Rocky Mountain National Park Air Quality Initiative
Regulatory and Non-Regulatory Options
March 4, 2005

For a number of years, the U.S. National Park Service (NPS) has expressed serious concern about visibility degradation, increasing tropospheric ozone concentrations, and nitrogen/acidic deposition at many national parks across the country, including Rocky Mountain National Park (RMNP). There is a growing body of scientific information, including park-specific sampling and monitoring data that substantiates ongoing impacts from nitrogen compounds occurring at RMNP, and evidence suggests that these impacts are increasing.

Staff members from the NPS, the Colorado Department of Public Health and Environment (CDPHE), the U.S. Environmental Protection Agency Region 8 (EPA), and other interested organizations have initiated discussions of the air quality-related issues affecting RMNP. During early 2004, the CDPHE decided to provide special attention to RMNP based on the finding that ozone levels at the park were approaching, and could violate, the 8-hour National Ambient Air Quality Standard (NAAQS) for ozone. And in September 2004, the EPA Administrator committed to seriously examine approaches to reduce the adverse impacts of nitrogen-related air pollution on national parks and other ecosystems.

The CDPHE, the NPS, and EPA agreed to pursue a collaborative process to address the air quality issues at RMNP. As part of this process, agency officials directed staff to compile and forward to decision makers emission control options that could be used to improve ozone and regional haze and reduce nitrogen deposition at RMNP. Thus, the purpose of this paper is to frame the air quality related issues at RMNP, specifically ozone, regional haze and nitrogen deposition, and to analyze regulatory and other options for addressing the problems. Assessment of the options will therefore include statements as to their potential effectiveness in achieving these objectives, though detailed cost/benefit analyses have not yet been performed.

Nitrogen, in its various chemical forms, plays a key role in the formation of ozone, in contributions to visibility impairment, and in atmospheric deposition of reactive species that are altering the natural ecosystems of the park. For purposes of this discussion, it is assumed that RMNP is experiencing adverse impacts and effects on sensitive air quality related values due in large part to airborne nitrogen-related compounds. Further, given the probable trend that these impacts are increasing at the park, this paper explores the range of options that could be implemented to reverse this trend and prevent and remedy adverse impacts to the park's natural resources.

Attachments to this paper provide summary information on ozone and regional haze monitoring as well as emissions of nitrogen oxides and ammonia. A separate paper

entitled "Nitrogen Deposition: Issues and Effects in Rocky Mountain National Park – Technical Background Document" (referred to as the "Nitrogen TBD") documents state of the science information on nitrogen deposition and park-specific monitoring information and data on the ecological impacts of nitrogen deposition on RMNP.

Background

In the 1916 Organic Act creating the NPS, Congress established that the agency's fundamental mission is "…to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them **unimpaired** (emphasis added) for the enjoyment of future generations." Included in this mission is the mandate to preserve the air quality of our national parks. Congress also emphasized the need to preserve air quality in Class I national park units, like RMNP, and large wilderness areas, when it amended the Clean Air Act (CAA) in 1977. Congress mandated that air quality in these areas be **protected and enhanced** (emphasis added), and not be allowed to deteriorate significantly. It also established a national goal of restoring natural visibility in these areas.

Other authorities and responsibilities are assigned the NPS under various federal statutes, including the Wilderness Act, the National Environmental Policy Act, and individual park legislation. Similar to the Organic Act, the Wilderness Act requires wilderness areas to be administered "for the use of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness." A key responsibility of the NPS is found in the CAA which gives park managers an affirmative responsibility to "protect air quality related values (including visibility)" from the adverse effects of air pollution. In assigning these mandates to the NPS, Congress maintained that the authority for managing the air resources of this nation would remain with the EPA and state and local air quality agencies, such that NPS concerns must be addressed through working with the air authorities having jurisdiction over the areas experiencing problems. The NPS has no regulatory authority over air quality matters.

RMNP is one of the crown jewels of the National Park System. Established by Congress in 1915, the park is recognized worldwide as an outstanding scenic area and natural treasure. As a mandatory Class I national park and wilderness, the meadows, forests, alpine peaks, tundra, lakes and streams, wildlife, and all other parts of the natural ecosystem (from soils to microscopic plants and animals) are part of this natural landscape. Over 3 million visitors come to RMNP each year to see and experience the ice and rock glaciers, clear, cold alpine lakes, abundant wildlife, over 350 miles of trails, and 60 mountain peaks reaching over 12,000 feet elevation. Two native trout, greenback cutthroat trout and the Colorado River cutthroat are protected in the park and attract fishermen to lakes and streams. The greenback cutthroat trout, once close

to extinction, is found east of the Continental Divide. The Colorado River cutthroat trout, eliminated from 99% of its historic range, still occurs in healthy populations in the park west of the Divide.

RMNP, located in north central Colorado, encompasses 265,780 acres and straddles the Continental Divide. Approximately 2,917 acres within the park are designated as wilderness, and an additional 248,464 acres have been recommended for wilderness designation and are managed as wilderness. The park lies within Larimer, Boulder and Grand counties and is bordered by the towns of Estes Park, Allenspark, and Glenhaven on the east and Grand Lake on the west. The metropolitan areas of Denver and Ft. Collins are east of the park. The park is surrounded by state, local, private and federally owned lands. Park managers are responsible for protecting the park's natural environment, while providing recreational opportunities for the public. RMNP's impact on Colorado's tourism industry is on the order of $189 million a year, so the integrity of the park's ecosystems and condition of its air quality, including visibility, is important economically to nearby local communities, the region and the State.

The NPS, the CDPHE and the EPA recognize that there are air quality issues facing Rocky Mountain National Park, and these issues include:

1) Human Health Concerns and Adverse Biological Impacts from Elevated Ozone Concentrations

In recent years, ambient ozone concentrations in RMNP have exceeded the level of the 8-hour NAAQS on many occasions. The ozone NAAQS is violated when the three-year average of the 4th maximum 8-hour concentration, at a monitoring site, is greater than or equal to 85 parts per billion (ppb). Though these exceedances have not resulted in a formal violation of the 8-hour ozone NAAQS at the Park, the concentrations are elevated enough that human health may be adversely impacted. NPS has found evidence of ozone effects on sensitive ecosystems at levels below the NAAQS at many parks across the country, and the NPS has this concern for RMNP. The emissions that cause ozone are nitrogen oxides (NOx) and volatile organic compounds (VOCs).

- The primary sources of NOx emissions are vehicles and commercial and industrial activities where fuels are burned.

- The sources of VOCs are vehicle exhaust and evaporative emissions, the oil and gas exploration and processing industry, and the numerous household, commercial and industrial activities where solvents, paints and other chemicals that easily evaporate are used.

- Vegetation also emits VOCs in large quantities -- approximately ½ of all VOC emissions. These natural sources are uncontrollable and will not be discussed in this regulatory options paper.

The park experienced 13 exceedances of the level of the ozone standard in 2002 and 2003. While data from 2004 indicated that measured ozone concentrations at the park and northern Front Range counties generally improved from prior years, the 3-year average of the 4th maximum concentrations at the park shows a slight increase for the period 2002-2004 (0.082 ppm) over the previous 3-year average (0.081 ppm). It is likely that the wetter and cooler summer of 2004 prevented higher levels of ozone formation and may have helped many areas in this region avoid violations of the ozone NAAQS. The recently adopted Ozone Action Plan under EPA's Early Action Compact provisions imposes controls for VOCs and NOx and should provide for long-term attainment of the 8-hour ozone NAAQS into the future. Details of the last seven years of ozone monitoring data in the region, including the park, are presented in the companion technical paper and in Attachment 1.

2) Visibility Degradation on the 20% Worst Days Due to Regional Haze

EPA's regional haze regulations require that the visibility on the clearest days (the 20% least-impaired days) must not deteriorate, and the visibility on the haziest days (the 20% most impaired-days) must improve. The most recent visibility monitoring data shows that on clearest days, visibility is improving at RMNP. However, on the haziest days, visibility at RMNP continues to deteriorate. Ammonium nitrate concentrations, one of the primary components of RMNP's visibility impairment, seem to be trending upward.

Fine particles scatter and absorb light – the more abundant the fine particles are, the worse the visibility becomes. The composition of the visibility impairing particles at RMNP includes ammonium nitrate, ammonium sulfate, organic carbon, elemental carbon, fine soils, and coarse mass.

- The primary sources of NOx emissions are vehicles and industrial/commercial activities.

- The primary sources of sulfur dioxide (SO_2) emissions are the burning of coal, fuel oil and vehicle fuels and smelting operations.

- The primary sources of ammonia (NH_3) emissions, excluding soil sources, are from fertilizer application and livestock.

- Industrial emissions, forest fires, and biogenic emissions (emissions of compounds from biological processes) contribute to the organic carbon portion.

