

Columbia River Gorge Air Quality Project

Work Plan Addendum



July 25, 2003

Developing a Regional Air Quality Strategy for the Columbia River Gorge National Scenic Area

Note: This addendum contains proposed revisions to the scientific study program and project timing as originally described in the 2001 project Work Plan. It augments and in some cases supercedes the 2001 Work Plan.

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Thank You

To all who participated in the work plan redesign effort, and those who contributed to the original 2001 project work plan.

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The Technical Team wishes to express its gratitude to those local and national experts in air science who contributed to the technical study plan.

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Preface

July 15, 2003

The Columbia River Gorge is an area of astounding beauty and diversity, and it is home to over 70,000 residents of Oregon and Washington. The National Scenic Area Act of 1986 lays out a unique challenge. Namely, to protect and enhance the scenic, natural, cultural, and recreational resources of this National Scenic Area while at the same time supporting the local economies so vital to the area's future prosperity. Meeting these two goals is not always an easy task.

Achieving these goals will require us to look both locally and regionally at sources influencing air quality in the Gorge, and to develop an air quality strategy that closely involves stakeholders and the public. Our first step was to develop the 2001 Gorge Air Quality Project Work Plan. It provided our first "road map" of how we would approach developing an equitable air quality strategy. The unfortunate downturn in our national economy and recent reductions in state agency budgets for both Washington and Oregon require us to revise our approach to this work.

Our mission is still to develop an equitable air quality strategy for the Gorge that is consistent with both the resource and economic objectives of the National Scenic Area Act. The Gorge air quality study will focus primarily on haze (visibility) in the Scenic Area, and on those pollution sources that degrade the scenic vistas of the Gorge. Those air pollutants that degrade visibility and scenic resources can also degrade the natural, recreational, and cultural resources of the Scenic area. By working to improve visibility in the Gorge; we will both directly and indirectly benefit all the valued resources to be protected under the Scenic Area Act.

This 2003 Work Plan Addendum continues to lay out a process for increasing our scientific understanding of air quality in the Gorge and for engaging the public in the development of a regional air quality strategy. Ultimately, the Columbia Gorge Air Quality Advisory Committee will lead a public process to design an air quality strategy that helps protect valued resources in the Gorge and meets the dual purposes of the Scenic Area Act. The Columbia Gorge Commission will be asked to decide if the strategy developed through this collaborative process meets the objectives of the Gorge Management Plan and the National Scenic Area Act.

With your help, decision-makers will develop an air quality strategy based on sound science that reflects a truly collaborative approach to making decisions about the future of air quality in the Gorge.

Thank You.

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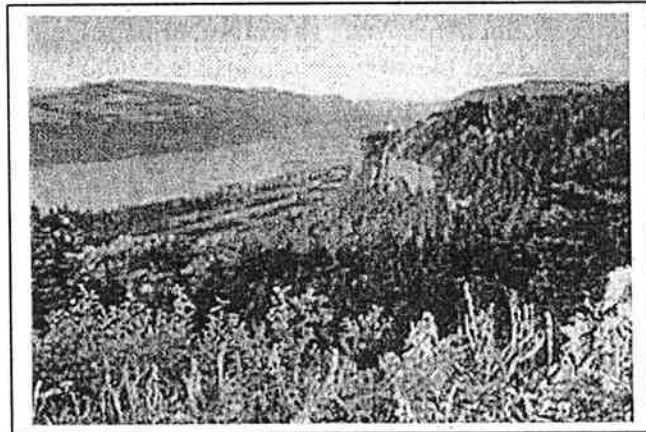
Columbia River Gorge Air Quality Project Redesign - 2003

Section I. Background

National Scenic Area Act

The Columbia River Gorge is our nation's only National Scenic Area. The 292,500 acre Columbia River Gorge National Scenic Area (NSA) was created by act of Congress in 1986 (PL92-663, 1986). The purposes of the Act are to—

1. establish a national scenic area to protect and provide for the enhancement of the scenic, cultural, recreational, and natural resources of the Columbia River Gorge; and
2. protect and support the economy of the Columbia River Gorge area by encouraging growth to occur in existing urban areas and by allowing future economic development in a manner that is consistent with paragraph (1).



Scenic Area Management

Plan: Protecting Air Quality and Valued Gorge Resources.

Preserving and enhancing air quality is an integral part of protecting the scenic, cultural, natural, and recreational resources in the Gorge. In May 2000, the Columbia River Gorge Commission approved an air quality amendment to the National Scenic Area Management Plan that states:

“Air quality shall be protected and enhanced, consistent with the purposes of the Scenic Area Act. The States of Oregon and Washington shall: (1) continue to monitor air pollution and visibility levels in the Gorge; (2) conduct an analysis of monitoring and emissions data to identify all sources, both inside and outside the Scenic Area that significantly contribute to air pollution. Based on this analysis, the States shall develop and implement a regional air quality strategy to carry out the purposes of the Scenic Area Act, with the U.S. Forest Service, the Southwest Air Pollution Control Authority [now the Southwest Clean Air Agency] and in consultation with affected stakeholders.¹

¹ Management Plan amendment language adopted by the Columbia River Gorge Commission on May 9, 2000. SMA Natural Resources Policy 12[pages I-123]

The Gorge Commission adopted the air quality language as regional policy because air quality monitoring indicates some threat to scenic, natural, cultural, and recreational resources in the Scenic Area. In adopting this policy, the Gorge Commission recognized that while a Class I² designation is not appropriate for the Gorge; air quality degradation can jeopardize those resources that must be protected under the National Scenic Area Act. An air quality strategy for the Gorge is therefore an important part of the Commission's overall effort to achieve the purposes of the Scenic Area Act.

The Gorge Commission has responsibility under the Scenic Area Management Plan to protect the valued Gorge resources that may be threatened by air quality degradation. It is recognized however, that the Commission itself does not have expertise in air quality issues, and that they will rely on the state air quality agencies to develop an air quality strategy for the Scenic Area.

The state air quality agencies will develop the air quality strategy through a collaborative public process. As the regional policy-making body for the Scenic Area, the Gorge Commission must also ensure that any proposed air quality strategy meets the purposes of the Scenic Area Act. Therefore, in its review of the strategy, the Gorge Commission must find that the strategy is consistent with the purposes of the Scenic Area Act.

Resource Protection

The Lead Agencies' approach to studying and protecting air quality in the Gorge will focus chiefly on visibility and the emission sources that contribute to haze in the Scenic Area. Focusing on visibility improvement in the Gorge will both directly and indirectly benefit all the valued resources to be protected under the Scenic Area Act. The main visibility impairing pollutants include sulfates, nitrates, organic and elemental carbon, and fine soil. These air pollutants not only impair visibility and degrade scenic resources in the Gorge, but can also degrade the natural, recreational, and cultural resources of the Scenic Area. These pollutants are created by a wide variety of sources (primarily combustion sources) both inside and outside the Scenic Area. An air quality strategy that reduces these pollutants will improve visibility and thereby protect air quality and other resources in the Gorge.

It should be noted that the scope and funding for this project do not allow for a comprehensive and exhaustive evaluation of all possible air pollution effects on scenic, cultural, natural, and recreational resources. For example, this study will not evaluate air pollution impacts on the full range of possible ecosystem issues, including Columbia River fisheries and native plants. However, as stated above, the agencies expect that an air quality strategy that addresses visibility and haze will also benefit broader ecosystem issues in the Gorge. In addition, there are several other air quality efforts underway, not directly associated with this project that should provide an air quality benefit to the Gorge. These include the Portland-Vancouver ozone maintenance plan, as well as state and federal programs to reduce hazardous air pollutants.

