Better emissions inventory data expected to be available each time, as the TOC iterates through these 2 exercises. Specific results from each of the source apportionment exercises will address emissions growth both inside and surrounding the CAC, as well as the impact on visibility at affected Class I Areas.

Other Clean Air Corridors: Other than the various options for selection of a CAC for Grand Canyon National Park, shown above, no other corridors have been identified. If the growth of visibility impairing emissions in the corridor identified remains protective of the Grand Canyon National Park, then it should be protective of the other Colorado Plateau Class I Areas.
Localized emissions near the Class I Areas within the CAC, however, may have more effect on those Class I Areas. Similarly, disproportionate emissions growth in the southern portion of the corridor may have more effect on Grand Canyon National Park.

The factors identified by Green, et al., low emissions of air pollutants, enhanced dispersion of air pollutants due to higher average ventilation (wind speed multiplied by mixing depth), and increased removal of pollutants due to precipitation, combined with the frequency of transport from this region make it relatively unique.

Findings:

With respect to Clean Air Corridors (CACs), Albuquerque/Bernalillo County has determined the following:

- No significant emissions growth is occurring at this time that is causing visibility impairment in the 16 Class I Areas of the Colorado Plateau.
- Emissions growth in the Clean Air Corridor, identified by the GCVTC and studied by the WRAP, does not adversely affect the Colorado Plateau Federal Class I Area in New Mexico-the San Pedro Parks Wilderness Area.
- Emissions growth in the CAC does not adversely affect the other fifteen Class I Areas on the Colorado Plateau.
- Outside the CAC there is no emissions growth occurring at this time that is impairing air quality within the CAC sufficient to cause any visibility impairment in any of the 16 Class I Areas of the Colorado Plateau.
- Outside the CAC identified above, there is no emissions growth occurring that is impacting or could begin to impact the Class I Areas within the Clean Air Corridor itself.

For the Class I Areas on the Colorado Plateau, Albuquerque/Bernalillo County note s the following:

- For the Best 20% visibility days, improvements occurred in 9 out of 16 Areas (56%).
- For the Worst 20% of visibility days, improvements occurred in 12 out of 16 Areas (75%).

For other Class I Areas in the 9-state region (less California), Albuquerque/Bernalillo County notes the following:

- For the Best 20% visibility days, improvements occurred in 24 out of 40 Areas (60%).
- For the Worst 20% of visibility days, improvements occurred in 29 out of 40 Areas (73%).

Documentation: The WRAPs "Policy Paper on Clean Air Corridors" addresses all requirements related to identifying the boundary of the clean air corridor, projections of emissions growth inside and outside the boundary, and if other corridors exist. This paper was based on the work of the Grand Canyon Visibility Transport Commission Meteorological Subcommittee, and updated with 1996 inventories used by WRAP.

The paper found that there is only one clean air corridor, and concludes that patterns of growth in and adjacent to the corridor are not causing significant emissions increases, and consequently no adverse visibility impact on any of the 16 Class I areas of the Colorado Plateau. The paper found that only 4% emissions growth was likely to occur, as compared to the GCVTC work that indicated it would take at least a 25% increase to result in perceptible visibility impact (0.7 deciview). Because no impairment of air quality in the corridor was identified, no further visibility analysis or additional emission reduction measures are needed now, but will be re -evaluated in 2008.

1 Note that the EDMS to be developed is described in a draft technical report to the Emissions Forum: Needs Assessment for Evaluation and Design of an Emissions Data Reportinq, Management, and Tracking System, (EA Engineering, Science, and Technology, June 26, 2003).