- Elemental carbon is due to sooty, black carbon from industrial and transportation sources and forest fire combustion.

- Because of the lower humidity and sandy soils in the West, fine soil dust and coarse mass particles (between 2.5 and 10 microns in size) contribute to visibility impairment.

Many small and large sources both near and far from the park contribute to the haze.

3) Increased wet and dry nitrogen deposition at high and intermediate elevations, resulting in adverse impacts to air quality related values (AQRVs)

Nitrogen deposition is a serious issue facing RMNP and will likely be the most difficult of the three issues to assess or rectify. After over 20 years of research at the Park, the NPS is finding that nitrogen deposition is adversely affecting the water quality, aquatic life, soils and vegetation in the park's high elevation ecosystems. These ecosystems have evolved in a low nitrogen environment, and the shallow soils and granitic bedrock provide poor chemical buffering for the influx of nitrogen from human sources. Specifically, the research shows nitrogen enrichment or eutrophication of lakes, elevated nitrate levels in snowmelt runoff, nitrogen enrichment or saturation of soil and vegetation, and altered plant communities due to nitrogen enrichment.

Nitrogen is from NOx emissions due to the burning of fuel (vehicles and industrial/ commercial activities) and from NH_3 emissions primarily from fertilizer and livestock. Studies indicate that nitrate and ammonia contribute approximately equally to nitrogen wet deposition in RMNP. One of the bigger challenges in assessing the causes of nitrogen deposition in the park is related to having or developing a reasonably accurate emissions inventory for various time periods, especially for ammonia since tracking of this pollutant has not been routinely performed by air management agencies.

The NPS has reported that the total annual wet and dry nitrogen deposition in RMNP has been increasing. For example, the wet deposition of nitrates has increased 26 percent between 1985 and 2002. For this same period, the wet deposition of NH_3 has increased 73 percent. Since the mid-1990's, wet and dry nitrogen deposition has averaged around 4.0 kilograms per hectare per year. The pre-industrial or "natural" level of nitrogen deposition is estimated to be around 0.2 kilograms per hectare per year. NPS is considering establishing a "critical load" value for nitrogen deposition for RMNP and other parks, which is a level of an air pollutant that is determined to cause a specific harmful effect. This critical load could be the natural condition or some "to be determined" value. Although the NPS may determine what the critical load of nitrogen deposition should be at the park, it could also suggest a less stringent "interim target load" as a more attainable measure in the short term.

The NPS, the EPA and the CDPHE are working to identify the sources of nitrogen - both within and outside of Colorado.

Statutory Requirements and Options - The Foundation for Action

Ozone

The Clean Air Act requires that the federal NAAQS for ozone be attained throughout the country. An area not attaining the 8-hour ozone NAAQS is subject to the requirements of the Act and must come into attainment as prescribed. The Denver metropolitan area and North Front Range counties, including the eastern side of RMNP, are part of an area that is not attaining the 8-hour ozone NAAQS, but Colorado has deferred, possibly permanently, formal nonattainment requirements by developing an Ozone Action Plan under EPA's Early Action Compact provisions.

In March of 2004, the Colorado Air Quality Control Commission (AQCC) approved an Ozone Action Plan to reduce future ozone concentrations. The plan requires the continuation of existing ozone control measures and additional reductions in VOC and NOx emissions from sources in northeastern Colorado. The plan demonstrates that the region will be in compliance with the 8-hour ozone NAAQS by the end of 2007, and the area is predicted to no longer violate the 85 ppb standard in the future. For RMNP, the plan also predicts attainment of the NAAQS with a projected three-year ozone concentration (2005-2007) of 79 ppb. The Ozone Action Plan shows the emission reductions necessary to meet the 2007 and 2012 ozone requirements, and the projected longer-term trend of reduced nitrogen emissions from non-agricultural sources should also assist in reducing the nitrogen loading in the Park. For the Denver metro area and the north Front Range counties taken together, the Ozone Action Plan projects 20% fewer NOx emissions in the year 2012 compared to the year 2002 due to federal controls for new motor vehicles. No additional strategies specifically targeting ozone are recommended, unless ozone precursor emissions growth or ozone concentration trends exceed current projections.

Regional Haze and Visibility

Colorado is required to adopt a regional haze State Implementation Plan (SIP) and submit it to the EPA by January 2008. The Division has begun to develop a regional haze plan under 40 CFR 51.308 of the federal regulations. This plan will be developed during 2005 and 2006 to meet the requirement for improved visibility at RMNP by the year 2018 and to achieve natural visibility conditions by the year 2064. The emission reductions necessary to meet the 2018 visibility requirements (approximately 1.71 deciviews of improvement at RMNP) could also assist in reducing the nitrogen emissions in the region affecting the park. It is unclear at this time what reductions in SOx, NOx, or other pollutants the State will need to make to reach the 2018 visibility improvement goal. The Western Regional Air Partnership (WRAP) is currently assisting states with technical analysis to determine what emission reduction strategies are necessary.

As with measures to control ozone, NOx reductions to meet the regional haze requirements must not increase ozone formation to the extent that it interferes with attaining and maintaining the ozone standard. Nevertheless, NOx control measures adopted for regional haze improvement should also reduce nitrogen deposition. Once approved by EPA as part of the Colorado visibility SIP, these provisions would also be federally enforceable. Such measures would be expected to benefit urban visibility along the Front Range as well.

A provision in the regional haze rule called best available retrofit technology, or BART, is one mechanism to be considered by the State as it develops control strategies to deal with emissions from older, major stationary sources that may not be well controlled. This concept may be extended to minor sources if necessary to make reasonable progress in improving visibility.

The State's existing Phase I visibility protection program, which addresses visibility impairment that may be reasonably attributable to a single source or small groups of sources, contains a provision that has the potential to reduce some portion of NOx emissions affecting the park. This provision allows the NPS (or any affected federal land manager of a Class I area) to identify a source or sources to the State that it believes may be causing or contributing to adverse visibility impacts on RMNP. The State would then have to conduct an assessment to determine the contributions from such source(s) and the effectiveness of emission controls to remedy the identified impairment. This course of action remains available to the NPS but would likely have limited effectiveness in dealing with the larger issue of area-wide emissions.

Nitrogen Deposition

There are presently two specific areas of authority that allow the State of Colorado to regulate sources of NOx for the benefit or purpose of reducing the deposition of nitrogen in RMNP.

Nitrogen Dioxide Increments

The first area of authority is the nitrogen dioxide (NO_2) increment that is part of the federal Prevention of Significant Deterioration (PSD) requirements found in 40 CFR 51.166(c). The purpose of the PSD program of the Clean Air Act is to ensure that air quality in clean air areas remains below the levels of the NAAQS. The primary mechanism created by Congress to meet this goal is the establishment of "PSD increments." These increments define the maximum allowable increases over baseline concentrations that are allowed in a clean air area for a particular pollutant. Any increase above this level indicates that significant deterioration of air quality has occurred.

Congress has designated all national wilderness areas which exceed 5,000 acres in size, and all national parks which exceed 6,000 acres in size (such as Rocky Mountain National Park), as mandatory Class I areas. Class I areas are to receive special protection from degradation of air quality, and the most stringent PSD increments apply in these areas. The current PSD nitrogen dioxide (NO_2) Class I increment is 2.5 ug/m^3 on an annual average. New major industrial sources individually, or all sources (major, minor, area, mobile) collectively, can cause the increment to be exceeded.

EPA has approved the State's PSD SIP, and the State of Colorado has the primary responsibility to implement and enforce the PSD program. The EPA maintains an oversight role of approved state PSD programs.

A study is underway to determine whether the NO_2 increment has been exceeded in RMNP or in the area of emission sources affecting the Park. If the study demonstrates that the NO_2 increment has been exceeded, the State will be required to develop a plan that reduces NOx emissions and brings NO_2 levels down below the increment. Such a plan would assist in reducing nitrogen deposition in RMNP. If the NO_2 increment is not exceeded, then this mechanism would not be useful in its present form to cause any reductions of NOx in the area. The NO_2 analysis should be completed by mid-2005 and will also be useful in determining the potential benefits of alternative NOx increment strategies.

In addition, the adequacy of the Class I NO_2 increment, originally set in 1988, has been called into question by a lawsuit. EPA has proposed three options to meet the objectives of the PSD program for NOx:

Traditional Increment Approach:

Allow new or modified sources near clean areas to expand provided their emissions do not exceed the level of the current annual NO_2 increment.

Regional Cap-and-Trade Program:

In this type of approach, a limited number of nitrogen and/or NOx emission allowances would be made available to sources of emissions in a "region". By buying or selling allowances, sources can determine the degree to which they must control their emissions. A source that finds emission controls to be particularly expensive can buy allowances, in essence, arranging to have another source take over some of its control burden.