² A "Class-I" designation is used to identify federal wilderness areas and National Parks for visibility protection.

Cultural Resources-Native American Rock Art in the Gorge

Two key visibility impairing pollutants (sulfates and nitrates), are especially significant in the formation of acid rain and fog that may damage cultural resources, primarily Native American rock art, and natural resources (including culturally significant plants). Given the special historic and cultural value of Native American rock art in the Gorge, the Forest Service has funded an independent special study (\$54,000) to sample and analyze fog and cloud water chemistry as a first step in a process for assessing potential risks to culturally significant artifacts and ecosystems in the Scenic Area.

The fog-water study will not provide a definitive assessment of the risk to rock-art or cultural resources. It is a first step, and the results can help inform decision-makers as to the next steps that could be taken to evaluate this issue. This study element is described further in the Addendum document and **Appendix A: Technical Study Plan**.

Section II: Work Plan Development: 2001 and 2003 (Scope, Progress, Funding, and Changes)

The first step for Oregon and Washington air quality agencies was to develop a Work Plan describing the scientific and public policy processes to be used in developing the Gorge air quality strategy. The Lead Agencies (Oregon Dept. of Environmental Quality, Washington Dept. of Ecology, and Southwest Clean Air Agency) began work on the Work Plan in late 2000; and after a lengthy public process, the Work Plan was presented to the Gorge Commission in August 2001.

Revised Work Plan

Good progress was made on the project in 2001-2002. The Lead Agencies began the selection of members for the project's bi-state Air Quality Advisory Committee, and funding was sought to begin the first phase of the Gorge air quality study.

In March 2002, the Lead Agencies, together with a coalition of project partners, asked the U.S. Congress for an appropriation of \$1.2 million dollars to support the first phase of a multi-million dollar scientific study of Gorge air quality. Congress has provided \$670,000 for that purpose.

In the last two years, national and state economic realities have changed drastically, and budget reductions have seriously reduced the availability of funding for many projects. As a result, the air quality agencies believe that significant additional funding for the Gorge project is not likely to be available in a reasonable timeframe. Therefore, the scientific study initially outlined in the 2001 work plan is being redesigned. A new study approach has been developed that will provide an initial assessment of Gorge air quality within 2-3 years. The new study takes advantage of opportunities for leveraging other technical work on the regional and national level that did not exist at the time the 2001 Work Plan was developed. Even if the current economic realities did not exist, leveraging other studies is good financial stewardship. In redesigning the study, the Lead Agencies gave the following charge to the project's technical work group:

Develop a "stand alone" study, leveraging other studies and within the available resources, that would:

a) provide an assessment of the causes of visibility impairment in the Columbia River Gorge National Scenic Area; b) identify emission source regions, emission source categories, and individual emission sources significantly contributing to visibility impairment in the Gorge; c) provide predictive modeling tools or methods that will allow the evaluation of emission reduction strategies; d) provide an initial assessment of air quality benefits to the Gorge from upcoming state and federal air quality programs; and e) refine or adapt predictive modeling tools already being developed for visibility or other air quality programs, including but not limited to Regional Haze.

Advisory Committee

State resources for supporting the Advisory Committee have also been severely curtailed. The bi-state Advisory Committee initially planned for 2003 must now be delayed until the redesigned air quality study is completed (about 2-3 years). The Lead Agencies hope to have adequate resources available in the 2005-06 timeframe to support the Advisory Committee effort. At that time, if resources are still not available for Committee support, the Lead Agencies will evaluate other options for proceeding.

Project Mission

It is important to note that the project's essential mission and scope has not changed. It is still to develop an equitable air quality strategy for the Gorge that is consistent with both the resource and economic objectives of the National Scenic Area Act. This includes evaluating emission sources from both inside and outside the Scenic Area to ensure geographic fairness.

This 2003 Addendum to the Work Plan has been developed over several months primarily by the Lead Agencies, in consultation with elected officials, stakeholder groups, tribes, and the public. The Lead Agencies hosted three public/stakeholder information sessions and requested comment on the Redesigned Technical Study. Public, stakeholder and tribal comment have been incorporated into the redesigned study plan to the greatest extent possible.

Washington State Visibility Disinvestment

Over the last four years, the state of Washington has dealt with a series of budgetary crises demanding ever-increasing resource reductions. The latest state budget forecasts predict additional significant state budgetary shortfalls for the FY 2003/05 biennium. These anticipated shortfalls necessitate elimination of various ongoing state programs including disinvestment from the state-wide visibility protection program of which the Columbia Gorge NSA Air Quality Study is a part.

This disinvestment means that, effective July 1, 2003, Ecology will no longer be able to participate as one of the Lead Agencies in the Gorge Air Quality study. Specifically, Ecology will not chair the Study's Technical/Re-design Team, operate Gorge study air quality monitoring sites, provide modelers/meteorologists and other experts for technical analysis, serve as a repository for Gorge data, provide quality control/quality assurance functions or continue to manage and participate in federal Gorge grants and related contract activities.

Many of these functions, including Ecology's participation in the management and oversight of the Gorge Air Quality Project will become the responsibilities of either the SW Clean Air Agency, Oregon Department of Environmental Quality, or others.

Key Elements Addressed in the Revised Work Plan:

As in the original Work Plan, the product of this 2003 Addendum will not be a recommended air quality strategy. The Addendum describes the process for gaining scientific knowledge about Gorge air quality, and the process to be used in making decisions about the future of air quality in the Gorge.

This Work Plan Addendum describes the revised technical study that will begin identifying emission sources, both inside and outside the Scenic Area, that significantly contribute to air pollution in the Gorge. The technical study will provide information about the physical, chemical, and cause-and-effect relationships influencing air quality and will help decision-makers make more informed choices about the future of air quality in the Gorge. This Work Plan also recognizes the role of economic analysis in developing air quality strategies. Economic and air quality analysis are used together to weigh important cost/benefit questions and develop a recommended air quality strategy that meets the dual purposes of the Scenic Area Act.

The Work Plan Addendum outlines a collaborative, public process for developing the air quality strategy. The Lead Agencies intend to convene a bi-state, Air Quality Advisory Committee to lead the strategy development process. The Committee will reflect a broad representation of interests in and around the Gorge. This decision-making process will also rely heavily on input from the public, Gorge-area tribes, and stakeholder groups.

Study Kick-Off

The air quality study's monitoring program is scheduled to begin this winter (2003/04), with subsequent study tasks conducted through approximately 2005/06. The start of the winter monitoring program is contingent on the timely availability of EPA funding and the ability to operationally deploy the monitoring equipment in the field. If logistics delay the winter 2003/04 sampling schedule, then the monitoring program will begin with the summer monitoring study scheduled for the summer of 2004. The winter monitoring program would then be conducted in the winter of 2004/05. This flexible schedule will provide initial study results to the Advisory Committee in the planned 2005-2006 timeframe.

Timing for Strategy Development and the Decision-Making Process.

Results from the upcoming technical study will be available beginning in 2-3 years (approx 2005-2006). The results will include an assessment of visibility in the Gorge and an initial identification of contributing emission sources, both inside and outside the Gorge. It will also provide some analysis tools for evaluating future air quality in the Gorge. The Advisory Committee will be convened just prior to the completion of the monitoring study so that it can begin to review initial results. Committee meetings will be open to the public. As final study results become available, the Committee will lead a public process to evaluate results and discuss options for an air quality strategy.

