Columbia River Gorge Air Quality Project

Work Plan

July 30, 2001

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

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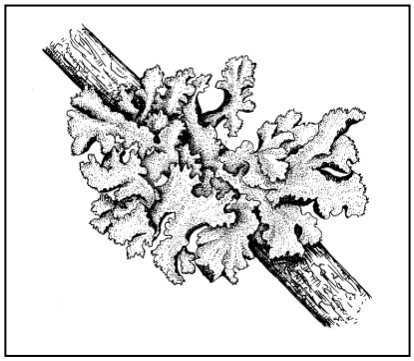
Special Thanks To

- *Alexander Mikulin* for his drawings of Pacific Northwest Lichen species. Lichen are an important indicator species. They are susceptible to impacts from air pollution, and their study can provide a valuable early warning of unwanted ecosystem impacts and a decline in other natural resources. Alexander's drawings are used several times in this document.

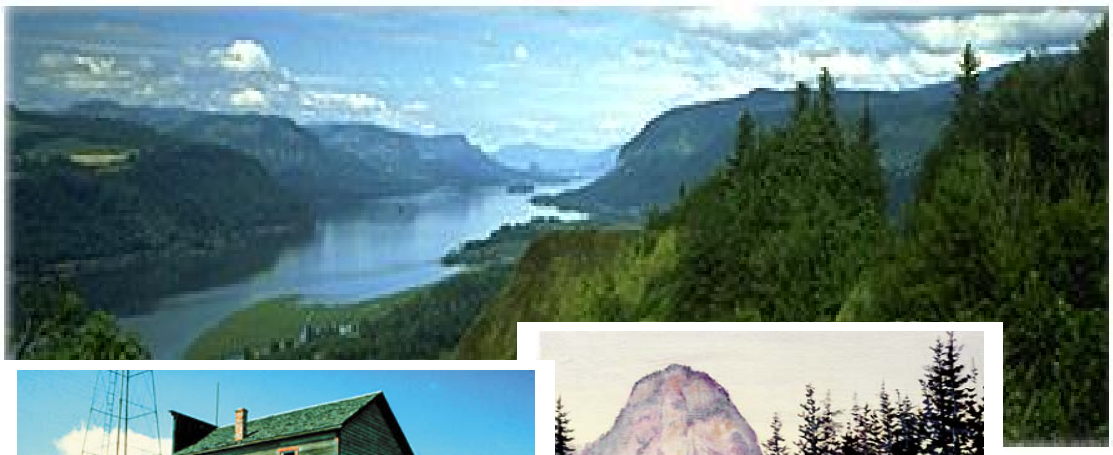


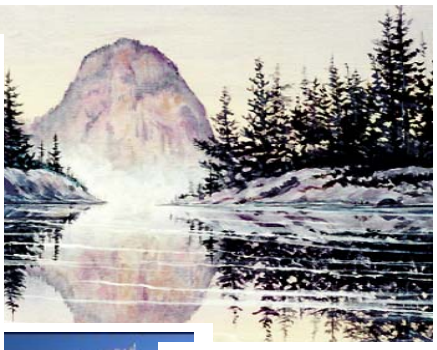
- *The Dalles Mural Society:* The mural "Where Wheat is King" by Robert Thomas is used on page 10 of this document.

- *Vicky Vance*: Local artist in the Columbia River Gorge Area. Vicky's paintings are used several times in this document.

- Colorado State University: For excerpts from their publication, "Introduction To Visibility", William C. Malm, May 1999.

Columbia River Gorge National Scenic Area





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Volume 1

July 2001

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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

The Columbia River Gorge is an area of astounding beauty and diversity. It is also an area that over 70,000 residents of Oregon and Washington call home. 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 the goals of the Scenic Area Act 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. It is vital to our work that those who care deeply about this area have a voice in making these choices.

We are at the very beginning of this work. There is much we have yet to discover about air quality in the Gorge. We must evaluate its current condition; and identify sources of pollution (both inside and outside the Gorge) that affect air quality. We are still taking our first steps in answering these questions. We must also understand the economic conditions that support so many Gorge communities. Both environmental and economic information will be vital to making informed and equitable decisions about Gorge air quality.

Our first step is to develop this work plan. It is essentially a "road map" that lays out how we will answer important questions about air quality in the Gorge and establishes an open and fair process for decision-making. The work plan does not recommend strategies now. The work plan does lay out a multi-step 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. This work plan lays out the "Big Picture" view of how we will do this work. Ultimately, the Columbia Gorge Commission will be asked to decide if the strategy options developed through this collaborative process meet the objectives of the Gorge Management Plan and the National Scenic Area Act.

With your help today and in the future, 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.

Andy Ginsburg
Air Quality Division Administrator
Oregon Department of
Environmental Quality

Mary Burg
Air Program Manager
Washington Department
of Ecology

History of the National Scenic Area Act

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 –

(1) to 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) to 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).

The special beauty and value of the Columbia River Gorge has been recognized for centuries. Efforts to provide some special protection for this area began as early as 1937 and continued throughout the following decades. In 1986, President Ronald Reagan signed the Columbia River Gorge National Scenic Area Act, establishing this nation's only National Scenic Area.

Other national legislation such as the Clean Air Act complement the Columbia River Gorge National Scenic Area Act in that emission reduction strategies adopted to protect public health can have the secondary benefit of improving other valued resources. However, the Columbia River Gorge National Scenic Area Act calls for an independent effort to protect and enhance key resources in the Gorge NSA while supporting local economies.

To achieve its purposes, the National Scenic Area Act called for a new partnership between the USDA Forest Service, a bi-state regional planning agency (the Columbia River Gorge Commission), the states of Oregon and Washington, the Southwest Clean Air Agency (SWCAA), and the six counties with land in the Scenic Area. The Act also calls for interagency and tribal cooperation and coordination. The regional air quality strategy process described in this work plan is designed to meet the purposes of the Columbia River Gorge National Scenic Area Act.

Columbia River Gorge Commission

The Columbia River Gorge Commission was authorized by the 1986 Columbia River Gorge National Scenic Area Act (Act) and created through a bi-state compact between Oregon and Washington in 1987. The Commission was established to develop and enforce policies and programs that carry out the purposes of the Act.

The Commission works in partnership with a number of entities to develop and implement a regional Management Plan. Partners include the states of Oregon and Washington, the Southwest Clean Air Agency, the USDA Forest Service, four treaty Indian Tribes -- the Nez Perce, Umatilla, Warm Springs, and Yakama Indian Nations,

Clark, Klickitat, and Skamania counties in Washington, and Hood River, Multnomah, and Wasco counties in Oregon.