State Planning Approach:

States would develop programs for protecting and enhancing air quality in areas that attain the NAAQS, including national parks and wilderness areas.

EPA will issue a final rulemaking by September 30, 2005.

Colorado Air Quality Related Values Protection Requirements

The second area of authority is protection for air quality-related values (AQRV) in State law. The AQRV law is intended to "fill a gap" in protection of Class I areas in Colorado.

When a major new or modified source seeks a permit under the PSD program, the source must analyze the potential impact on "non-visibility AQRVs" in nearby Class I areas. If the Federal Land Manager (FLM) determines that the impact would be adverse and demonstrates this to the satisfaction of the State, the permit is denied.

This protection applies only when a permit is sought. However, if the FLM believes there is an existing non-visibility AQRV problem in its Class I area due to existing air pollution sources, there is no specific process provided in federal law to address the allegation and remedy it if appropriate. The State AQRV law was intended to fill this gap as a State-only program and is the product of over two years of negotiations between the State, environmental groups, and industry.

The Colorado AQRV law sets out a process for an FLM to seek protection for non-visibility AQRVs. The FLM initiates the process by asserting significant impairment of AQRVs to the Governor and the Air Pollution Control Division. Baseline data and site-specific evidence of impairment must support the assertion. The Division informs the Commission, convenes a peer review panel and begins a consultation process, then reviews the assertion and supporting documentation to assess whether the FLM demonstrated a significant impairment.

If the Division concludes that the FLM demonstrated a significant impairment, the Division must perform attribution and apportionment studies, which must be subjected to peer review. The analysis must address stationary, natural and mobile sources and agriculture. Once completed, the Division uses the studies to identify sources both within and outside the state that significantly contribute to the impairment. Colorado law anticipates that funding for the studies will come from the sources or source categories from which a potential contribution to impairment is identified.

The Division must order stationary sources to develop and identify best available retrofit technology and other sources to identify reasonably available control measures. The Division must develop recommendations and control strategy options and report its findings to the Commission.

The Colorado AQRV law requires the Commission to conduct a rulemaking hearing. In order for further action to take place, the Commission would have to find that: a significant impairment exists; an identifiable source or category is responsible; best available retrofit technology exists for stationary sources [or reasonably available control measures for other sources] and control measures would make a significant improvement in the impairment. The Commission must also base its actions on a correlation of the reasonably expected extent of improvement from the sources or source category from the control strategies. The Commission then would order implementation within a reasonable time of practical and cost-effective control strategies that will provide reasonable progress toward remedying the impairment. Rather than be subject to a Commission order, responsible entities also may enter a voluntary process to reach an enforceable agreement with the State.

To date, the NPS has not filed an assertion of AQRV impairment in RMNP with the State of Colorado. While this option remains available, the cooperative process the NPS, EPA and the CDPHE have embarked on to address the multiple issues at the park is intended to provide a more holistic approach and one that is expected to be much less adversarial. The measure of success using this preferred cooperative process will be timely action by regulatory authorities to reduce emissions that cause or contribute to unacceptable air pollution effects on the park. If the collaborative effort should fail to ensure reasonable progress in addressing air quality problems at RMNP, the State's AQRV rule could still be used by NPS to initiate State action.

Improving Conditions at RMNP Through the Collaborative Process

The goal for RMNP is to stabilize and reverse the trends of higher ozone concentrations, deteriorating visibility, and increasing nitrogen deposition at the park. The collaborative process provides opportunities to solve environmental problems under authority already provided to the State. Local control and flexibility can result in cost-effective solutions to the serious air quality problems facing RMNP. The alternatives to this course of action are petition/certification processes, federal mandates and court decisions that may force the State into less desirable, less flexible, and potentially less effective approaches.

The collaborative process would be best facilitated through a memorandum of understanding between the NPS, the EPA and the CDPHE. The MOU would commit the three agencies to promptly address the technical and policy issues and to present recommendations to the Colorado AQCC that are designed to meet the ozone, visibility and nitrogen deposition goals outlined in this paper.

Establishment of a Standard or Goal for Nitrogen Deposition

Using the regional haze program as a model, it is recommended that a "sustainable conditions", "critical load" or "natural conditions" standard or goal with interim milestones be established for nitrogen deposition in RMNP. It is reasonable that the year 2018 serve as a milestone year, but not necessarily the first milestone year. This is because current nitrogen deposition is more than 20 times the estimated background levels, and an immediate reduction of nitrogen deposition is critical to stopping the trend of increasing impacts and to begin mitigating the damage done to the park. The year 2012 would serve as a good first interim year as it is half way between the present and 2018, and 2012 is a milestone year in the Ozone Action Plan. A critical load or sustainable/natural conditions milestone year of 2032 is suggested.

One mechanism available that may help in determining a sustainable goal for nitrogen levels, and therefore the baseline necessary for controlling nitrogen deposition, is use of the water quality protection system established by the Colorado Water Quality Control Act. The Act authorizes the Colorado Water Quality Control Commission to assign water quality "classifications and standards," as well as water quality "designations" for water bodies in Colorado.

"Use classifications" identify the current and future uses for which a water body is to be protected. Water quality "standards" establish narrative or numerical restrictions on the acceptable quantity of pollutants in a water body that will be consistent with protecting its use classifications. The Commission classified the waters within the park for uses including aquatic life, recreation, water supply and agriculture. Numerical water quality standards have been adopted to protect water quality for the classified uses. The standards do not directly apply to terrestrial ecosystems or other values important to the mission of the Park. Providing coincidental benefits to those ecosystems and values is not the function of the Commission. Nevertheless, air pollutant deposition may impact water bodies and their associated uses either through direct deposition or through runoff. The same standards that provide protection for aquatic life may as a practical matter limit acceptable nitrogen levels for other ecosystems.

The water bodies within Rocky Mountain National Park are designated as Outstanding Waters. They must be maintained and protected at their existing quality. However, the traditional program implementing this protection regulates pollutants coming from point source dischargers. The headwaters in the Park are not impacted by significant point source discharges and are not likely to be within the foreseeable future. Thus, implementing the anti-degradation program for these Outstanding Waters presents untrodden ground. The State has no experience in interpreting or applying Outstanding Waters protections in these circumstances.

Colorado's water quality control mechanisms provide a firm basis for determining a minimum level of protection for water bodies within the Park. Measures necessary to protect water quality may also protect other Park values.

Need for Further Assessment of Emissions Sources

The emission inventories from the 2004 Ozone Action Plan show a significant reduction in mobile source NOx emissions (on-road and off-road) along the Front Range urban corridor due to new federal standards. These reductions fuel a 20% reduction in total NOx emissions from 2002 through 2012 in the Front Range region. However, emissions from electricity generation, area sources, and other stationary sources are increasing. Projections of NH_3 emission changes have not been performed at this time.

For 2002, the Front Range emissions inventory for NOx indicates that on-road mobile sources contribute 35% of NOx emissions at 178 tons per day. Off-road mobile sources contribute 21% of NOx emissions at 105 tons per day, electricity generation contributes 16% of NOx emissions at 82 tons per day, other stationary sources (including industrial engines) contribute 19% of NOx emissions at 96 tons per day, and other area sources contribute 6% of NOx emissions at 30 tons per day.

Significant NOx emission reductions of approximately 110 tons per day are anticipated from on- and off-road mobile sources by 2012 and beyond due to federal controls, even with ever-increasing growth along the Front Range urban corridor. Industrial engine emissions will be reduced by about 12 tons per day by 2012 due to ozone-related control measures. NOx emissions from area sources, electricity generation and other stationary sources are anticipated to increase by 16 tons per day by 2012. Again, NH_3 emission trends from agriculture have not been determined.

Additional analysis is needed to better determine the sources of nitrogen that is transported and deposited in RMNP. The modeling workgroup is working towards determining the sources of the nitrogen (source types and locations), and their work will help identify the benefits of emission reductions already in place and that are anticipated to occur over the next 10 years, and which additional sources should be controlled. One area that requires further inventory and projection work is agriculture's NH_3 emissions. Front Range NH_3 emissions are currently estimated to be about 90 tons per day, which is comparable to the Front Range electricity generation NOx emissions of approximately 82 tons per day. Current inventories for animal husbandry will undergo revision during 2005, and work must be devoted to determine emissions from the application of ammonium nitrate fertilizers, which is presently unknown and will undoubtedly increase NH_3 emission estimates. The need for further assessment of sources and emission inventories, however, should not inhibit the evaluation of NOx and NH_3 control measures and reductions from regional sources (i.e., the most likely contributors to nitrogen deposition at the park).