While the technical study proceeds, voluntary pollution prevention initiatives could be pursued. The Lead Agencies are currently working on voluntary initiatives to reduce emissions from several diesel vehicle fleets that travel in the Gorge. Unfortunately, the Lead Agencies do not have the resources at this time to lead an effort to explore additional pollution prevention opportunities.

Section III: Air Quality in The Columbia River Gorge

What We Know Now

Monitoring of visibility, air quality, and ecosystem conditions has been ongoing in the Scenic Area since 1993. Visibility has been monitored at two sites, one near the west end (Mt. Zion-since 1996), and another near the east end (Wishram-since 1993). Monitoring of ozone and acid deposition (through lichen sampling) has also occurred since 1993. We have much more to learn about air quality and its cause and effect relationships: such as understanding the complex meteorology, the physical and chemical processes, and the major source types and source regions that affect the Scenic Area.

The following are some highlights of what we know so far.

Visibility in the west end of the Scenic Area

Very small particles of sulfate in the air are the most significant contributors to visibility impairment, followed by organic carbon and nitrate. On average, visibility is worse in the summer and early fall and better in the winter, excluding natural causes such as rain, clouds, and fog. Poor summer visibility can be mostly attributed to significantly high sulfate levels. Visibility on average is worse in the west end than the east end. Much of this difference is due to the fact that the types of pollutants present in the west end, such as sulfate particles, are more efficient at impairing visibility under the higher relative humidity found there. Geographic source regions of pollutant-laden air reaching the west end in summer are generally the industrialized and populated areas west of the Cascades from Vancouver B.C. southward to Eugene, internal sources, and in rare instances, pollutant impacts from as far away as Asia have been identified.

Visibility in the east end of the Scenic Area

Very small particles of sulfate are a significant source of visibility impairment, but are not as large a contributor to impairment as in the west end. Organic carbon and nitrate are also significant contributors to impairment. On average, visibility is worse in the late fall and winter and better in the summer, excluding natural causes such as rain, clouds, and fog. This is the opposite of observed conditions at the west end of the NSA. Poor winter visibility levels can mostly be attributed to a relative increase in nitrate. Visibility on average is better in the eastern Gorge than the west end largely because of lower relative humidity.

Over the last ten years, pollutant concentrations in the Portland/Vancouver airshed have either remained about the same (e.g. ozone) or have decreased (e.g. nitrogen oxides, fine particulate, and carbon monoxide), even with the area's growth. This trend is likely to continue because of new air quality programs (regulations) currently being implemented. These programs are discussed later.

Although we have not identified specific sources that contribute to visibility impairment in the Scenic Area, we do know the types of sources on a regional basis that emit pollutants that have the *potential* to impair visibility. These are:

- Sulfate – from combustion of fuels containing sulfur, such as coal-fired power plants, and any form of diesel fuel and oil fired combustion.
- Nitrate – from any high temperature fuel combustion, mostly motor vehicles, also industrial boilers.
- Organic carbon – from wood burning, motor vehicles, industrial processes, restaurants, and natural sources.
- Elemental carbon – soot from wood burning and diesel engines.
- Soil – windblown dust, road dust, agricultural and construction activities.

Emission inventories of these pollutants are being completed and refined in each state. These inventories will support the initial air quality study, and later, the development of air quality strategy options. Emission inventories are being refined as part of both national programs and as part of this project. The Advisory Committee will review periodic emission inventory updates as they become available.

From the monitoring and analysis of lichen species in the Scenic Area, we know that air pollution is likely causing some level of ecosystem disturbance. Lichen species that are sensitive to sulfur pollution are largely absent in the Scenic Area and those that thrive in high nitrogen polluted conditions are abundant. This is an indicator of unnatural environmental conditions for the NSA ecosystem.

Ozone (smog) in the eastern portion of the Scenic Area has been measured at levels that are known to harm vegetation.

Meteorology and climate

The meteorology and climatic conditions in the Scenic Area and surrounding source regions are in general terms well known. However, the specific structure of the horizontal and vertical winds, associated turbulent air motions, moisture, and temperatures has not been well studied or documented. Regional and local wind patterns determine the transport and dispersion of air pollutants, while the moisture fields affect gas-to-particle conversion, particle growth, and deposition. A better understanding of these processes is important for the computer modeling simulations that would be used to identify sources and their relative contribution to air quality in the Scenic Area.

What We Don't Know:

There is much we have yet to learn about the physical and chemical process of air pollution within the Scenic Area. The topography, meteorological conditions, emission sources, and chemical transformations in and around the Scenic Area are very complex. A better understanding of these processes is necessary in order to evaluate cause-and-effect relationships between emissions and air pollution in the Gorge. Some of the key questions that need further study include better defining the contribution of emission sources from areas west and east of the Scenic Area, as well as, the contribution from sources within the Gorge. Further study is needed on the potential for ecosystem disturbance (i.e. ozone or other air pollutant impacts on trees, vegetation, and crops). Additional study is also needed on potential risks to cultural artifacts, such as Native American rock art that can be degraded by acidic aerosols.

Meteorology and other factors influencing chemical transformation within the Gorge must be better understood. It is important to better understand seasonal changes in air pollution, and to better identify the key geographic areas in the region that significantly contribute to air pollution in the Gorge. It is also necessary to better define and understand the characteristics of sulfates, nitrates, ammonia, organic and elemental carbon in the formation of visibility impairing pollutants, and the impacts from ground-level ozone within the Gorge.

Section IV: Redesign of Air Quality Study (2003)

Original 2001 Technical Study Plan

In July of 2001, The Columbia River Gorge Technical Team (Technical Team) and Interagency Coordination Team (Coordination Team), with the assistance of national and global experts in air quality science, developed a phased technical study plan for the Columbia River Gorge National Scenic Area (See "Columbia River Gorge Visibility and Air Quality Study – Working Draft: Existing Knowledge and Recommended Scientific Assessment to Consider", June 2001, Green et al). That study plan was submitted to the Columbia River Gorge Commission and approved in August of 2001.

Initial Study Approach in 2001

The initial study approach began with a Technical Foundation Study (TFS) that would begin to characterize the physical, meteorological and chemical processes governing air quality in the Scenic Area, and the development of an initial conceptual model of causes of haze and other air quality issues. The TFS was not designed to support the development of air quality strategies, but rather to guide the development of the study's second phase.

The second phase of the study was to be designed based upon what we learned in the TFS. Results of the Technical Foundation Study were to be used to verify the conceptual model of air quality, to identify contributing pollution sources and source areas, and to support the final development, testing, validation and selection of an air quality predictive model to be used later for strategy development.

The original TFS was estimated to cost about \$1.8 million dollars. The second phase of the technical study program was initially estimated to cost between \$3 and \$8 million dollars. The states had previously received approximately \$600,000 for initial study work, and requested that Congress provide \$1.2 million dollars to fully fund the TFS. Congress has provided an appropriation of \$670,000. It should also be noted that when the \$670,000 congressional appropriation is combined with previous funding, a total of \$1,358,000 will have been devoted to studying air quality in the Scenic Area.

Redesigned Study (2003)

Significant progress has been made over the past several years in developing air quality data and analysis tools that can provide information about visibility in the Gorge. Many of these advancements were not available in 2001 when the initial study was conceived. They can now be used in designing the new air quality study.