Regional Air Quality Strategy

In May 2000, the Gorge Commission approved an air quality amendment to the National Scenic Area Management Plan. The amendment language states that:

"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.

The States and the Forest Service together shall provide annual reports to the Commission on progress made regarding implementation of this policy. The first report shall include a work plan and timeline for gathering/analyzing data and developing and implementing the strategy. The work plan shall be submitted to the Commission for approval at the next annual update (August 2001)." [1]

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. There was recognition by the Gorge Commission in passing this policy that while a Class I designation is not appropriate for the Gorge, there is some potential risk to the resources that must be protected under the National Scenic Area Act. The new air quality amendment language reflects both purposes of the National Scenic Area Act.

The Columbia River Gorge Commission has responsibility under the Scenic Area Management Plan to protect natural, scenic, cultural, and recreational resources. It is recognized that the Commission does not have expertise in air quality planning and that they will rely on the three state environmental agencies to develop an air quality strategy for the NSA (these agencies chose to develop this strategy through an Advisory Committee). However, as the regional policy-making body for the Scenic Area, the Gorge Commission must 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 it is consistent with those purposes.

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

Work Plan Development Process

This work plan has been developed over many months through the collaborative efforts of the states of Oregon and Washington; the Southwest Clean Air Agency; Klickitat, Wasco, Skamania, Hood River, Multnomah, and Clark Counties; the U.S Forest Service; local and national experts in the fields of air science; interested stakeholder groups, and the public. The Yakama, Umatilla, Warm Springs, and Nez Perce Indian Nations were also invited to participate on the Coordination Team. The tribes were unable to actively participate due to resource limitations, but did provide some comment on the draft work plan. Active tribal involvement is hoped for in the near future. The inter-agency project coordination team has relied heavily on stakeholder and public input in developing the work plan. The work plan reflects, to the greatest extent possible, the values, priorities, and preferences of these groups for a fair and equitable process leading to a regional air quality strategy that satisfies the dual purposes of the Scenic Area Act. The work plan will be submitted to the Columbia Gorge Commission for their approval in August 2001.

Funding Strategy

Funding to develop this work plan has been provided by the states of Oregon and Washington. The U.S. Environmental Protection Agency has also generously provided initial grant funding to begin the scientific study of Gorge air quality. The U.S. Forest Service will continue to provide $150,000 to $200,000 per year to support on-going air monitoring.

Significant additional funding will be required for the various elements described in this work plan. In the short-term, funding will be necessary to continue the initial study of Gorge air quality and characterization of emission sources. The Technical Foundation Study described in this work plan is the first in a series of studies to characterize the physical and chemical processes influencing air quality in the Gorge. The Foundation Study will lay important groundwork for future phases of the technical study program, and will require approximately one million dollars in funding over the next two years. The states, in cooperation with the Southwest Clean Air Agency, the U.S Forest Service, and other partners such as the U.S Environmental Protection Agency will work to secure funding for the Foundation Study as soon as possible.

Later technical phases will also require significant funding. These phases will provide a more refined and detailed study of chemistry and physical processes in the NSA, including refinement of source apportionment. Later phases will also lead to the development of predictive modeling tools to be used in strategy development. Over the next few years, the results of the Technical Foundation Study will be evaluated and a second-phase technical study designed. At that time, we will have a clearer picture of the funding level needed to support the full technical study program.

Additional funding will also be needed to perform econometric analysis as part of the cost-benefit evaluation of strategy options, and to support the overall stakeholder advisory committee and public and stakeholder outreach process. The funding levels

described in this work plan reflect an estimated range of costs for economic analysis and for supporting the decision-making process. Costs for economic analysis will vary depending on the number of air quality strategy options evaluated. An initial estimate for economic analysis ranges from $60,000 to $150,000. Securing funding for this work is a vital part of the projects overall fund raising effort.

Fund Raising

A critical early role for the Advisory Committee will be to work with the states to evaluate funding sources, and how to proceed if full funding does not become available. The states and Advisory Committee will have to weigh many important issues regarding funding, science, and the efficient use of limited resources. It is very important to develop the science and technical tools needed to make informed decisions about air quality in the Gorge. It is also important to invest limited resources as efficiently and wisely as possible.

Once approved, this work plan will serve as a fund raising tool for the states and Advisory Committee to use in developing specific funding strategies. The states will continue to seek initial funding over the next several months. The states and Advisory Committee will then work with the Oregon and Washington state legislatures and governor's offices, as well as with other state and federal agencies to develop a comprehensive fundraising strategy and pursue the necessary resources. Funding strategies may also involve the U.S. Congress, the Columbia River Gorge Commission, and private business.

Profile of the Columbia Gorge National Scenic Area

The Columbia River Gorge National Scenic Area (CRGNSA) is a unique area in which resource-dependent communities exist within an area of great natural beauty. The Columbia River Gorge is a spectacular river canyon, 80 miles long and up to 4,000 feet deep. The Scenic Area is one of the most unique natural systems in the world and includes parts of Clark, Skamania, and Klickitat Counties on the Washington side, and Multmonah, Hood River, and Wasco Counties on the Oregon side (a map of the Scenic Area is on page 6). Carved over 40 million years, the Columbia River Gorge cuts the only sea level route through the Cascade Mountain Range. It is more than a natural wonder; the Gorge is a critical transportation corridor and is home to diverse communities, businesses, and farms.

Approximately 75,000[2] people live in communities within in the National Scenic Area. These communities, in the aggregate, have less diversified and more vulnerable economies than many other communities of Washington and Oregon. The metropolitan areas of Portland, Oregon and Vancouver, Washington (combined 1999 population of approximately 1.8 million) lie just outside the western entrance to the Scenic Area.

The south rim of the Gorge rises to over 3,000 feet above the Columbia River and boasts several majestic waterfalls. The area affords spectacular views for miles, and harbors the second highest year-round waterfall in the United States.

Climate, geology, soils, and other environmental factors combine to create a unique diversity of plant and animal life. A rich and diverse array of cultural resources, some up to 10,000 years old, exist in the National Scenic Area.

Extraordinary recreational opportunities abound in the Scenic Area, including fishing, boating, and hiking. The Columbia River Gorge is also considered the windsurfing capital of the world.

Located in the Columbia River Gorge National Scenic Area 40 miles east of Portland, Oregon, Bonneville Lock and Dam spans the Columbia and links the two states. Since 1938, hydropower from Bonneville Dam has supplied the northwest region and beyond.