Additional Options for Making Progress on Air Quality Issues

It is noted that for this discussion of additional options for improving air quality at RMNP, Colorado law prohibits incorporation of provisions that are more stringent than required by federal law into the state implementation plan. Historically, broad state air quality programs have been adopted to satisfy broad federal requirements. For instance, many of the measures that may alleviate nitrogen deposition in RMNP are already parts of programs for other specific purposes, and State law would not forbid inclusion in the state implementation plan of measures that provide collateral benefits such as reduction of deposition in the park. To the extent that federal law does not require nitrogen deposition remedies, the Commission has authority to adopt programs exclusively under state authority. Those programs for nitrogen deposition, or additional programs for ozone and regional haze that go beyond what is federally required, would be enforceable only under Colorado law and would not be subject to enforcement under the Clean Air Act by the federal Environmental Protection Agency or by citizens.

NOx/NH_3 Emissions Cap and Trade Program

A geographically weighted NOx and NH_3 cap and trade program may be the most palatable and attractive approach available for controlling the growth in, and/or obtaining reductions of, NOx and NH_3 emissions. The concept of capping emissions at present levels and then incrementally reducing the cap over the next 20 years to achieve the RMNP goals of improved visibility and reduced nitrification and ozone levels should be considered. All sources of nitrogen emissions should be considered for inclusion into the program and consideration given to geographically weighting emissions reduction caps based on the relative importance of source areas affecting the park's air quality. A cap and trade program would provide Colorado sources with the flexibility to achieve NOx and NH_3 reductions through controls or by purchasing allowances under the program, allowing market forces to drive the effort. This could be a State-only program allowing more flexibility while avoiding the "more stringent than" federal SIP restrictions. If adopted as a major component of either the State's regional haze or ozone SIPs, then trading would become federally enforceable.

New Source Review (NSR) for Major Sources

For major sources in Colorado, a permitting program similar to the nonattainment NSR program could be implemented. For new and modified sources with NOx emissions greater than 100 tons per year, the requirements would include lowest achievable emission rate control technology and offsets of the remaining emissions to control emissions growth from the source. This would help control the growth in NOx emissions. The State has the authority to adopt such a program as long as it does not become part of the federal SIP.

Minor Source Controls

The largest and fastest growing category of NOx emissions is minor sources that, for the most part, are uncontrolled. Significant, growing emission categories include the minor source power generation and the oil and gas exploration industries. The surrounding States of Wyoming, Utah, and New Mexico have minor source Best Available Control Technology (BACT) requirements, and a Colorado program could be modeled after these State's programs.

Agriculture Emission Controls

Depending on analysis results assessing the contribution of emission sources to the park's air quality and nitrogen deposition, it may be important for the State to seek emission reductions from agricultural practices and activities. There are numerous best management practices (BMPs) that could be implemented in the agricultural sector and, at a minimum, the State should work with agriculture sources towards implementing BMPs as widely as possible.

Statewide Oil and Gas Industry Controls

Exploration for natural gas is increasing in Colorado and throughout the West. VOC and NOx emissions from the oil and gas industry are increasing and are relatively uncontrolled in Colorado due to their minor source status. VOC controls can be modeled after the Denver Ozone Action Plan and applied throughout the State. NOx controls for engines are readily available and should be adopted Statewide. This could also be part of a larger minor source BACT program discussed above.

Power Generation NOx Emissions Reductions

The electricity generation sector is a contributor of NOx emissions within and outside the State, and all projections point to growth in sources and emissions. In order to deal with the increase, Colorado may need to consider means of reducing NOx emissions from existing and new sources using best available controls. These controls could include selective catalytic reduction (SCR) on all new sources and low-NOx burners or SCR on existing sources of electricity. Power sector NOx emissions growth can also be offset by utilization of renewable energy resources, primarily wind, in the next few decades.

Voluntary Reductions

Voluntary measures to reduce the emission of air pollutants are always encouraged, and voluntary VOC and NOx reductions from large and small sources would assist in reducing ozone and nitrogen deposition as well as improving visibility. Slowing down

the projected growth in emissions through energy efficiency, alternative sources, and renewable energy would also be beneficial.

Pollution Prevention (P2)

P2 efforts fit under the voluntary emission reduction category and have some potential for positively affecting the air quality issues at RMNP. P2 is viewed by industry as a positive means for achieving environmental benefits while retaining the flexibility of a non-regulatory program. Incentives for encouraging P2 should be explored. Both P2 and voluntary reduction measures would be useful elements of a comprehensive control strategy in making progress to protect air quality, but neither program would likely be effective as stand-alone strategies.

Media and Public Outreach/Education

The public has a great interest in the health of RMNP. The education of the public and the media about the air quality issues facing the Park will help build support for potentially costly control programs. The development of an outreach effort is recommended.

NOx Reduction Emphasis in the Development of the Regional Haze SIP

The State's regional haze SIP, which will be developed during 2005-2007, must show reasonable progress towards meeting the national visibility goal of natural conditions by the year 2064. The first milestone for achieving progress towards this goal is the year 2018. The degree of additional emission reductions needed from Colorado's sources is not yet known, but it is assumed that some level of reduction in visibility-impairing emissions must be achieved.

Visibility in RMNP and all 12 Colorado mandatory Class I areas must improve by 2018, and the AQCC has the authority under State law to adopt the controls necessary to make it so. As with ozone, the State cannot include in the SIP controls more stringent than federal requirements. The State could go beyond what is federally required if the measures are adopted and enforceable only under state law.

Various control scenarios will be fully scoped out during the next two years with consideration of the control options identified in this paper to meet the regional haze needs of the State. Emphasis on NOx reductions, such as a NOx cap-and-trade program, to meet the visibility requirements would achieve the co-benefits of reduced nitrogen deposition and ozone formation. RMNP should also benefit from visibility controls implemented in other states under the regional haze program.

NOx Reductions and Ozone

When considering NOx reductions to benefit RMNP, care has to be taken to ensure that ozone levels do not increase in other locations along the Front Range. This is because certain urbanized areas are "VOC limited", which means that reductions in NOx can increase ozone due to the complex interactions between NOx, VOCs and ozone formation. Although hot-spots of high ozone are a concern from a regulatory perspective (i.e., attainment of the ozone NAAQS), lower emissions of NOx should have overall regional benefits to diminish ozone formation, regional haze, and deposition.

Implications and Consequences of Failure to Make Gains Through the Collaborative Process

The following actions could be initiated at any time if progress in addressing the air quality issues at RMNP is too slow or otherwise ineffective to show promise. These approaches are extremely rigid, time and resource intensive, and often adversarial. In addition, some of them would only be partially effective at addressing the multiple issues at RMNP.

Under the PSD program, the NPS or other parties may seek a determination by EPA that the Colorado SIP is substantially inadequate to prevent significant deterioration or that an applicable increment is being violated. Part of the consideration in resolving such an assertion would be to "preserve, protect, and enhance the air quality in national parks, national wilderness areas" and other areas of special value. If EPA made the determination, it could require that the State revise its SIP to address the problem. In addition, a FLM or any other party could request that the AQCC take action to provide remedies on its own initiative. Such a petition to EPA could result in a SIP revision to address the problem; the SIP revision could include minor/area/mobile source controls, BART for existing sources, and/or limits on new permits for all sources if needed.

The NPS can also make a finding of adverse impact on a PSD permit decision, make a finding that a particular source can be reasonably attributed to a visibility impact at RMNP or invoke the State's AQRV rule to seek protection for non-visibility AQRVs.

The organization *Environmental Defense* has filed a petition with the Department of the Interior (DOI) demanding the protection of air quality and ecosystem resources in RMNP. This petition requests that the DOI "call for the U.S. EPA and the State of Colorado to fulfill their legal responsibilities to lower NOx and NH_3 to protect human health, plants and ecosystems, and scenic vistas at Rocky Mountain National Park and to fully mitigate nitrogen deposition above the identified critical load." Specifically, the petition requests: (1) that DOI declare that air quality-related values at RMNP are adversely impacted; (2) that DOI establish a critical load standard for nitrogen deposition; and (3) that DOI call on Colorado and EPA for further action. Environmental

Defense requests that DOI call on the State and EPA take action to lower NO_x and ammonia and fully mitigate nitrogen deposition above the critical load.

Though this petition does not require immediate DOI, EPA or State action, it serves notice that further legal actions may be forthcoming. Those actions could lead to coercive, rather than collaborative, approaches to nitrogen deposition at RMNP. If legal actions are successful, prescriptive court mandates could reduce the flexibility afforded to the State by the collaborative process recommended in this paper.