Given that progress, the reduced appropriation from Congress, and the scarcity of significant additional funding, the Lead Agencies directed staff to redesign the Gorge air quality study; combining elements from both phases of the initial approach into a single core study that can begin to inform decision-makers about sources of air pollution influencing visibility in the Scenic Area.

The following is a list of what the Redesigned Study, will and will not accomplish. The new study design also allows for add-on study elements that can be conducted later (if needed and as funding is available) to clarify specific questions. **A more detailed description of the redesigned air quality study is provided in Appendix A.**

The Redesigned Study Will Provide:

- 1) Additional measurement data to support the development of a conceptual understanding of the causes of haze in the Gorge; (CoHaGo);

- 2) Additional measurement data to evaluate the predictive numerical model's ability to mimic and predict haze in the Scenic Area;
- 3) Additional certainty about what we know and what we do not know as a result of the CoHaGo assessment and the predictive, numerical modeling activities;
- 4) An assessment of what we know today (based on previous and planned additional measurements) and present this information in one clearly organized document;
- 5) Refine, adapt and select a predictive numerical model specifically for assessing haze conditions in the Scenic Area;
- 6) Modeled results for a base case; (Presumably 2004) based on two, 6-week intensives that will characterize the worst-case seasons of the year;
- 7) Predictive numerical model results for a future year (presumably 2018) to determine what trend, if any, is apparent for haze in the Scenic Area that can be attributed to the implementation of new state and federal programs;
- 8) Leveraging of current knowledge and studies;
- 9) A new data set from which future studies can leverage;
- 10) Additional measurement data that will help us understand historic trends and support models to predict future trends from either existing or new state and federal programs not yet implemented;
- 11) Enhanced knowledge and understanding of the complex processes that lead to the formation of haze in the Scenic Area so that informed management decisions can be made regarding any needed future measurement and modeling tasks; and
- 12) A better understanding of emission regions, categories and possible individual sources located both inside and outside the Scenic Area, that contribute to haze.
- 13) A Forest Service study to sample and analyze fog and cloud water chemistry as a first step in a process for assessing potential risks to culturally significant artifacts and ecosystems in the Scenic Area;

The Redesigned Study Will Not Provide:

- 1) The complete suite of measurements that were envisioned under the original study plan;
- 2) The temporal (time) and spatial (space) resolutions that are necessary to achieve the same degree of confidence anticipated in the original study plan;

- 3) The fog-water study will not provide a definitive assessment of the risk to rock-art or cultural resources. It is a first step, and the results can help inform decision-makers as to the next steps that could be taken to evaluate this issue.
- 4) The generation of a complete set of meteorological data for the Scenic Area for use in validating the meteorological model. The Redesigned Study relies on the ability of the meteorological model (MM5) to accurately simulate wind fields with less data than would have been generated by the original study plan;
- 5) A full year of analysis via the predictive numerical model; instead, it will use two, seasonal intensive 6-week periods (summer and winter) that represent the two worst periods of the year; and
- 6) An assessment of the impacts or benefits from additional emission reduction strategies beyond those existing, but not yet fully implemented, state and federal programs.

Section V: Project Management Activities

The technical work plan will be managed by the Southwest Clean Air Agency (SWCAA). SWCAA will serve as the grant administrator for this study, and provide management oversight. SWCAA and Oregon DEQ will host meetings when necessary and will also make arrangements for meetings, as necessary, at remote locations including holding public meetings and updates as requested by the Gorge Commission.

Section VI: Project Reports

Reports will be provided for several of the activities described in the redesigned technical study plan. At a minimum, these will include:

- The Causes of Haze Assessment (CoHaGo) (prepared by contractor).
- Data reports on an annual or episode basis depending on the sampling method.
- Detailed modeling protocol document for CMAQ and PMCAMx (prepared by Technical Team).
- CMAQ modeling results for base year and out year and sensitivity analysis (prepared by contractor).
- PMCAMx modeling results for base year and out year and sensitivity analysis (prepared by contractor).
- Outside comment and peer review of each of the modeling analysis (prepared by contractors).
- Summary Report and Management Recommendations to Gorge Commission annually and at project end (prepared by Technical Team).

These reports will be available as portions of the study program conclude (2004-2006 timeframe).

Section VII: Decision-Making: Using the Study Results

The redesigned study will not be as comprehensive as the initial technical program outlined in 2001, and will not provide the same level of certainty. It will however, when combined with previous Gorge air quality studies, and parallel processes, provide a significant amount of information regarding the emission source regions, source categories, and (potentially) individual sources that significantly contribute to air quality degradation in the Gorge.

It is recognized that the redesigned technical study will not provide answers to all possible questions about air quality in the Gorge. Additional follow-up study may be needed to better answer specific questions. Nonetheless, the Lead Agencies believe the new study will allow decision-makers to:

1. Gain a good understanding of the physical and chemical processes that influence air quality in the Gorge.
2. Draw reasonable conclusions about many (but likely not all) emission source regions, categories, and individual sources affecting the Scenic Area.
3. Evaluate the air quality benefit that is expected from existing state and federal air quality programs.
4. Conduct a discussion among the Advisory Committee, elected officials, tribes, stakeholder groups, and the public as to whether any additional emission reduction measures (beyond those already anticipated) might be desired to further protect and improve Gorge air quality.

The study is designed to give the Advisory Committee and others sufficient information to begin their evaluation of Gorge air quality, and identify any additional study that may be needed.

Setting an Air Quality Goal

The first use of the redesigned technical study will be an evaluation of the air quality benefit to the Gorge expected from existing state and federal programs that will phase in over the next several years. **These programs are listed in Appendix B.** The Advisory Committee, elected officials, tribes, stakeholder groups and the public will evaluate the predicted benefit of these programs and discuss whether any additional emission reduction strategies are desired. Initial results of the redesigned study will become available in the 2005-2006 timeframe.

If additional air quality improvement is desired, the Advisory Committee will lead a public process to agree on an air quality goal for the Scenic Area and evaluate options for developing the most equitable and cost effective strategy for meeting that goal. Additional measures, if needed, could range from voluntary efforts to state or local requirements; and could phase-in under various timeframes. Significantly contributing emission sources that are clearly identified through the 2003-2005 study could be addressed at that time. Other sources that are suspected contributors to Gorge air quality

could be studied further, if necessary, and addressed after their contribution has been clarified.

Advisory Committee First Steps

Before evaluating study results, one of the Advisory Committee's first steps will be to develop a set of rules by which the Committee can operate effectively. This includes agreeing on a set of collaboration principles that will govern decision-making. The Committee must also go through a learning process to become familiar with the complex issues governing air quality and visibility. **Appendix C** includes a more detailed description of the proposed Advisory Committee structure, and the collaborative public process to be used in decision-making.