[2] Projection for year 2000. Columbia Gorge Economic Development Association

Three deep-water ports lie within the Scenic Area supporting regional industries and international trade. The Gorge area holds over thirty major employers (100+ employees) with combined annual sales of about $500,000 million dollars.

The diverse character of the Columbia Gorge makes the Columbia River Gorge National Scenic Area one of the most unique areas of the country. This blend of natural beauty and fragile community economies requires a comprehensive and collaborative approach to protecting and enhancing both the scenic resources and economic well being of the area.

Cities Within the Columbia River Gorge National Scenic Area

Population in 1999/2000

OREGON		WASHINGTON	
Cascade Locks	1,085	North Bonneville	513
Hood River	5,135	Stevenson	1,165
Mosier	360	Carson	2,116*
The Dalles	11,880	Home Valley	No Data
		White Salmon	1,913
		Bingen	659
		Lyle	530*
		Dallesport	1,185*
		Wishram/Wishram Heights	324*

Note: just outside the western boundary of the Columbia River Gorge National Scenic Area lay the Oregon cities of Portland, Gresham, Fairview, Wood Village and Troutdale; and the Washington cities of Vancouver, Camas, and Washougal.

* Estimated from 2000 census.

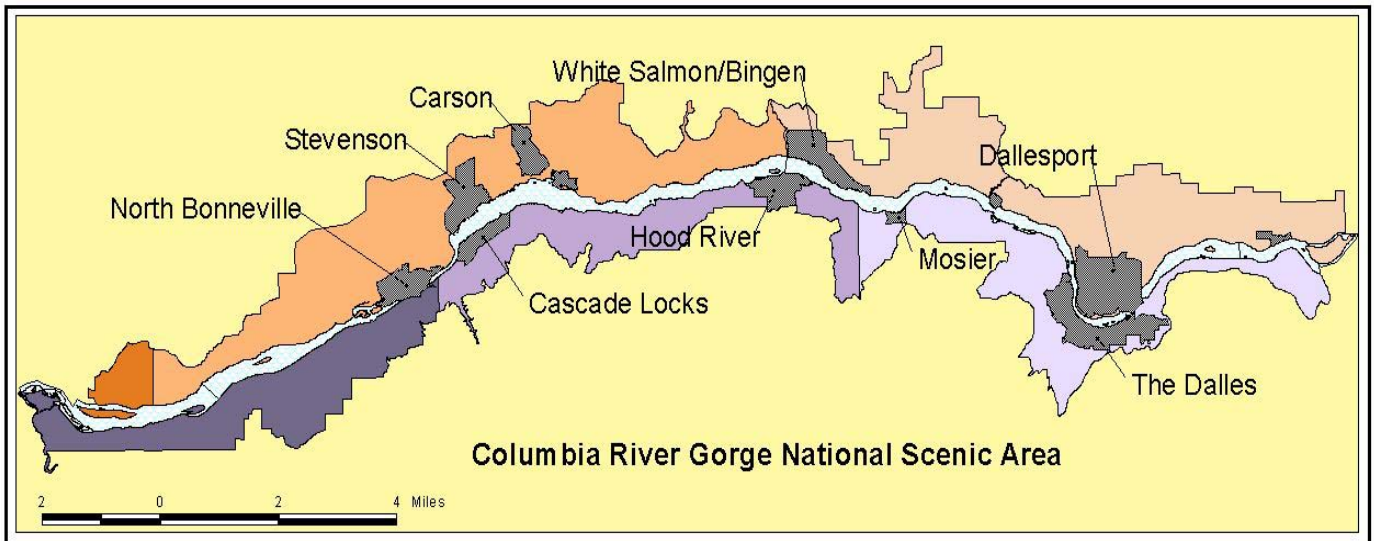
Counties Within the Columbia River Gorge National Scenic Area

Population in 1999/2000

OREGON		WASHINGTON	
Hood River	20,411	Skamania	9,831
Wasco	23,791	Klickitat	19,530
Multnomah*	660,486	Clark*	336,268

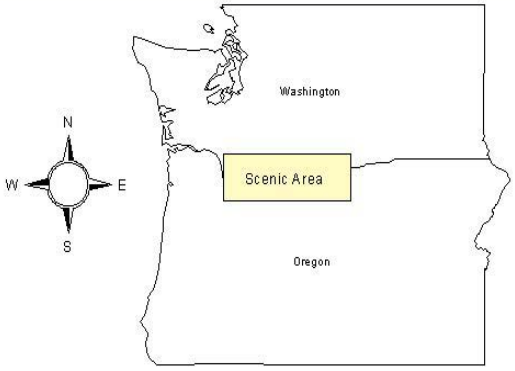
* Multnomah and Clark Counties have a portion of their populations within the Columbia River Gorge National Scenic Area, however the majority of Multnomah and Clark County residents live in urban areas outside the NSA. Approximately 1,700 Multnomah County residents and about 260 Clark County residents live within the National Scenic Area boundaries.

Map of Columbia River National Scenic Area



Urban Areas
Columbia River

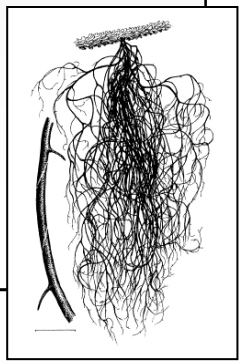
Counties
- CLARK
- SKAMANIA
- KLICKITAT
- MULTNOMAH
- HOOD RIVER
- WASCO



The Columbia River Gorge National Scenic Area cannot assure the reliability or suitability of this information for a particular purpose. Original data was compile from various sources. Spatial information may not meet National Map Accuracy Standards.

Original Data can be downloaded from www.fs.fed.us/r6/columbia/

R.Robles/April 25, 2001/ Columbia Gorge Commission



Northwest Lichen Species

Resources to be Protected Under the Scenic Area Act

Scenic

Protecting the future of scenic vistas within the Gorge is at the heart of the regional air quality strategy. The majestic views encountered throughout the National Scenic Area provide residents and visitors alike a special opportunity to appreciate nature's grandeur and to be inspired by scenes of great beauty. The scenic resources of the Gorge are highly valued in many ways. Enhancing air quality by reducing visibility impairing air pollutants such as ammonium sulfate, ammonium nitrate, as well as organic and elemental carbon, would help protect these scenic resources.