Attachment 1

8-Hour Ozone Data for Rocky Mountain National Park

4th Maximum Concentrations at RMNP

2001 8-hr. O3 4th Max. Value (ppm)	2002 8-hr. O3 4th Max. Value (ppm)	2003 8-hr. O3 4th Max. Value (ppm)	2004 8-hr. O3 4th Max. Value (ppm)	2001-2003 3-yr. Avg. 4th Max. Value (ppm)	2002-2004 3-yr. Avg. 4th Max. Value (ppm)
0.070	0.087	0.087	0.073	0.081	0.082

Exceedances of Federal Health-Based Ozone Standard in RMNP

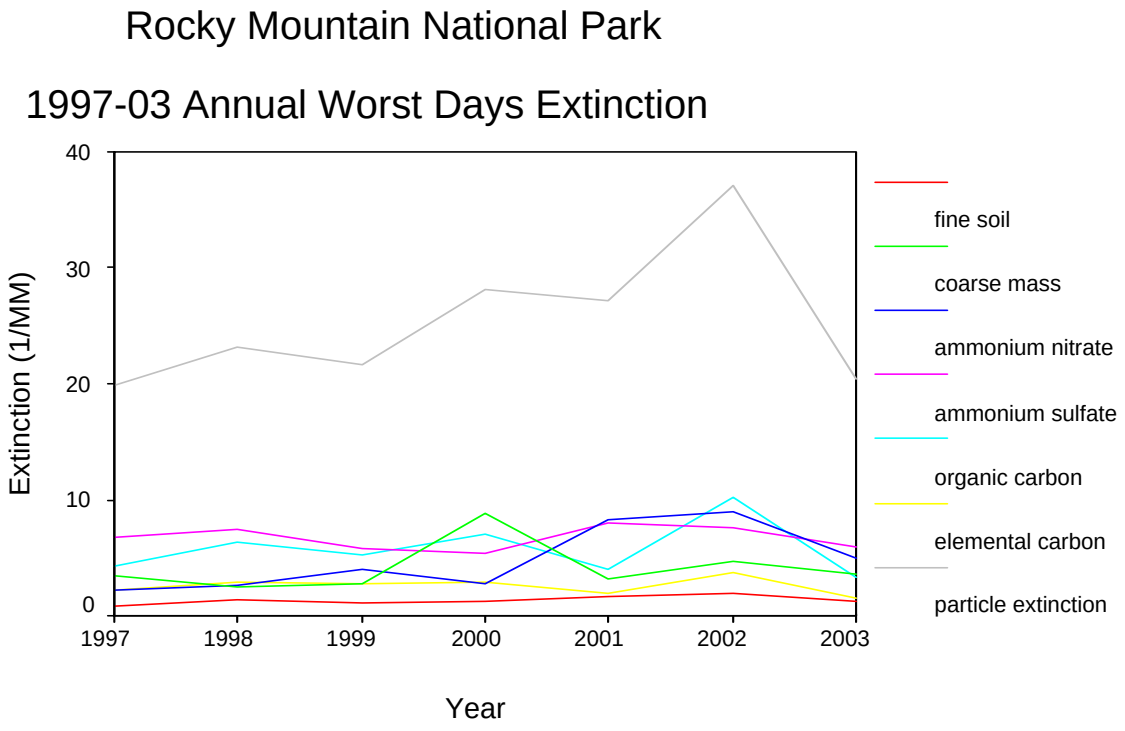
Year	Number of Exceedances	Maximum 8-hr Concentration (ppb)	4th Highest 8-hr Concentration (ppb)
2004	0	77	73
2003	7	92	87
2002	6	92	87
2001	0	80	70
2000	2	90	78
1999	1	85	73
1998	3	88	80

* An exceedance of the ozone NAAQS occurs when the maximum daily 8-hour average concentration is greater than 84 ppb.

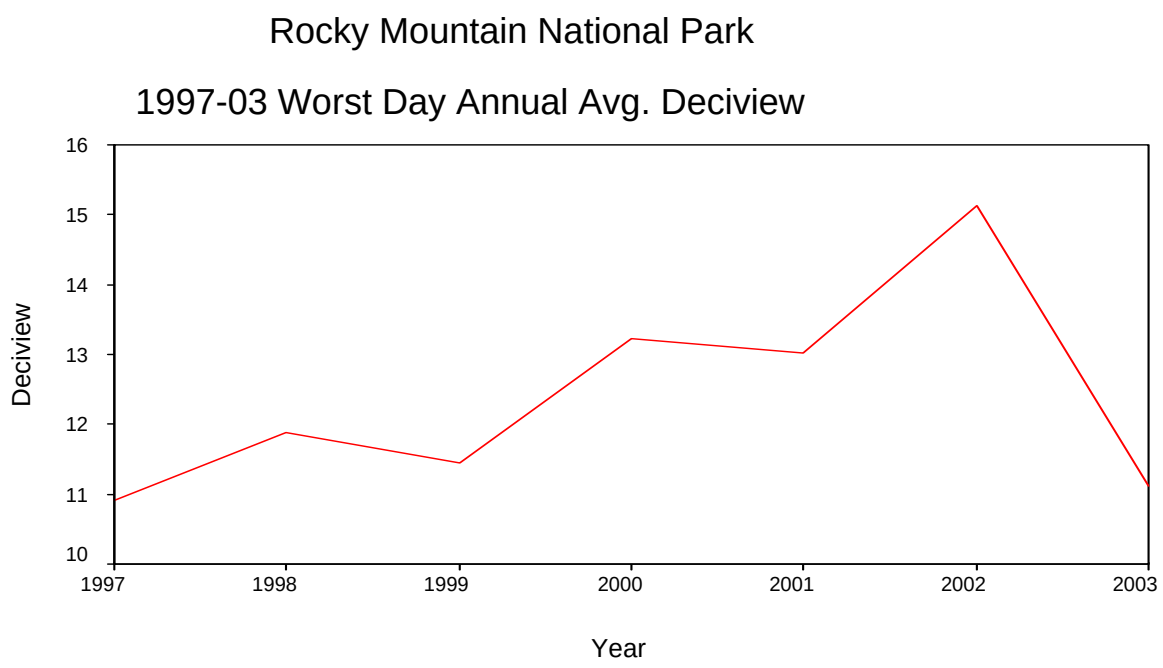
Attachment 2

Visibility Information for Rocky Mountain National Park

The decline in visibility on the 20% worst days may be associated with increases in drought related haze components such as dust, and it may be that the worsening visibility is linked to wildfires and wind events caused by the drought. In addition to direct impacts from the drought, fewer precipitation events equate to less of a potential for natural removal mechanisms (i.e., rain and snow storms) scrubbing particles out of the air. Though the worsening visibility may be due to the sustained and extensive drought in the western United States, human sources of emissions also play a large role in the visibility problems at RMNP. Ammonium nitrate concentrations, which are not dependent on drought conditions, seem to be trending upward.



Note: Data for 2003 is for the 1st six months of the year only.



	1997-2001 Monitored Visibility Data Worst 20% Days (deciviews)	**2018 *Preliminary* Reasonable Progress Visibility Target Values Worst 20% Days (deciviews)**	**Difference between 1997-2001 observed and *Preliminary* 2018 Reasonable Progress Estimates (deciviews)**
Rocky Mountain National Park	**13.40**	**11.69**	**-1.71**

Note: The visibility monitoring data for the period 2000-2004, not 1997-2001 as presented above, will be used determine reasonable progress for RMNP in the SIP.

Attachment 3

Colorado AQRV Protection Requirements (Statute)

25-7-1001. Legislative declaration.

In order to establish a fair, practical, and cost-effective process for evaluating and, where appropriate, responding to assertions that air quality related values within Colorado's class I federal areas are being significantly and adversely affected by air pollution, such as air pollution that is causing biological harm, the general assembly hereby institutes the procedures set forth in this part 10.

25-7-1002. Air quality related values program.

(1) In addition to maintaining a program that complies with the requirements of the federal act for prevention and remediation of significant deterioration of visibility in class I federal areas, the commission, in consultation with the general assembly, the governor, and affected federal, state, and local governmental entities, shall maintain a state-retained authority program in conformance with section 25-7-105.1 for non-visibility air quality related values, referred to in this part 10 as the "program".

(2) The commission shall develop a program under which, except for grant funds secured from other sources, the federal government undertakes the responsibility for the funding of air quality related value baseline data collection and the verification studies needed to substantiate an assertion of significant impairment, and the commission is encouraged to conduct the activities specified in this part 10 in coordination with interested state and local governmental entities and affected citizens and businesses.

25-7-1003. Definitions.

As used in this part 10:

(1) "Air quality related value (AQRV)" means a feature or property of a class I federal area other than visibility that the state of Colorado finds may be affected by air pollution. General categories of air quality related values include odor, flora, fauna, soil, water, geologic features, and cultural resources.

(2) "Air quality related value baseline data" means research data based on site-specific measurements and samplings of air quality related values within a class I federal area needed to substantiate a determination of whether or not a particular observation is within the range of naturally occurring changes or fluctuations.