Coordinated Implementation

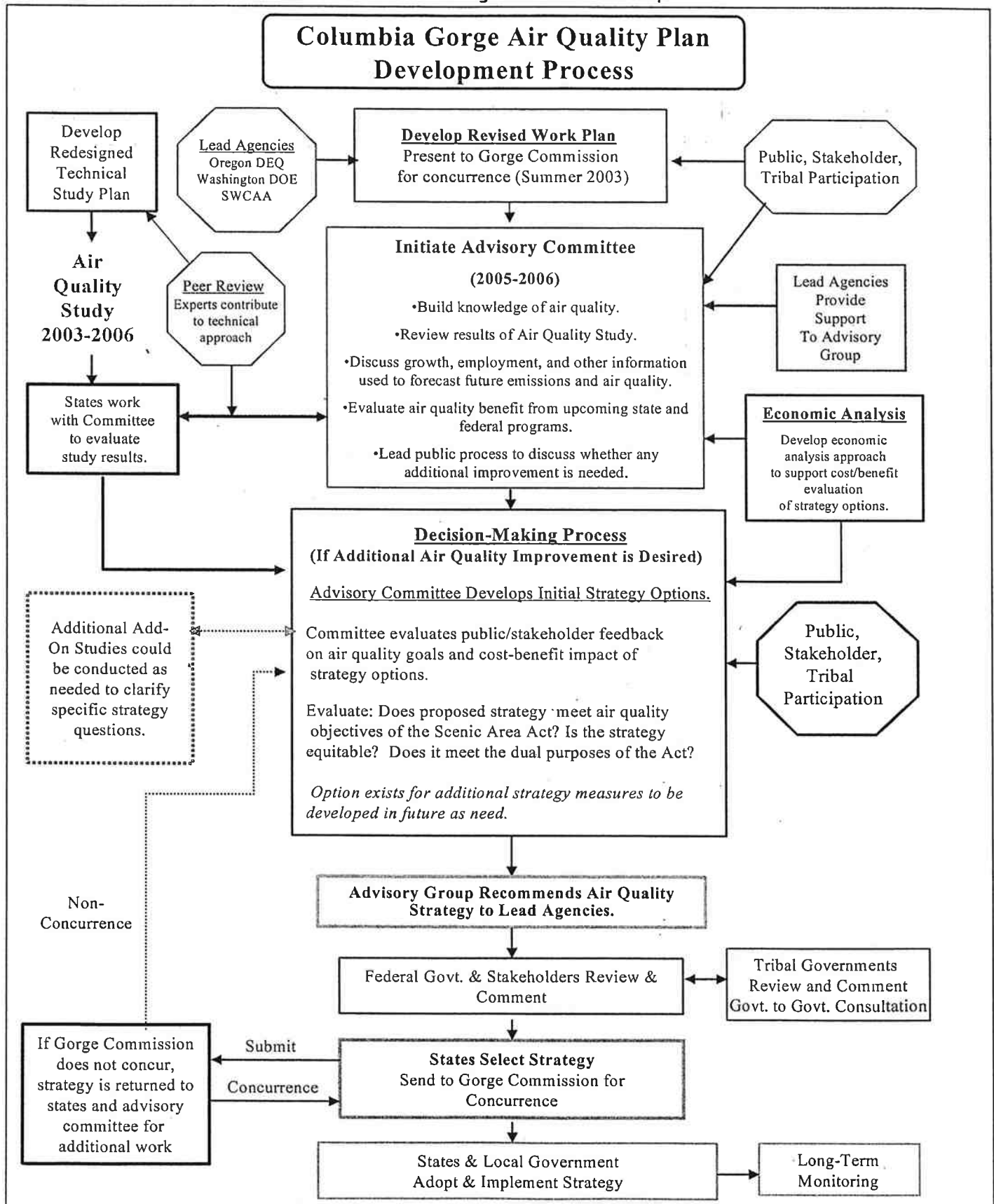
The states have experience in coordinating with various agencies and local governments to achieve concurrent adoption of an integrated, bi-state air quality plan. This means that emission reduction measures, whether they are for sources inside or outside the Scenic Area, could move forward toward adoption and implementation on the same schedule regardless of location. It would not be equitable to proceed with measures for the Scenic Area while needed measures affecting sources outside the Gorge fail to move forward. The Advisory Committee will however have the flexibility to develop a strategy using a phased approach, adopting and implementing some measures early, and others at a later date as needed. The Committee will carefully consider questions of geographic fairness when developing a comprehensive strategy for the Scenic Area.

Each emission reduction strategy may have differing phase-in schedules depending on cost and complexity. For example, some measures such as local ordinances or improvements to the state's prescribed forestry smoke management plan could proceed rapidly. Other strategies could be phased in on a multi-year schedule due to cost and other factors. The final recommended air quality strategy will describe the various timelines for implementing individual emission reduction measures.

Continued Study of Gorge Air Quality

Monitoring and study of air quality in the Gorge will continue during and after implementation of the regional strategy. Air quality trends in the National Scenic Area (NSA) will be tracked to ensure that improvement is made as expected.

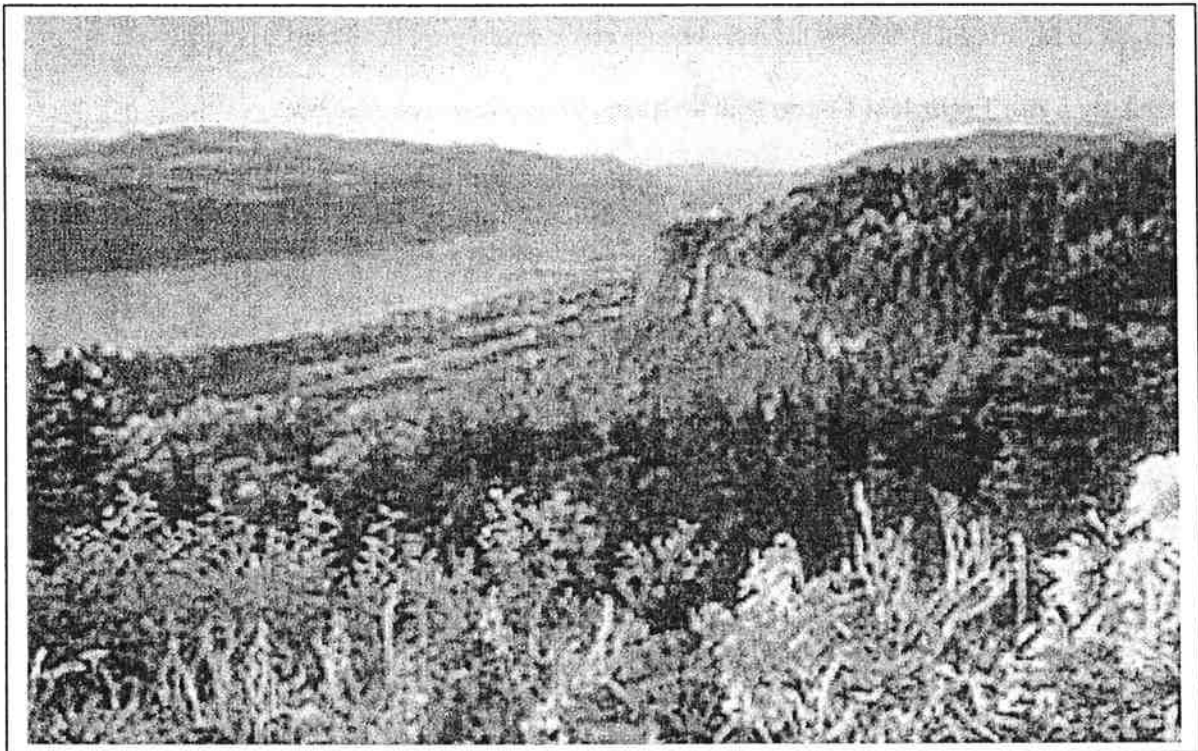
Overview of Project Relationships



Redesigned Air Quality Study Program

Redesigned Technical Study Plan Columbia River Gorge National Scenic Area Air Quality Study

~7/25/2003~



*Developing a Regional Air Quality Strategy for the
Columbia River Gorge National Scenic Area*

Executive Summary

In July of 2001, the Columbia River Gorge Technical Team and Interagency Coordination Team, with the assistance of national and global experts in air quality science, developed a phased, technical study plan for the Columbia River Gorge National Scenic Area. In 2003, WDOE, ODEQ and SWCAA asked the Technical Team to develop a “stand alone” study, leveraging other studies and within the available resources, that would:

a) provide an assessment of the causes of visibility impairment in the Columbia River Gorge National Scenic Area; b) identify emission source regions, emission source categories, and individual emission sources significantly contributing to visibility impairment in the Gorge; c) provide predictive modeling tools or methods that will allow the evaluation of emission reduction strategies; d) provide an initial assessment of air quality benefits to the Gorge from upcoming state and federal air quality programs; and e) refine or adapt predictive modeling tools already being developed, for visibility or other air quality programs, including but not limited to Regional Haze.