Natural

Because of the wide range of elevation and precipitation in the Gorge, a diverse collection of wildflowers and native plants thrive from the temperate rain forest at Oneonta Gorge to the grasslands at Celilo. The Gorge area boasts fourteen unique species of wildflowers, hundreds of native plant species, and forests. Enhancing air quality by reducing air pollutants such as ozone and acidic aerosols that damage plants and forests would help protect the natural resources and ecosystem diversity that are so important to the Scenic Area.

Cultural

For thousands of years, the Columbia River Gorge has supported flourishing civilizations. Evidence of the Folsom and Marmes people, who crossed the Great Continental Divide from Asia, have been found in local archaeological digs. Alternatively, Native American tradition describes the unique genesis of native peoples within the Columbia Gorge area. Excavations at Five Mile Rapids, a few miles east of The Dalles, show that humans have occupied this ideal salmon fishing site for more than 10,000 years. Ancestors of today's Yakama, Warm Springs, Umatilla, and Nez Perce Indian nations as well as many other Native American peoples lived and fished along the river's banks. Evidence of their life and creativity along the river exists today in the ancient petroglyphs and rock art found within the Scenic Area. These important cultural resources can be protected by reducing acidic aerosols that erode rock surfaces.

Ancient Native American Rock Art in the Gorge, Tsgagalal- "She Who Watches"

Recreational

The Columbia River Gorge is a world class location for hiking, windsurfing, bicycling, sightseeing, climbing, horseback riding, boating, fishing, and more. By protecting scenic, natural, and cultural resources in the NSA, the regional air quality strategy will also preserve the recreational appeal and value of the National Scenic Area.

Economic Resources

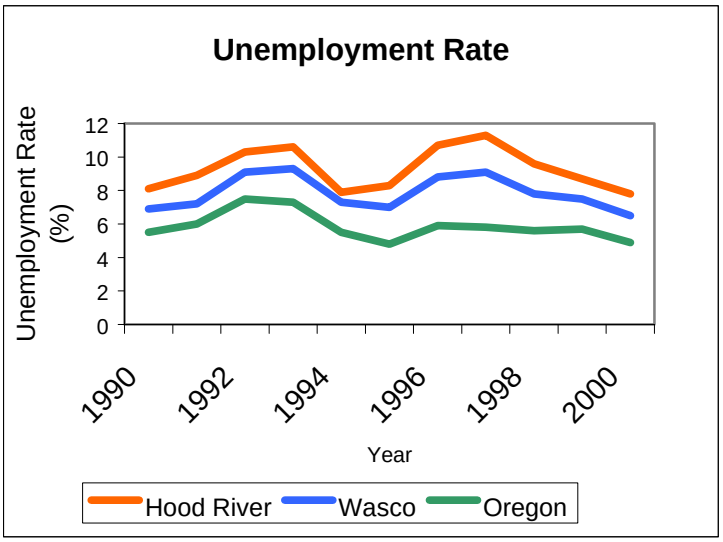
The Columbia River passing through the National Scenic Area is a major transportation route through the Cascade Mountain Range. Improved infrastructure has led to development of largely resource-based industries throughout this corridor. Lumber, aluminum, wool, and flourmills, as well as fish and fruit canneries contribute to local, regional, and international trade. The river continues to carry grain, livestock, lumber, and fruit and vegetables grown and processed in the Columbia Basin.

Columbia Gorge Economies - Oregon

	1990 Census	2000 Census	% Change
Oregon	2,842,321	3,421,399	20.4%
Hood River	16,903	20,411	20.8%
Wasco	21,683	23,791	9.7%

The 2000 Census shows total population in Hood River County to be 20,411 persons and 23,791 for Wasco County. This was a strong 20.8% increase in population for Hood River since the 1990 Census, and a slower 9.7% growth rate for Wasco.

Over the 1990 to 1999 period, **Hood River** and **Wasco** county total employment grew 22.0% and 24.8% respectively, both below the statewide rate of 27.6%. Similarly, wage and income levels in the region lag statewide averages. The 1999 average annual covered wage for Hood River and Wasco counties are $20,643 and $23,382 respectively, compared to a state average wage of $30,867. Hood River County's average wage is the second lowest in Oregon, and Wasco County's is 12th lowest. Agricultural crop production is a large part of the regional economies and, in 1999, was the largest employing sector in both Hood River and Wasco counties. Employment growth in agricultural crops over the 90-99 period was 60.7% and 52.9% for Hood River and Wasco counties, respectively. The unemployment rate in both counties has fallen in recent years, but still remains above the state average. While the general, long-term economic outlook for the region should be positive due to its



proximity to Portland, its attractiveness as a tourist destination, and its access to both Interstate 84 and the Columbia River, several troubling trends are evident.

The recent power shortage and supply induced shutdown of Northwest Aluminum plants in The Dalles, Oregon and in Goldendale, Washington appears to be intermediate-to long-term, and impacts some of the highest-wage jobs in the region. Similarly, global competition in the tree fruit industry is putting extreme price pressure on growers in the region, a trend which appears likely to persist. Other risks to the economies exist as well including the potential impact from lost tourist dollars related to drought, and price pressures on other agricultural products grown in the region.

Tourism sectors employed 3,570 people in the Gorge area in 1999, or one employee for every 16 area residents. This ratio is very high compared to other tourism areas in the state. Total tourism industry payroll was $50.3 million and local and state tax receipts were $5.6 million and $2.7 million, respectively.

The Oregon tourism Commission defines the Mt. Hood/Gorge Tourism Region as the **Eastern parts of Clackamas and Multnomah** Counties, Hood River County and North Wasco County. Leaving out East Clackamas County figures, the Oregon side of the Columbia Gorge Scenic Area generated $208.8 million in destination travel spending in 1998. This total includes spending on such activities as accommodations, eating & drinking, food purchases, and ground transport, recreation and retail sales. **Multnomah and Clark Counties** comprise only a small portion of the National Scenic Area. The full economic profile of these two counties is not discussed in detail here so as not to unfairly influence the economic picture of the NSA.

About 1,700 of **Multnomah County's** 660,486-person population (about 0.25%) live in the National Scenic Area (2000 Census). In 1990, median household income in this area was 43% higher than the rest of Multnomah County and 41% higher than the State of Oregon. According to the1990 census, over 60% of the workers in this part of the county commute over 20 minutes to work, presumably to the Portland/Vancouver Metro area. Most of the county's land base in the National Scenic Area is National Forest. Private land in the National Scenic Area is a mix of farms, forest, rural residences, and the community of Corbett.