(3) "Best available retrofit technology" means a control strategy for addressing emissions of a stationary source developed on a case-by-case basis after taking into consideration the costs of compliance, the energy and non-air quality environmental impacts of compliance, any existing pollution control technology in use at the source, the remaining useful life of the source, and the degree of improvement in the air quality related value that may reasonably be anticipated to result from the use of such technology.

(4) "Peer review" means a review of scientific or technical information by a balanced objective panel of experienced scientists qualified to review the subject matter involved in verifying the existence of or attributing the cause of an AQRV impairment.

(5) "Reasonably available control measure" means a control strategy for addressing emissions of a non-stationary source developed on a case-by-case basis after taking into consideration the options available to achieve emission reductions that a particular source or source category is capable of meeting as appropriate to an air quality related value if such steps may be feasibly and practicably taken considering technical and economic constraints.

(6) "Significant impairment of an air quality related value" means a measurable change in an air quality related value that is outside the probability of natural variability, that is caused by human activities, and that is causing a significant adverse effect to flora, fauna, soil, geologic features, cultural resources, or a beneficial use of water recognized under Colorado law.

25-7-1004. Administration of the program by the division.

(1) In administering the program, the division shall:

(a) Conduct or oversee program activities and scientific studies and determine an appropriate scope, sequence, and timetable for such studies and activities;

(b) Subject assertions by a federal land manager of air quality related value impairment in a class I federal area and studies concerning source attribution and source apportionment to peer review;

(c) Utilize the study design and data collection and analytical techniques set forth in section 25-7-211 that are relevant and appropriate to the activity or study;

(d) Assure that studies proceed as expeditiously as sound science will allow in order to minimize any delay in the process.

(2) As necessary or appropriate, the division may:

(a) Enter into memoranda of understanding for participation in the studies and activities required by this part 10;

(b) Create cooperative public-private partnerships with various entities; and

(c) Perform any other appropriate activity to carry out the intent of the program.

(3) The division shall not be required to pay the cost of any studies that are discretionary as set forth in this part 10 other than as set forth in this section. If the division determines that an air quality related value of a class I federal area has the potential to be significantly threatened by air pollution, or is being impacted by air pollution, then the division shall apply for grants or act as a catalyst to secure financial support from available funding sources in federal, state, or local governments and private entities, to identify the threat by funding the necessary air quality related value baseline data collection, or to assist in remedying the threat by funding necessary attribution or apportionment studies. The division is also authorized to act as a catalyst to secure financial support from other sources for such studies. The results of such studies and data collection shall be made available to the appropriate federal land manager and interested members of the public to assist in the management of these scenic resources and to cooperate in any needed air quality related values assessments.

25-7-1005. Verification of federal land manager's assertion of air quality related value impairment.

(1) The federal land manager of a class I federal area may initiate the procedures of this part 10 by submitting to the governor and division an assertion of significant impairment of an air quality related value, referred to in this part 10 as an "assertion". To be adequate to support a verification of impairment, the assertion shall be supported by sufficient air quality related value baseline data and site-specific evidence of impairment. The assertion may be supported in part by information that concerns other areas with a similar environment to the class I federal area asserted to be impaired, provided such information is relevant to the class I federal area asserted to be impaired and significant site-specific data is also available.

(2) Upon receipt of an assertion, the division shall initiate the following actions concurrently:

(a) Inform the commission at its next regularly scheduled monthly meeting of the receipt of an assertion, at which time the commission shall schedule the matter for a formal report from the division at the regular commission meeting that is scheduled to occur six months subsequent. All such informational briefings and formal reports on the subject shall be noticed on the published agenda of the commission.

(b) Within sixty days of receipt of the assertion, the division shall convene a peer review panel to review the assertion, its supporting documentation, including the adequacy of the baseline data and the adequacy of the site-specific and other evidence of impairment, and any other relevant information submitted to the division by the public. The requirement for peer review as specified in this paragraph (b) is waived with respect to any peer reviewer who has not submitted peer review comments within sixty days of the date on which the division certifies that the assertion, documentation, and other information has been transmitted to the individual peer reviewers.

(c) Convene a consultation process that is open to the public in order to apprise the public and potentially affected sources and source categories of all stages of the program and to solicit the scientific, technical, economic, and managerial views and assistance of the public and the potentially affected sources and source categories; and

(d) Initiate a review by division staff of the assertion and the supporting documentation submitted by the federal land manager to assess whether the federal land manager has demonstrated a significant impairment of an air quality related value in a class I federal area within Colorado.

(3) At the commission meeting required by paragraph (a) of subsection (2) of this section, the division shall report to the commission. The division's report shall include, but is not limited to, the conclusions of the peer review panel concerning verification of the assertion and the division's determination of whether the federal land manager has demonstrated a significant impairment of an air quality related value in a class I area within Colorado. If the division determines that the assertion has not been verified, it shall so notify the commission and the federal land manager of its findings and the fact that the proceedings authorized under this part 10 have been completed. If the division determines that the assertion has been verified, it shall proceed in accordance with the provisions of section 25-7-1006.

25-7-1006. Source attribution and control strategy development.

(1) If the division determines that the assertion has been verified, it shall:

(a) Compile a comprehensive inventory of the sources of the pollutants that are suspected to be causing the impairment;

(b) Subject the development, conduct, and results of the attribution and apportionment studies to appropriate peer review; and

(c) Perform attribution and apportionment studies to the extent feasible in order to develop for the division and the commission the identity and relative contribution of the significant contributors to air quality related value impairment, including, but not limited to, stationary sources, natural sources, wood smoke, agriculture, mining, roads, mobile source categories, and other area sources. The general assembly recognizes that the ability to attribute the cause of air pollution effects and apportion the air pollution effects among sources and source categories identified by attribution studies is an area of evolving science.

(2) (a) The funding of source attribution and apportionment studies shall be derived as provided in this subsection (2). Contributions to support the funding of such studies shall be requested from sources and source categories identified by the division as potentially contributing to the impairment.

(b) If a potential contribution to impairment is identified from federal lands or state lands, the division shall request a funding contribution for such studies from the appropriate federal or state land manager.

(c) If a potential contribution to impairment is identified from stationary sources or source categories, the division shall request a funding contribution for such studies from such sources or source categories.

(d) If a potential contribution to impairment is identified from mobile sources, the division shall seek an appropriation by the general assembly of excess funds in the AIR account in the highway users tax fund for funding contributions to such studies.

(e) The division shall annually report to the legislative council on the adequacy of funding derived pursuant to this subsection (2). If funding derived pursuant to this subsection (2) is inadequate, the legislative council may recommend that the general assembly appropriate funds from available sources for purposes of this section.

(3) Following its review and analysis of the reasonable attribution and source apportionment studies and the reports thereon from the members of the peer review panel, the division shall identify those sources and source categories within the state and region significantly contributing to air quality related value impairment.

(4) The division shall identify the sources and source categories significantly contributing to air quality related value impairment that are located outside the state and report this list to the commission, governor, and general assembly for their consideration in identifying options for remedying such impacts.

(5) The division shall issue an order to the sources and source categories significantly contributing to air quality related value impairment located within the state that have not made a voluntary enforceable commitment under section 25-7-1008.

(6) (a) An order issued pursuant to subsection (5) of this section shall require:

(I) Such sources and source categories to submit a report within a reasonable period of time;

(II) A stationary source to identify the best available retrofit technology; and

(III) Other sources and source categories to identify reasonably available control measures.

(b) After considering the responses to an order issued pursuant to subsection (5) of this section, the division shall issue a public report to the commission concerning its recommendations on air quality related value impairment, source attribution, source apportionment, and control strategy options.

25-7-1007. Commission to consider control strategies in rule-making proceeding.

(1) Upon receipt of a report under section 25-7-1006 (6) (b) from the division, and after the division has made the report available to all significant source or source categories identified pursuant to section 25-7-1006, the commission shall give notice that it is to conduct a rule-making hearing concerning the implementation of control strategies recommended in the report.

(2) In addition to other applicable rule-making provisions, the rule-making hearing shall be conducted:

(a) In reasonable proximity to the affected class I federal area;

(b) To allow sufficient time for comment and testimony by all interested persons; and

(c) To allow reasonable discovery pursuant to section 24-4-103 (13) and (14), C.R.S.