Some of the existing state and federal air quality programs from which emission reduction is expected include:

- 1) Ozone Strategies: Ozone plan updates for Portland/Vancouver and Seattle.
- 2) New Source Review: New or expanding major point sources must evaluate air quality impacts on Class I areas. Given the Gorge’s proximity to the adjacent Class I areas, the Gorge NSA will benefit indirectly from the New Source Review program.
- 3) National Programs: Nonroad Engines, including new standards for trains & marine vessels.
- 4) National Air Toxics Emission Standards: Maximum Achievable Control Technology Standards for some major point sources. (Air Toxics Rules).
- 5) Washington and Oregon Regional Haze Programs (State Implementation Plan -SIP): with control strategies, if needed, to reduce impacts to Class I areas (Mt. Adams, Mt Hood, etc.).
- 6) Washington’s RACT for the Trans Alta Centralia Coal Fired Power Plant with the full sulfur dioxide scrubbing came online December 31, 2002.
- 7) National programs affecting mobile emissions. (New tail pipe standards for vehicles and light duty trucks, low sulfur gasoline, low sulfur diesel fuel, heavy-duty diesel vehicle standards, non-road diesels).
- 8) Oregon and Washington Smoke Management Programs: Designed to reduce smoke impacts from prescribed forestry burning.
- 9) Washington’s Yakima Maintenance Plan status for Carbon Monoxide (CO) and Particulate Matter – Coarse Particles (PM₁₀) and Wallula’s non-attainment status for PM₁₀.

The Technical Team reviewed the original Study Plan and prioritized the measurement and modeling elements that would best meet the new charge with the available funding. The Technical Team recognized that not all the objectives identified under the original, phased approach would be reached with the same level of certainty. As a result, the Redesigned Study does not provide the complete suite of measurements that were originally envisioned, nor does it provide for the temporal and spatial resolutions necessary to achieve the same degree of confidence anticipated in the original Technical Foundation Study.

It does enhance, however, our knowledge and understanding of the complex processes that manifest themselves in the form of haze in the Scenic Area with sufficient confidence in the data and results

to make management decisions on future activities. The resulting Redesigned Study combines elements from both phases of the original (phased) study approach into a single core study that can begin to inform the Advisory Committee and decision-makers about sources of air pollution influencing visibility in the Scenic Area. The Redesigned Study will provide measurement data to support the understanding of Causes of Haze in the Gorge (CoHaGo) assessment and validation of the numerical chemical transport model. It will provide a better understanding of emission regions, categories and possible individual sources that contribute to haze, located both inside and outside the Scenic Area. It will also provide additional certainty about what we know and what we do not know as a result of the CoHaGo assessment and the predictive, numerical modeling activities, and present this information in one clearly organized document.

The scope of the Redesign Study's scientific study program is designed to focus primarily on visibility and the emission sources that contribute to haze in the Scenic Area. The main visibility impairing pollutants include sulfates, nitrates, organic and elemental carbon, and fine soil. These pollutants are created by a wide variety of sources both inside and outside the Scenic Area. These air pollutants that impair scenic vistas and degrade scenic resources in the Gorge can also degrade the natural, recreational, and cultural resources of the Scenic Area.

The scope and funding for this project does not allow for a comprehensive and exhaustive evaluation of all air pollution affects on scenic, cultural, natural, and recreational resources. For example, this study will not evaluate air pollution impacts on the full range of possible ecosystem issues, including Columbia River fisheries and native plants. However, by working to improve visibility in the Gorge; we will both directly and indirectly benefit all the valued resources to be protected under the Scenic Area Act.

Two key visibility impairing pollutants (sulfates and nitrates) are especially significant in the formation of acid rain and fog water that may damage cultural resources, primarily Native American rock art, and natural resources (including culturally significant plants). Given the special historic and cultural value of Native American rock art in the Gorge, the Forest Service has funded an independent special study (\$54,000) to perform an initial assessment of the chemistry of fog/cloud water that could pose a risk to Native American rock art and other ecosystem resources.

The fog-water study will not provide a definitive assessment of the risk to cultural resources. It is the first step in this evaluation. It can inform decision-makers as to the next most appropriate step in evaluating impacts to culturally significant resources. This study element is described further in Attachment F.

Impacts to cultural and ecosystem resources will be minimized by the same measures that protect and enhance visibility in the Scenic Area because the impacts to both are caused by the same suite of pollutants. To improve visibility, reductions in emissions of precursor gases such as SO₂, NO_x, and VOCs are necessary. Reductions in primary organic and elemental carbon and fugitive dust would also help improve visibility. Many of these pollutants also may contribute to additional air quality impacts. Acidic aerosols containing sulfur and nitrogen can cause damage to cultural and ecosystems resources. NO_x and VOCs contribute to ozone concentrations that can have a detrimental impact on plants. Because small amounts of pollution can have a significant effect on visibility, reducing these pollutants sufficient to protect visibility helps reduce other air quality impacts.

The Redesigned Study will provide information to refine or adapt a numerical chemical transport model specifically for assessing haze conditions in the Scenic Area for a base year (presumably 2004). While not performing “what if” analyses, nor an assessment of emission reduction strategies, it does provide information to run the numerical chemical transport model for a future year (presumably 2018) to determine what significant trend, if any, is apparent for haze in the Scenic Area attributed to the implementation of new state and federal programs.

The Redesigned Study will provide a basis for leveraging opportunities, now and in the future, for such tasks as assessing acid deposition and the associated impacts on cultural artifacts. The additional measurement data will help us understand historic trends and support models to predict future trends from either existing or new state and federal programs yet to be implemented.

Finally, it has been designed to support “add-ons” for additional analysis of measurement data/samples and additional model refinement/model runs. The potential “add-on” components could be recommended by the Advisory Committee if additional funding becomes available, and if for example, the Advisory Committee recommends that the Redesigned Study should: a) be expanded in scope to analyze additional time periods; b) clarify the contribution of specific emission sources; or c) develop and test strategy options if the initial Redesigned Study results do not indicate existing and planned air quality strategies will improve air quality sufficiently to meet the goals of the Gorge Scenic Area Act.

As in the original, phased technical study, the Redesigned Technical Study Plan will not recommend air quality strategies. It will describe the process for gaining scientific knowledge about Gorge air quality and the process to be used in making decisions about the future of air quality in the Gorge.

While not part of this document, the agencies involved recognize the role of economic analysis in developing air quality strategies. Economic and air quality analysis are used together to weigh important cost/benefit questions and develop a recommended air quality strategy that meets the dual purposes of the Scenic Area Act.