Columbia Gorge Economies - Washington

Skamania County's economy is heavily influenced by land ownership. About 90% of the county is owned by the public—roughly 80% falls within the Gifford Pinchot National Forest, and another 10% is state timberland. Most of the privately owned acreage is in the southerly strip of land bordering the Columbia River, and so falls under the development rules of the National Scenic Area Act.

With most of the county being timberland, it is no surprise that timber has dominated Skamania County's employment. For years, the majority of jobs in the county were in logging, lumber and wood products, and through the Forest Service. Timber harvests,

which topped 350 million board feet through most of the 1980s, began declining in 1989 and bottomed out at 29 million board feet in 1996. Timber-related employment began to deteriorate in the late 1980's, culminating in the closure of the county's largest private-sector employer, Stevenson Co-Ply, in early 1992, and the subsequent closure of the Forest Service tree nursery later in the decade. A year after Co-Ply closed, the Skamania Lodge opened with about the same number of jobs at considerably lower wages

In 2000, the county had a population of 9,900, a labor force of 4,030, including 2,070 nonfarm jobs, and an unemployment rate of 9.2 percent. As of March 2001, the Skamania County labor force is 3,870, with 460 unemployed—a rate of 11.9 percent compared to the statewide average unemployment rate of 6.1 percent. This means 30 out of 39 Washington counties have lower unemployment rates than Skamania County. About half of the county's labor force migrates out of Skamania County to work in neighboring counties. Half of Skamania County's earned income comes from employment outside of the county. Of the almost $50 million in payroll generated by employers in the county in 1999, almost half came from the public sector. Another 19% came from manufacturing (11% from logging and lumber) and about 15% from other services. The average wage of $24,839 was far below the state average, and per capita income was 79% of the U.S. average and 74% of the state average.

Klickitat County's economy is somewhat more diverse than Skamania's, due in part to more diverse land ownership as well as geography. Klickitat's plateaus have proven suitable for wheat farming and ranching, and its valleys are devoted to fruit orchards. The county also has timberland, with harvests averaging around 100 million board feet per year. The John Day Dam on the Columbia explains in part the presence of the Goldendale Aluminum Smelter, while the dry climate accounts for the landfill in Roosevelt, the second largest municipal solid waste landfill in the nation.

In 2000, Klickitat County had 19,200 residents and a labor force of 8,710. The unemployment rate in Klickitat County for 2000 was 10.4%. Of 1,370 manufacturing jobs, 520 were in logging and lumber and wood products (down from 700 in 1990 and more than double that in 1980), and most of the rest were at the smelter. Total payrolls approached $150 million in 1999. Of that amount, 29% came from the public sector, 10% from timber, and 25% from other manufacturing. The overall average annual wage was $25,586. The unemployment rate for Klickitat County as of March 2001 is 19.4 percent. As with Skamania County, per capita income is far below the state average. Farm income provided 2.5% of total personal income vs. 0.9% for the state as a whole.

At the beginning of 2001, the Goldendale smelter was partially curtailed due to high energy prices from the Bonneville Power Administration (BPA). Currently the company is selling power back to BPA and paying its workers to do facility maintenance so that a labor force is available to re-start production. When production will resume remains unclear.

Tourism in a significant economic force in both Skamanina and Klickitat Counties. In 1998, destination travel spending generated approximately $34 million in Skamania County and $17.6 million in Klickitat County. Both counties showed growth in destination travel spending in 1999 ($37.5 million for Skamania County and 19.7 million for Klickitat County)[3].

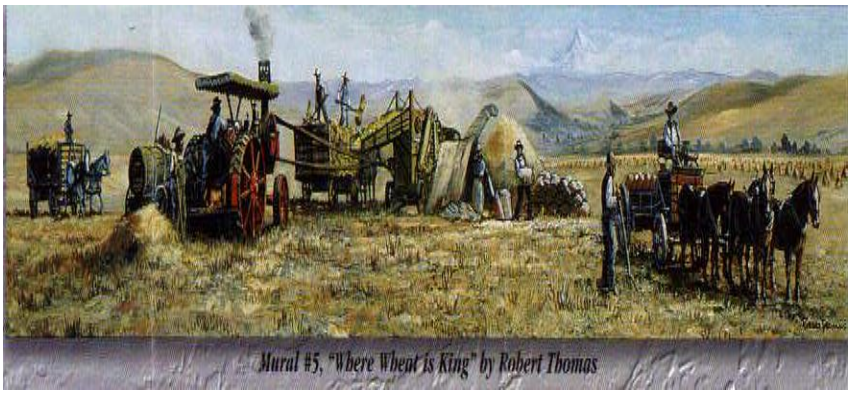
About 260 of **Clark County's** 336,268-person population live in the National Scenic Area (2000 Census). Most of the county's land base in the National Scenic Area is private farmland and rural residences. The U.S. Fish and Wildlife Service owns one large wildlife refuge, and the Forest Service holds a number of conservation easements.

Connections between Resource Protection and Economic Strength.

The goals to protect important resources in the Gorge while also supporting local economies are connected in many complex ways. Businesses such as Skamania Lodge and many others rely on the National Scenic Area as a tourist destination. One benefit of enhancing scenic resources would be to protect the tourist appeal of the Gorge. But increased human activity, such as high motor vehicle travel during peak tourist seasons can also degrade air quality. Reducing air pollution to protect natural resources such as native plants and forests will also benefit local farmers and orchardists whose crops can be harmed by air pollution.

Further growth in sustainable tourism in the Scenic Area depends upon the cooperation of federal, state, county, and local entities (both in the public and private sector) to create one unified travel destination. With declines in other industries, such as the timber industry, one of the strongest economic assets the Columbia Gorge possesses is its scenic beauty, reverse recreational opportunities, and other natural resources. In order for the region to profit by these natural resources, they need to be preserved with sustainable tourism development practices.[4]