(3) (a) The commission shall order by rule implementation within a reasonable time of a practical and cost-effective control strategy or strategies that will provide reasonable progress toward remedying the impairment, if the commission finds that:

(I) The evidence in the record shows the existence of a significant impairment of an air quality related value in a class I federal area;

(II) An identifiable source or source category is responsible for significantly causing or contributing to the impairment;

(III) The best available retrofit technology exists for any such stationary source;

(IV) Reasonably available control measures exist for any such other sources or source categories;

(V) Implementation of the control strategies would make significant improvement in the impairment;

(VI) Taking into account that the ability to attribute the cause of air pollution effects and to apportion the air pollution effects among sources and source categories identified by attribution studies is an area of evolving science, a correlation of the extent of improvement in air quality related value impairment can reasonably be expected to result from imposition of a control strategy or strategies for each significant source or source category identified by the division.

(b) Within fourteen days after having received the division's report under section 25-7-1006 (6) (b), a source or source category may petition the commission, as part of its rule-making hearing conducted pursuant to this subsection (3), to make a determination that the benefits of phasing, segmenting, or excusing the control strategy or strategies outweigh the benefits of imposing the control strategy or strategies. In making such determination, the commission shall consider all economic and related costs associated with the implementation of the control strategy or strategies involving the source or source category. The burden of proof shall be on the petitioner.

25-7-1008. Voluntary agreements.

(1) The division may convene, at any appropriate time, an informal voluntary negotiation process, with appropriate public participation, to seek voluntary enforceable commitments from sources and source categories to achieve emissions reductions sufficient to make reasonable further progress in reducing any portion of the impairment.

(2) A voluntary enforceable commitment becomes enforceable through a commission rule, local ordinance or resolution, judicially enforceable consent decree, or division permit condition, as appropriate to the circumstances.

(3) If subsequent to January 15, 1996, a source or source category agrees to an enforceable commitment to adopt a control strategy that the division determines is as effective or is more effective than best available retrofit technology for stationary sources or reasonably available control measures for non-stationary sources, the division shall exempt that source or source category from the imposition of further controls pursuant to this part 10 for a period of ten years from the date established for achieving the emission reductions as specified in the voluntary enforceable agreement.

(4) If subsequent to January 15, 1996, and prior to January 15, 1998, a source or source category agrees to an enforceable commitment contained in a judicially enforceable consent decree to adopt a control strategy that the division determines provides both for reasonable progress toward the national visibility goal under 40 CFR Part 51, Subpart P and 5 CCR 1001-4 and for reasonable progress in reducing any present or future impairment of an air quality related value, the division shall exempt that source or source category from the imposition of further controls pursuant to this part 10 for a period of ten years from the date established for achieving the emission reductions as specified in the judicially enforceable consent decree. The provisions of section 25-7-133 shall not apply to that portion of an amendment to the visibility component of the state implementation plan that implements and enforces the control strategy covered by this subsection (4).

(5) If a source or source category agrees to an enforceable commitment to adopt a control strategy that the division determines is not as effective as best available retrofit technology for stationary sources or reasonably available control measures for non-stationary sources but that the division determines will assist in making reasonable further progress in reducing impairment of an air quality related value, the commission may, after public hearing, exempt that source or source category from the imposition of further controls pursuant to this part 10 with respect to those pollutants that the source or source category has agreed to control for a period of up to ten years from the date established for achieving the emission reductions as specified in the voluntary enforceable agreement.

(6) A source that, prior to June 1, 1996, has received a permit under the federal prevention of significant deterioration program, 42 U.S.C. secs. 7470 to 7479 or sections 25-7-201 to 25-7-210, and installed pollution control measures comparable to the best available control technology pursuant to that program shall not be required to install additional control measures pursuant to this part 10 for a period of ten years from June 1, 1996, but may be required to operate pollution control equipment to its maximum efficiency. This section shall not apply to any source that is not subject to compliance with the requirements of 42 U.S.C. sec. 7651 (f), which establishes schedules and emission limitations for the control of nitrogen oxide emissions from certain stationary sources. Nothing in this subsection (6) shall be construed to modify the terms of any permit applicable to such source or excuse compliance with respect to any other requirement under this article or the federal act. Except for the exemption for a period of ten years provided in this subsection (6), nothing in this subsection (6) shall excuse such sources from responding to reasonable requests by the division for information required to complete inventories and attribution and apportionment studies.

Attachment 4
NOx Emission Inventories
(tons per average summer day)

Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, Jefferson, Weld, Larimer, Morgan and Elbert Counties

Source Category	**2002 Base (tons/day)**	**2007 Base (tons/day)**	**2007 Control (tons/day)**	**2012 Control (tons/day)**
Flash	0.0	0.0	0.0	0.0
Gas Stations	0.1	0.1	0.1	0.1
Oil and Gas Production	0.2	0.2	0.2	0.2
Commercial/Institutional/ Industrial Sources (includes Engines)	44.1	48.7	30.3	32.2
Electric Generation	81.7	81.0	80.6	89.1
Other Stationary Sources	14.1	15.0	15.0	16.5
Total Point	**140.1**	**144.9**	**126.1**	**138.1**
Automotive After Market Products	0.0	0.0	0.0	0.0
Architectural Coatings	0.0	0.0	0.0	0.0
Household and Personal Products	0.0	0.0	0.0	0.0
Adhesives and Sealants	0.0	0.0	0.0	0.0
Ag. Pesticide Application	0.0	0.0	0.0	0.0
Other Area Sources	30.4	32.7	32.7	36.7
Total Area	**30.4**	**32.7**	**32.7**	**36.7**
Lawn & Garden	10.4	10.4	10.5	10.4
Other Off-road	94.2	82.1	82.8	74.1
Total Off-road	**104.6**	**92.4**	**93.3**	**84.6**
Total On-road Mobile	**177.6**	**136.6**	**136.3**	**90.1**
Total Anthropogenic	**452.7**	**406.6**	**388.4**	**349.4**
Total Biogenic	52.3	52.3	52.3	52.3
Total	**505.0**	**458.9**	**440.7**	**401.8**

(From 3/12/2004 Ozone Action Plan. Significant figures are used to show the small contributions from certain source categories and do not imply a level of accuracy.)

Attachment 5
VOC Emission Inventories
(tons per average summer day)

Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, Jefferson, Weld, Larimer, Morgan and Elbert Counties

Source Category	**2002 Base (tons/day)**	**2007 Base (tons/day)**	**2007 Control (tons/day)**	**2012 Control (tons/day)**
Flash	134.3	147.2	92.0	101.7
Gas Stations	24.5	17.5	16.3	11.3
Oil and Gas Production	4.2	4.6	3.7	4.2
Reciprocating Internal Combustion Engines	9.0	9.9	6.0	6.7
Other Stationary Sources	28.0	30.1	30.1	35.4
Total Point	**200.0**	**209.3**	**148.1**	**159.2**
Automotive After Market Products	30.0	32.1	32.1	34.9
Architectural Coatings	21.5	23.0	23.0	25.0
Household and Personal Products	18.8	20.1	20.1	21.9
Adhesives and Sealants	16.3	17.4	17.4	18.9
Pesticide Application	11.7	13.1	13.1	15.0
Other Area Sources	12.9	14.0	14.0	15.6
Total Area	**111.3**	**119.6**	**119.6**	**131.3**
Lawn & Garden	53.0	35.0	34.7	30.0
Other Off-road	31.9	27.6	27.9	26.2
Total Off-road	**84.9**	**62.6**	**62.6**	**56.2**
Total On-road Mobile	**172.6**	**135.1**	**126.0**	**89.0**
Total Anthropogenic	**568.8**	**526.6**	**456.4**	**435.7**
Total Biogenic	799.46	799.5	799.5	799.5
Total	**1368.3**	**1326.1**	**1255.8**	**1235.2**

(From 3/12/2004 Ozone Action Plan. Significant figures are used to show the small contributions from certain source categories and do not imply a level of accuracy.)

Attachment 6

YEAR 2002 COLORADO STATE-WIDE NH3 EMISSIONS (TONS PER YEAR)

AREA AND NON ROAD SOURCES

Pollutant	Source Type	Source Category	State TOTAL
NH3	Waste Disposal, Treatment, and Recovery	Public Owned	1,932.38
NH3	Stationary Source Fuel Combustion	Distillate Oil	21.75
NH3	Stationary Source Fuel Combustion	Natural Gas	16.80
NH3	Miscellaneous Area Sources	Managed Burning, Prescribed	13,580.15
NH3	Miscellaneous Area Sources	Fertilizer Application	8,021.33
NH3	Miscellaneous Area Sources	Forest Wildfires	4,297.90
NH3	Miscellaneous Area Sources	Animal Husbandry	56,712.58
NH3	NON ROAD SOURCES		51.99
NH3	**TOTAL**	**TOTAL**	**84,634.88**

Pollutant	Source Category		State TOTAL
NH3	**POINT SOURCES**		20.29

Pollutant	Source Category		State TOTAL
NH3	**HIGHWAY SOURCES**		4,403.41
Pollutant	Source Type	Source Category	State TOTAL
NH3	**GRAND TOTAL**	**GRAND TOTAL**	**89,058.58**

Note: This NH_3 inventory is the APCD's latest draft. Revised inventories using updated methodologies will be developed in 2005 for Colorado and the nation for use by 2006. Fertilizer application only includes the spreading of manure on farm fields. Significant figures are used to show the small contributions from certain source categories and do not imply a level of accuracy.