Comments on the Redesigned Technical Study Plan were solicited at a public meeting on May 29, 2003 and changes were made to this Study Plan as necessary as a result of comments received at that presentation. If the Gorge Commission concurs, results from the Redesigned Study will be available beginning in 2-3 years (approximately 2005-2006). This schedule is contingent on timely funding availability from EPA and the ability to operationally deploy the additional monitoring equipment in the field.

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I. OVERVIEW

In July of 2001, the Columbia River Gorge Technical Team (Technical Team) and Interagency Coordination Team (Coordination Team), with the assistance of national and global experts in air quality science, developed a phased, technical study plan for the Columbia River Gorge National Scenic Area (Scenic Area). (See "Columbia River Gorge Visibility and Air Quality Study – Working Draft: Existing Knowledge and Recommended Scientific Assessment to Consider", June 2001, Green et al). The Study Plan was submitted to the Columbia River Gorge Commission and concurred with in August of 2001.

The phased approach called for an initial Technical Foundation Study (TFS) that would characterize the physical, meteorological and chemical processes governing air quality in the Scenic Area, and the development of an initial conceptual model of causes of haze and other air quality issues, such as the effect of acid deposition on Native American cultural artifacts. The TFS was not designed, by itself, to lead to the development of a regional air quality control strategy. It was designed to better understand key processes that are important in modulating air quality in the Scenic Area; thus guiding the final development of the second phase of study.

The second phase of the original Study Plan would have been designed, based on what was learned in the TFS, to: a) verify the conceptual model of air quality, b) identify contributing pollution sources and source areas, and c) do final development, testing, validation and selection of an air quality predictive model to be used later by air quality managers for strategy development.

WDOE, ODEQ and SWCAA asked the Technical Team to develop a "stand alone" study that would:

- a) provide an assessment of the causes of visibility impairment in the Columbia River Gorge National Scenic Area;
- b) identify emission source regions, emission source categories, and individual emission sources significantly contributing to visibility impairment in the Gorge;
- c) provide predictive modeling tools or methods that will allow the evaluation of emission reduction strategies;
- d) provide an initial assessment of air quality benefits to the Gorge from upcoming state and federal air quality programs; and
- e) refine or adapt predictive modeling tools already being developed for visibility or other air quality programs, including but not limited to Regional Haze.

Attachment A provides the Redesigned Technical Study Plan at a Glance.

The Technical Team reviewed the original TFS Study Plan and prioritized the measurement and modeling elements that would best meet the new charge with the available funding. It was recognized that we would not be able to reach all the objectives identified under the original phased approach with the same level of certainty. However, the redesigned study could provide additional certainty in our understanding of haze in the Scenic Area that we do not have today because it focuses on the two, most important seasonal periods. From this information, we will be in a position to consider, what, if anything further, needs to be done to achieve the purposes of the Gorge Scenic Area Act.

Measurement and modeling tasks proposed in the redesigned study plan not only are intended to cover some of the tasks proposed in the original TFS, but also many of the tasks of subsequent phases envisioned in the original Study Plan - especially those that are needed to attempt to verify our hypotheses. The Redesigned Study Plan consists of a Measurement Program (Section II, below) and a Modeling Program (Section III, below). Attachments B and C provide a detailed comparison of the original phased approach with the Redesigned Study Plan.

The scope of the Redesign Study's scientific study program is designed to focus primarily on visibility and the emission sources that contribute to haze in the Scenic Area. The main visibility impairing pollutants include sulfates, nitrates, organic and elemental carbon, and fine soil. These pollutants are created by a wide variety of sources both inside and outside the Scenic Area. These air pollutants that impair scenic vistas and degrade scenic resources in the Gorge can also degrade the natural, recreational, and cultural resources of the Scenic Area.

The scope and funding for this project does not allow for a comprehensive and exhaustive evaluation of all air pollution affects on scenic, cultural, natural, and recreational resources. For example, this study will not evaluate air pollution impacts on the full range of possible ecosystem issues, including Columbia River fisheries and native plants. However, by working to improve visibility in the Gorge; we will both directly and indirectly benefit all the valued resources to be protected under the Gorge Scenic Area Act.

Two key visibility impairing pollutants (sulfates and nitrates) are especially significant in the formation of acid rain and fog that may damage cultural resources, primarily Native American rock art, and natural resources (including culturally significant plants). Given the special historic and cultural value of Native American rock art in the Gorge, the Forest Service has funded an independent special study (\$54,000) to perform an initial assessment of the chemistry of fog/cloud water that could pose a risk to Native American rock art and other ecosystem resources.

The fog-water study will not provide a definitive assessment of the risk to cultural resources. It is the first step in this evaluation. It can inform decision-makers as to the next most appropriate step in evaluating impacts to culturally significant resources. This study element is described further in Attachment F.

Impacts to cultural and ecosystem resources will be minimized by the same measures that protect and enhance visibility in the Scenic Area because the impacts to both are caused by the same suite of pollutants. To improve visibility, reductions in emissions of precursor gases such as SO₂, NO_x, and VOCs are necessary. Reductions in primary organic and elemental carbon and fugitive dust would also help improve visibility. Many of these pollutants also may contribute to additional air quality impacts. Acidic aerosols containing sulfur and nitrogen can cause damage to cultural and ecosystems resources. NO_x and VOCs contribute to ozone concentrations because ozone can have a detrimental impact on plants. Because small amounts of pollution can have a significant effect on visibility, reducing these pollutants sufficient to protect visibility helps reduce other air quality impacts.

Attachment D provides a partial list of the many opportunities for leveraging the technical work being conducted under other projects (e.g., the model development for the Regional Haze program, AIRPACT, the Vancouver/Portland Ozone Maintenance Plan, the WRAP Causes of Haze Assessment, etc.).

This Redesigned Study will not provide, at its end-point, the same certainty of the causes of haze or the same certainty in the predictive model's ability to mimic air quality conditions that was anticipated under the original, multi-phase study plan. It is important to note, however, that at the conclusion of this Redesigned Study, we will understand much more than we do today, including the identification of key areas of science and modeling, if any, that should be investigated further. This Redesigned Study is designed to support "add-ons" for: a) additional analysis of measurement data/samples if key questions of the causes of haze remain, and b) additional model refinement and model runs if the base case modeling does not indicate existing and planned air quality strategies will improve air quality sufficient to meet the goals of the Scenic Area's Management Plan.

II. MEASUREMENT PROGRAM

A. Objectives

The measurement program is designed to support three main objectives:

Determine the Current Causes of Haze in the Gorge (CoHaGo) – A suite of measurements will provide information that will be analyzed to attempt to identify emission source regions (both inside and outside the Scenic Area), emission source types and individual emission sources that significantly contribute to haze in the Scenic Area. Understanding the causes of haze will also allow us to focus predictive, numerical modeling on sources and regions that are most important in contributing to haze in the Scenic Area. These measurements will consist of existing monitors and new monitors to be funded under this project. Attachment E is a map of the Scenic Area with existing monitoring locations.

Support Predictive Numerical Model Evaluation – Provide ambient information about haze conditions that will be used to evaluate the ability of 3D, numerical, predictive models to assess current haze conditions and predict future haze conditions in the Scenic Area. This will increase our certainty that the model can be used to accurately test the effect of emission management scenarios (Control strategy testing). Control strategy testing is not planned or funded under this project, but may be performed later under "add-on" studies if the base case modeling under this project indicates additional strategies are warranted.

Track Long-term Haze Trends – Long-term, trend monitoring using the existing IMPROVE sites at either end of the Scenic Area is funded under another project and is anticipated to continue. Tracking trends is essential for assessing whether existing control programs are working to protect and/or improve visibility or if additional control programs are warranted. The additional information provided under this study will allow us to verify that these sites are representative of general conditions within the Scenic Area.