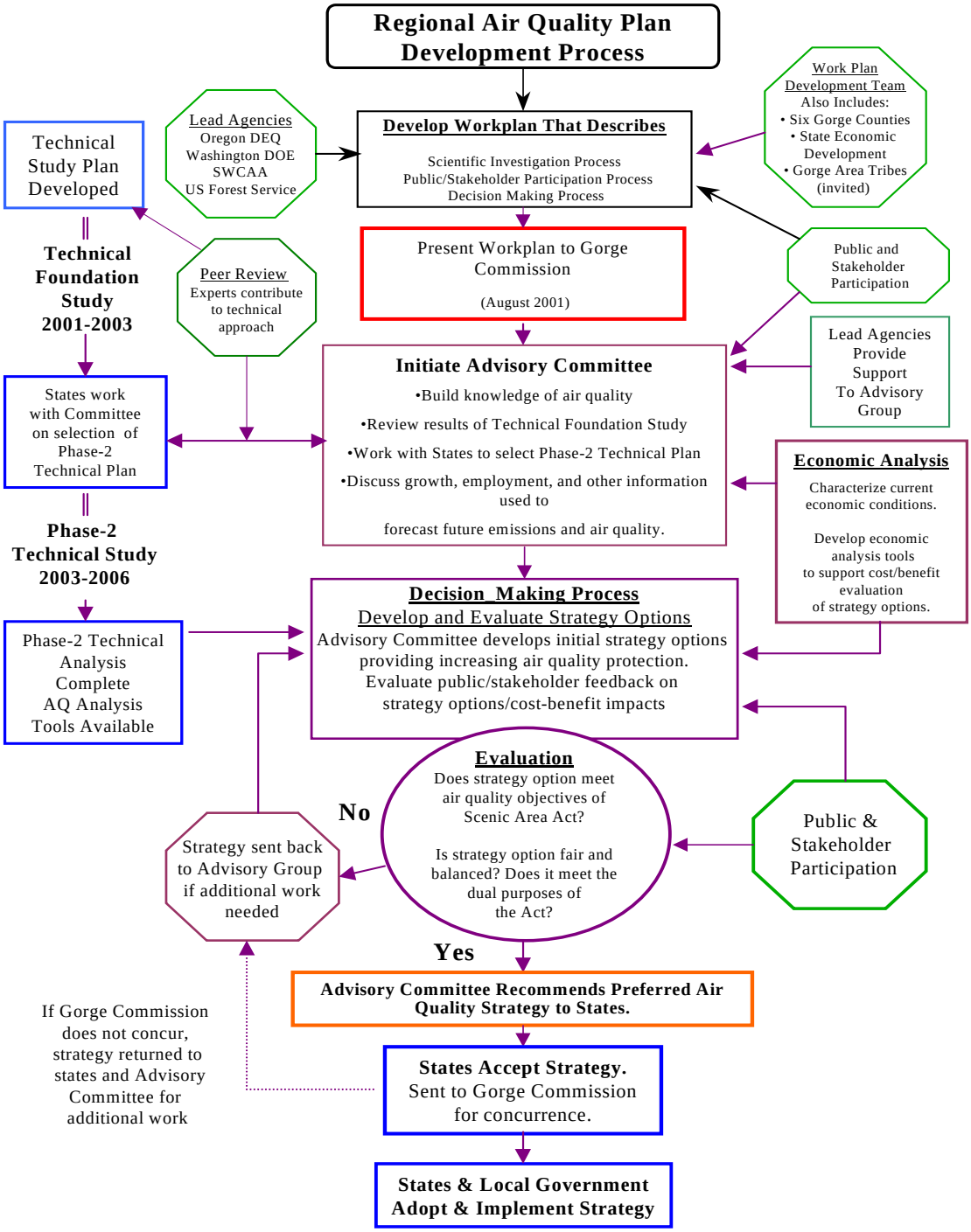
Many of these complex relationships will be examined by decision-makers as they develop an air quality strategy for the Scenic Area.



[3] Estimates for destination travel spending provided by the Columbia River Gorge Visitors Association, citing January 2001 report on Washington State Travel Impacts. Dean Runyan Associates.
[4] Columbia River Gorge Visitors Association.

Process for Developing a Regional Air Quality Strategy

Throughout its many stages the Columbia River Gorge Air Quality Project will require the participation and dedication of many state and federal agencies, local governments, tribes, businesses, environmental and civic organizations, as well as the general public. The following chart shows the scientific investigation and decision-making process to be used in developing an air quality strategy. This work plan provides a "road map" for all subsequent steps in the project.



THREE-STEP APPROACH TO AIR QUALITY PROJECT

PHASE	PURPOSE/CONTEXT	TIMELINE
Step-1: Technical Studies Multi-Phased Technical Study Program to characterize air quality and current (baseline) conditions of local Gorge economies	1. Phased, multi-year technical study program to evaluate air quality processes in the Gorge and gather information necessary to characterize air quality and areas of influence. Identify emission sources both inside and outside the Gorge that contribute to air quality in the National Scenic Area. 2. Characterize baseline economic conditions of local Gorge economies. 3. Initiate Stakeholder Advisory Committee: Build understanding of air quality issues, review results of the Foundation Study, work with states and SWCAA to develop second phase of technical study, discuss economic growth and other important planning assumptions, discuss potential for voluntary pollution prevention. **Final Products Expected From This Work** 1) Modeling and other tools to support the development of a regional air quality strategy. 2) Thorough understanding of baseline economic conditions.	Some air quality assessment work has already been completed. Further investigation is planned from now, through about 2005-2006.
Step-2: Develop Comprehensive Air Quality Strategy.	Continue Committee work and stakeholder and tribal involvement process. Citizens/Stakeholder Advisory Group will: 1. **Evaluate results of air quality analysis** and characterization of contributing emission sources. 2. **Develop several strategy options** that protect and enhance air quality, consistent with the purposes of the National Scenic Area Act. Several options may be developed that provide increasing levels of air quality protection. (This process will develop the air quality benefit information needed for a cost/benefit evaluation.) 3. **Perform economic analysis** to evaluate the potential impact of strategy options on local economies. (This process will develop the cost information needed for a cost/benefit evaluation.) 4. With input from the public, stakeholders, and tribes, **weigh air quality benefits and costs of strategy options and develop a preferred approach** to meeting Management Plan and Scenic Act objectives. Recommend preferred strategy to states. **5. States take recommended air quality strategy to Columbia Gorge Commission for their concurrence.** **Final Product Expected From This Work** A regional air quality strategy that meets the dual purposes of the National Scenic Area Act.	The strategy development phase begins when the air quality study is complete (approximately 2005-2006). It is anticipated that strategy development would take approximately one year.
Step-3: Implement the Strategy.	State air quality agencies (DEQ, DOE, SWCAA) and local governments as necessary put strategy in place. **Final Products Expected From This Work** 1. State and/or federal rules as needed. 2. Local ordinances or other agreements as necessary.	When the strategy development is complete.