Attachment 7

YEAR 2002 COLORADO FRONT RANGE NH3 EMISSIONS (TONS PER YEAR)

AREA AND NON ROAD SOURCES

Pollutant	Source Type	Source Category	Front Range	Adams	Arapahoe	Boulder	Broomfield	Denver	Douglas	El Paso	Jefferson	Larimer	Morgan	Pueblo	Weld
NH3	Waste Disposal, Treatment, and Recovery	P.O. Water Treatment	1,584.62	160.41	218.74	119.72	17.51	240.30	90.52	233.19	228.00	113.46	11.88	62.98	87.91
NH3	Stationary Source Fuel Combustion	Distillate Oil	17.47	1.27	2.75	1.33		6.05	0.07	1.96	2.03	0.81	0.12	0.54	0.54
NH3	Stationary Source Fuel Combustion	Natural Gas	13.12	0.55	2.08	0.82		6.73	0.03	1.10	0.92	0.38	0.05	0.23	0.23
NH3	Miscellaneous Area Sources	Forest Wildfires	573.08	15.41	25.37	34.45		3.17	37.23	84.68	34.24	107.68	21.16	113.52	96.19
NH3	Miscellaneous Area Sources	Fertilizer Application	1,901.55	398.85	164.76	38.26		0.15	5.09	9.82	1.27	100.88	243.48	49.49	889.50
NH3	Miscellaneous Area Sources	Man. Burn., Prescribed	8.68	0.22	0.37	0.52		0.03	0.57	1.27	0.49	1.65	0.33	1.75	1.48
NH3	Miscellaneous Area Sources	Animal Husbandry	24,211.52	572.08	70.99	114.01		863.19	134.29	483.68	110.3	1520.74	5028.44	437.04	14,876.77
NH3	NON ROAD SOURCES		34.61	3.61	5.18	3.06		5.91	2.88	3.89	3.77	2.37	0.58	0.94	2.40
NH3	**TOTAL**	**TOTAL**	**28,344.64**	**1,152.40**	**490.25**	**312.17**	**17.51**	**1,125.52**	**270.68**	**819.58**	**381.02**	**1,847.98**	**5,306.04**	**666.49**	**15,955.02**

Pollutant	Source Category		Front Range TOTAL	Adams	Arapahoe	Boulder	Broomfield	Denver	Douglas	El Paso	Jefferson	Larimer	Morgan	Pueblo	Weld
NH3	**POINT SOURCES**		17.78	4.48		0.21		4.79		2.69		0.38	0.60	1.03	3.61

Pollutant	Source Category		Front Range TOTAL	Adams	Arapahoe	Boulder	Broomfield	Denver	Douglas	El Paso	Jefferson	Larimer	Morgan	Pueblo	Weld
NH3	**HIGHWAY SOURCES**		3,277.61	362.24	407.31	208.23	47.24	555.42	190.39	429.95	471.10	219.23	37.25	131.93	217.30

Pollutant	Source Type	Source Category	Front Range TOTAL	Adams	Arapahoe	Boulder	Broomfield	Denver	Douglas	El Paso	Jefferson	Larimer	Morgan	Pueblo	Weld
NH3	**GRAND TOTAL**	**GRAND TOTAL**	**31,640.03**	**1,519.11**	**897.57**	**520.61**	**64.74**	**1,685.74**	**461.06**	**1,252.22**	**852.12**	**2,067.59**	**5,343.89**	**799.46**	**16,175.93**

Note: This NH_3 inventory is the APCD's latest draft. Revised inventories using updated methodologies will be developed in 2005 for Colorado and the nation for use by 2006. Fertilizer application only includes the spreading of manure on farm fields. Significant figures are used to show the small contributions from certain source categories and do not imply a level of accuracy.

Attachment 8

YEAR 2002 COLORADO STATE-WIDE NOX EMISSIONS (TONS PER YEAR)

AREA AND NON ROAD SOURCES

Pollutant	Source Category	State TOTAL
NOX	Aircraft	2,152.25
NOX	Forest & Structure Fires	20,500.93
NOX	Fuel Combustion	8,771.07
NOX	Non-Road	34,622.94
NOX	Prescribed Fire	11,606.96
NOX	Railroads	13,647.23
NOX	Woodburning	916.09
NOX	**TOTAL**	**92,217.47**

Pollutant	Source Category	State TOTAL
NOX	**POINT SOURCES**	**117,593.96**

Pollutant	Source Category	State TOTAL
NOX	**HIGHWAY SOURCES**	**120,479.43**

Pollutant	Source Category	State TOTAL
	Biogenics	**40,080.78**

Pollutant	Source Type	State TOTAL
NOX	**GRAND TOTAL**	**370,371.63**

From APCD's Emission Inventory System. Significant figures are used to show the small contributions from certain source categories and do not imply a level of accuracy.

Attachment 9

YEAR 2002 COLORADO FRONT RANGE NOX EMISSIONS (TONS PER YEAR)

AREA AND NON ROAD SOURCES

Source Category	Front Range TOTAL	Adams	Arapahoe	Boulder	Broomfield	Denver	Douglas	El Paso	Jefferson	Larimer	Morgan	Pueblo	Weld
Aircraft	2,037.11	1.20	6.17	2.20		1,881.40		136.53	2.06	1.39	0.07	3.73	2.36
Forest & Struct. Fires	2,735.26	73.68	121.74	163.16		15.93	177.82	404.63	163.34	513.92	100.94	541.62	458.48
Fuel Combustion	6,927.26	460.12	1,157.11	486.59	48.10	2,033.13	249.60	751.95	819.66	372.25	40.29	229.61	278.88
Non-Road	22,953.63	2,452.53	3,186.18	2,102.39	251.55	3,773.08	1,698.60	2,609.37	2,218.46	1,505.29	484.31	636.33	2,035.54
Prescribed Fire	66.73			0.35				3.83	1.68	58.65		0.94	1.28
Railroads	6,918.00	999.46	408.71	340.89	75.69	244.23	497.07	775.19	309.83	71.03	1,009.56	816.76	1,369.59
Woodburning	534.97	17.89	17.76	19.48	2.22	29.54	11.50	279.70	44.62	34.56	5.71	49.90	22.10
TOTAL	**42,172.97**	**4,004.88**	**4,897.67**	**3,115.07**	**377.55**	**7,977.30**	**2,634.59**	**4,961.19**	**3,559.66**	**2,557.09**	**1,640.87**	**2,278.89**	**4,168.22**

Source Category	Front Range TOTAL	Adams	Arapahoe	Boulder	Broomfield	Denver	Douglas	El Paso	Jefferson	Larimer	Morgan	Pueblo	Weld
POINT SOURCES	**65,385.24**	**13,014.14**	**746.26**	**4,804.59**	**14.05**	**5,789.22**	**75.04**	**8,640.73**	**2,742.38**	**4,373.67**	**6,479.39**	**9,918.11**	**8,787.66**

Source Category	Front Range TOTAL	Adams	Arapahoe	Boulder	Broomfield	Denver	Douglas	El Paso	Jefferson	Larimer	Morgan	Pueblo	Weld
HIGHWAY SOURCES	**84,311.57**	**8,829.38**	**10,022.15**	**5,484.91**	**1,255.09**	**13,021.49**	**5,414.49**	**10,917.27**	**11,823.85**	**5,968.62**	**1,221.61**	**3,715.70**	**6,637.03**

Source Category	Front Range TOTAL	Adams	Arapahoe	Boulder	Broomfield	Denver	Douglas	El Paso	Jefferson	Larimer	Morgan	Pueblo	Weld
Biogenics	**9,141.52**	**1,032.90**	**801.90**	**265.40**	**10.75**	**433.42**	**228.74**	**929.75**	**92.88**	**731.02**	**1,493.33**	**595.85**	**2,525.58**

Source Type	Front Range TOTAL	Adams	Arapahoe	Boulder	Broomfield	Denver	Douglas	El Paso	Jefferson	Larimer	Morgan	Pueblo	Weld
GRAND TOTAL	**201,011.31**	**26,881.30**	**16,467.98**	**13,669.97**	**1,657.43**	**27,221.43**	**8,352.86**	**25,448.94**	**18,218.75**	**13,630.40**	**10,835.20**	**16,508.55**	**22,118.49**

From APCD's Emission Inventory System. Significant figures are used to show the small contributions from certain source categories and do not imply a level of accuracy.