The Technical Team examined components of the original Study Plan and focused on those measurements that would be most critical to support the new management charge in the most efficient and cost-effective manner. In some instances, the Technical Team was able to: 1) identify less costly methods for gaining the same information; 2) scale back the number or duration of samples (mostly by focusing on two seasonal intensive periods versus year-round measurements); 3) identify components that were already being conducted by other projects (e.g., enhanced meteorological measurements with SODAR); 4) eliminate components that were of a more research

like nature that would not directly lead to the identification of contributing sources and source regions; and 5) eliminate components that did not directly relate to the charge of understanding and modeling haze in the Scenic Area (like acid deposition effects on cultural and ecosystem resources). The Technical Team also focused on measurement components that would best compliment the existing measurements currently being conducted in the Scenic Area, with a special focus on filling some of the knowledge gaps left by the current monitoring program.

It was agreed that the largest deficiencies in the existing measurement network were high time and spatial resolution speciated aerosol and gaseous measurements. Existing measurements are either speciated, 24-hour average samples taken once every three days (low time resolution), or high time resolution measurements without speciation (continuous non-speciated light scattering and light absorption measurements). Therefore, the bulk of the new monitoring will be high time resolution measurements of the key species or precursor species most important in contributing to haze in the Scenic Area or for evaluating the numerical model's performance. These species are SO₄, NO₃, Organic and Elemental Carbon (OC and EC), NO_x, and SO₂.

High time resolution measurements of the key species will be conducted in two 6-week seasonal intensive periods that coincide with worst-case visibility at either end of the Scenic Area. (A summer/early fall period for the west end and a winter period for the east end). Also, to determine if the atmosphere is ammonia limited, additional cation analysis of IMPROVE samples will be made. This information, added to the existing measurements, will support an assessment of the causes of haze (CoHaGo) and will support the evaluation of numerical predictive model performance. The two long-term IMPROVE sites at Mt. Zion and Wishram will continue to operate after this study period for use in tracking long-term trends. These sites are funded and operated separate from this study.

What is different about this approach from the original approach is there will be less information on a temporal and spatial basis, although every attempt is made to meet these needs on a seasonal intensive basis. The same basic approaches are being employed with the same basic objectives, but on a less "information dense" level. This could lead to identification of additional knowledge needs that could be filled by "add-on" measurement studies or additional analysis of information already collected.

Attachment F provides a description of existing and proposed measurements and what those measurements tell us.

B. Assessment of the Causes of Haze

The suite of existing and new measurements established in and near the Scenic Area under the Redesigned Study Plan will allow us to better understand the chemical and physical dynamics of haze in the Scenic Area. Both 24-hour average and high-time resolution (continuous) speciated measurements will be used. The measurements will determine optical, chemical and meteorological properties of air in the Scenic Area and lead to the development of a conceptual understanding of the causes of haze. Once we have a better understanding of those regions, sources and times of year most important in contributing to haze in the Scenic Area, future predictive numerical modeling can focus on those areas and sources, if necessary.

In addition, it will be important that our conceptual understanding of the causes of haze be subject to peer review by national and global experts in the field of atmospheric science. A peer review

will be invaluable in illuminating deficiencies in our conceptual understanding of the causes of haze, which could further help focus “add-on” studies or analysis, or it could help by adding a degree of certainty to our conclusions if the scientific community agrees with some or all of our conclusions.

The assessment of the information provided by the measurement program will be designed to answer the following questions:

- 1) *What aerosol components are responsible for haze?*
 - a. What are the major components for best, worst, and average days and how do they compare?
 - b. How variable are they episodically, seasonally, inter-annually, spatially?
 - c. How do the relative concentrations of the major components compare with the relative emission rates nearby and regionally?
- 2) *What is meteorology's role in the causes of haze?*
 - a. How do meteorological conditions differ for best, worst and typical haze conditions?
 - b. What empirical relationships are there between meteorological conditions and haziness?
 - c. How does the spatial difference in meteorology and climate between west and east Scenic Area account for the haze differences observed between west and east Scenic Area?
 - d. How well can haze conditions be predicted solely using meteorological factors?
 - e. How well can inter-annual variations in haze be accounted for by variations in meteorological conditions?
- 3) *What are the emission sources responsible for haze?*
 - a. What geographic areas are associated with transported air that arrives at sites on best, typical and worst haze days?
 - b. Are the emission characteristics of the transport areas consistent with the aerosol components responsible for haze?
 - c. What do the aerosol characteristics on best, typical and worst days indicate about the sources?
 - d. What does the spatial and temporal pattern analysis indicate about the locations and time periods associated with sources responsible for haze?
 - e. What evidence is there for urban impacts on haze and what is the magnitude and frequency when evident?
 - f. What connections can be made between sample periods with unusual species concentrations and activity of highly sporadic sources (e.g., major fires and dust storms, point source activity changes such as aluminum plant shut-downs, etc.)?
 - g. What can be inferred about impacts from sources in other regions?
- 4) *Are there detectable and/or statistically significant multi-year trends in the causes of haze?*
 - a. Are the aerosol components responsible for haze changing?
 - b. Where changes are seen, are they the result of meteorological or emissions changes?
 - c. Where emissions are known to have changed, are there corresponding changes in haze levels? (e.g., aluminum plant shutdowns or emission controls on the Centralia power plant)?

C. Budget

- | | |
|--|-----------|
| 1) Equipment purchase and sample/data analysis | \$333,000 |
| 2) Operation of new monitoring sites (Air agency staff time) | 60,000 |

- | | |
|---|--------|
| 3) Lease extensions and additional site development | 8,000 |
| 4) Causes of Haze Assessment (Contract - data analysis and development of conceptual model of causes of haze) | 75,000 |

Measurement Program Total: \$476,000

D. Timeline

The following timeline is dependent on receiving the federal funding award in a timely fashion that supports purchase and installation of equipment in this calendar year.

- 1) Purchase new equipment: 8/03 – 10/03
- 2) Deploy new equipment: 11/03
- 3) Conduct measurements for one year with two seasonal intensives: 12/03 – 11/04
- 4) Validate data, report data and perform the causes of haze assessment: 12/04 – 6/05
- 5) Provide draft and final report on causes of haze in the Scenic Area: 6/05 – 9/05

III. NUMERICAL MODELING PROGRAM

A. Objectives

The numerical modeling program has two main objectives:

- 1) Refine, adapt and select a predictive computer modeling tool to be used to evaluate visibility conditions in the Columbia River Gorge Scenic Area. The model needs to be run for a current year to demonstrate that the model is capable of reasonably representing visibility conditions in the Scenic Area as compared to monitored data.
- 2) Provide an initial assessment of air quality benefits from upcoming state and federal air quality, emission reduction programs. (Future year model run). Control strategy testing beyond known upcoming air quality, emission reduction programs is not planned under this project, but may be conducted under “add-on” studies if warranted.

B. Overview

The requirements for the Scenic Area numerical modeling system are:

- 1) Because haze, ozone, and secondary particle formation operate on a regional scale, a regional scale modeling system is required;
- 2) The numerical computer model must be able to accurately characterize the complex atmospheric chemistry associated with secondary particle formation and haze;
- 3) The numerical computer model must be structured for future analysis to be able to identify contributions from individual sources and/or areas; and
- 4) The numerical computer model must be predictive.