CHRONOLOGY OF PROJECT ACTIVITIES

	Step 1: Technical Studies, Initiate Advisory Committee
Aug. 2001	2001-2003
Gorge Commission Approves Work Plan	Fund Raising →
	INITIAL TECHNICAL STUDY PERIOD
	Technical Foundation Study →
	Foundation Study lays ground work to characterize air quality in the Gorge. Air Monitoring, Emission Inventory, and Model Development.
	Phase-2 Technical →
	Phase-2 Technical Study completes characterization of air quality and develops strategy analysis tools.
	★ **Initiate Advisory Committee during Foundation Study (2002)**
	➢ States work with Committee on fund raising issues. ➢ Work to build a common understanding of air quality issues in the Gorge. ➢ Committee reviews results of Technical Foundation Study. ➢ States begin work with Committee on the selection of the Phase-2 Technical Study. ➢ Evaluate potential for voluntary pollution prevention measures. ➢ Lay groundwork for future economic and air quality discussions. Discusses growth and other planning assumptions to use in future forecasts.
	→ →
	On-Going Public and Stakeholder Outreach: Provide information on key Gorge issues and initial study results as they become available.

ESTIMATED CHRONOLOGY OF PROJECT ACTIVITIES

Step 2: Develop Air Quality Strategy		Step 3: On-Going Monitoring		
2004 – 2006				
STRATEGY DEVELOPMENT PERIOD				
Completion of Phase-2 Technical Study				
Completion of Phase-2 Air Quality Investigation: Predictive modeling tools available.	Air Quality analysis to support testing strategy options.			
Data Gathering for Economic Analysis.	Economic Analysis to help evaluate strategies.			
Advisory Committee ➢ Committee reviews results of technical study as they become available. ➢ Continue to build an understanding of air quality issues in the Gorge. ➢ Finalize economic, growth, and other planning assumptions to use in future forecasts.	Committee begins strategy development. Considers air quality strategies and cost/benefit information. Develop Initial Air Quality Strategy Options.	Committee develops preferred strategy option with public, stakeholder input.	States Approve Strategy Gorge Commission Concurrence that strategy meets purposes of the Scenic Area Act.	States and local governments as necessary put strategy in place.
	Public, Stakeholder, and Tribal Participation. Continued Outreach			
				On-Going air quality monitoring and progress tracking

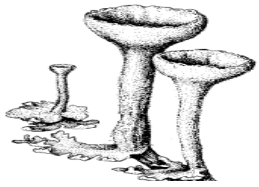
Public Outreach and Involvement

Multiple Audiences and Diverse Cultures

People of diverse backgrounds and cultures live, work, and play in the National Scenic Area. Each have their own values, priorities, and needs. To ensure success in developing a balanced strategy it is vital that all groups feel well represented and have frequent and regular opportunities to participate in decision-making. Bringing all these interests together requires a thoughtful approach to public outreach and participation. It also requires a willingness on the part of the public and stakeholder groups to participate constructively in the process.

People are busy with many competing personal and professional commitments. It is a challenge to devise public outreach approaches that accommodate these conflicts and encourage participation. A variety of approaches, tools, and techniques will be used to inform and engage the public and stakeholders about air quality and other resource issues in the Gorge. Public understanding and participation will be key to weighing questions of environmental choices and cost-benefit tradeoffs as different options are considered for the regional air quality strategy. Our primary tools and techniques for communicating with the public and stakeholder groups include: *working with local and regional media, special publications, public workshops, town meetings, constituent and public focus groups, surveys, individual meetings with stakeholder groups, discussions with civic organizations, and the project Internet site*. The public and stakeholder outreach work will focus on providing the basic information needed to make informed decisions about the Gorge.

"Hot Button" Issues: There are issues of special importance to Gorge area residents regarding the development of a regional air quality strategy. One such issue can be described as "geographic fairness." Our outreach work will help clarify that the regional strategy will evaluate emission sources from both inside and outside the Gorge, and will not disproportionately or unfairly burden local Gorge communities while allowing significant air quality impacts to continue from sources located outside the National Scenic Area. Another hot button issue is the potential impact that an air quality strategy might have on local economies. Our outreach efforts will describe how economic analysis will be used as part of the strategy development process to evaluate questions of cost-benefit tradeoffs. A third issue of great importance to the public is the protection of air quality and other natural resources in the Gorge. The public outreach efforts address these important issues as well, and will be strongly oriented toward building trust and strengthening long-term relationships among stakeholders and the public.



Northwest Lichen Species

Target Audiences: An important part of the collaborative approach is to identify the various target audiences, along with their interests, concerns, and information needs. These audiences have various points of view and frames of reference related to managing natural resources in the Gorge. Their voices and perspectives are very important in creating a regional air quality strategy that respects and reflects the diversity of the area.

Native American Tribes: Four federated tribes have treaty rights and cultural ties to the Columbia Gorge National Scenic Area: the Nez Perce Tribe, the Confederated Tribes and Bands of the Yakama Indian Nation, the Confederated Tribes of the Umatilla Indian Reservation, and the Confederated Tribes of the Warm Springs Reservation of Oregon. The tribes are sovereign nations and have a special place in the development of the regional air quality strategy. The process described in this work plan is designed to encourage tribal participation. We will also continue the special government-to-government consultation process established between the federal and state governments and the tribes. Throughout this process we will continue to seek the Native American perspective on protecting the scenic, natural, recreational, and cultural resources of the Gorge.

The target audience for public outreach and involvement include:

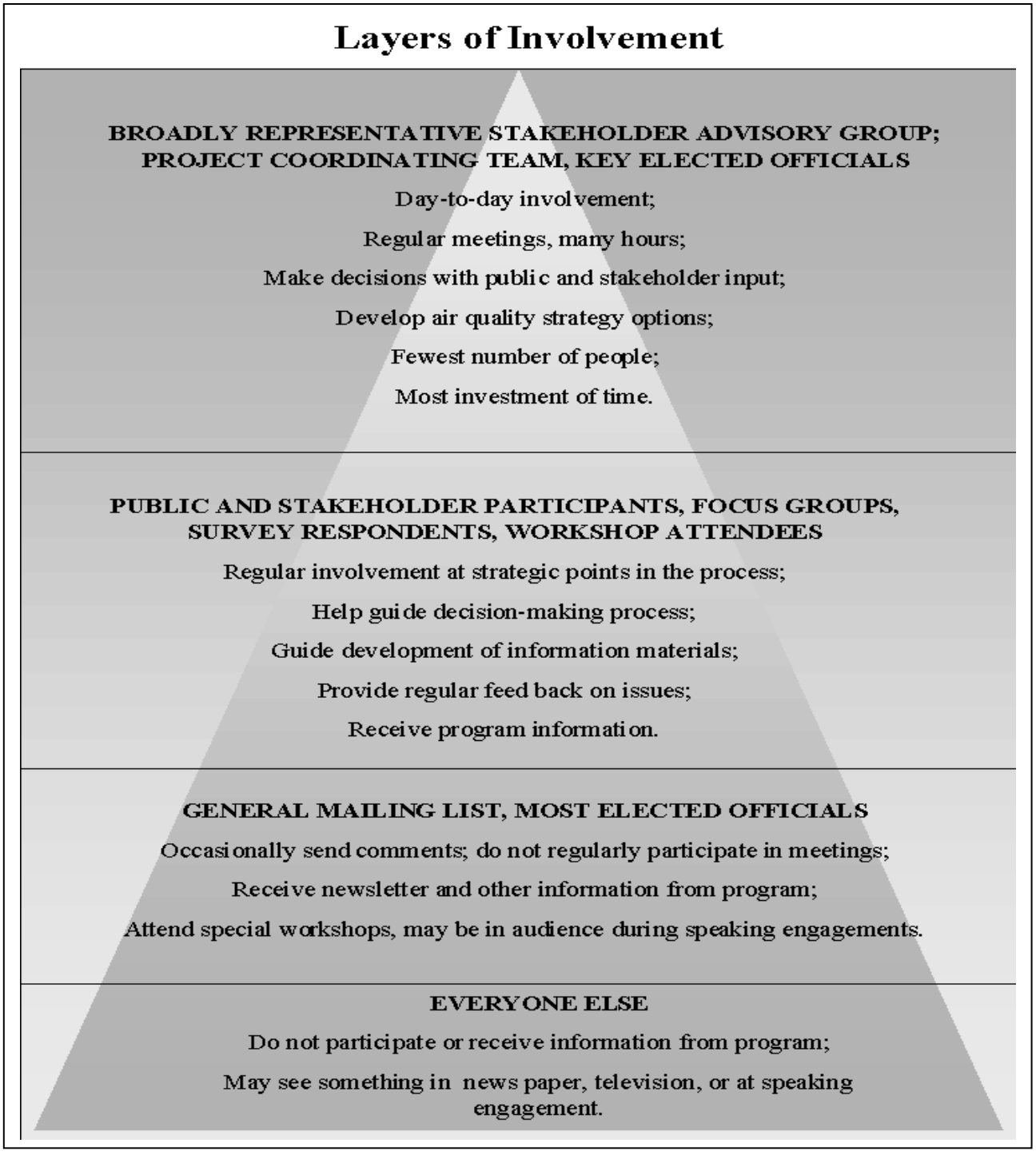
- General public of all ages
- Elected Officials
- Local, state, and federal officials
- Technical/scientific community
- Educators
- Native American tribes
- Environmental groups
- Community groups
- Civic organizations
- Industries
- Ports
- Agricultural interests
- Labor
- Recreational users
- Media
- Others

Perceptions/Misperceptions: Our outreach efforts also provide an opportunity to increase the public's knowledge about Gorge issues and to clarify any misperceptions shared by the public or stakeholder groups.

Baseline Scientific Understanding: There is a need to provide the public and stakeholder groups with a basic understanding of the science behind air quality impacts in the Scenic Area. It will be an important part of the outreach work to build this common level of knowledge about air quality and other resource issues in the NSA. It will also be very important to convey scientific information in a way that is understandable to all stakeholders and the general public.

Layers of Involvement

It must be recognized that in any process such as this, different segments of a community participate in different ways and at different levels. To meet differing needs, the public outreach and participation effort will include a variety of tools and methods to provide opportunities for all citizens to have a voice in the process. The multiple layers of involvement are summarized here.

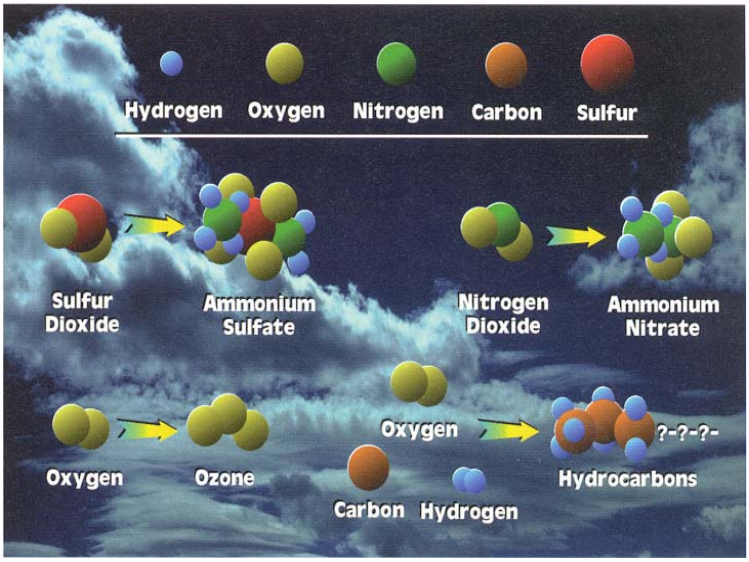


SCIENCE AND AIR QUALITY IN THE COLUMBIA RIVER GORGE NATIONAL SCENIC AREA

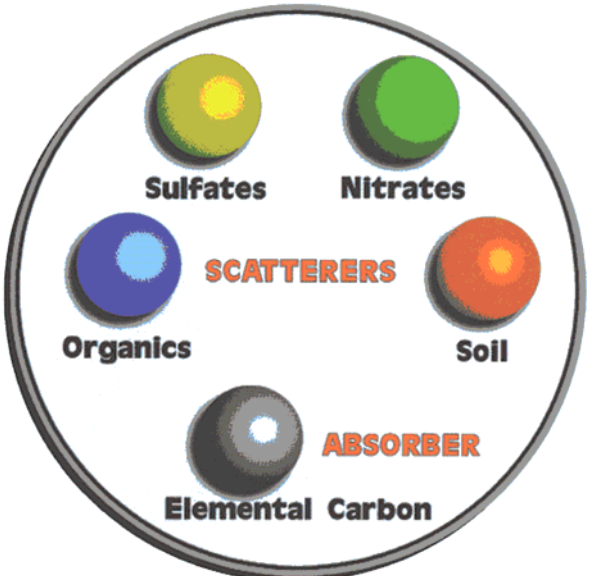
To protect and enhance the scenic, natural, recreational, and cultural resources of the NSA, we must first come to understand the air pollution characteristics and impacts that may threaten those resources. Scenic resources relate to "visibility," or our ability to view scenic vistas within the Gorge. These vistas are naturally limited during certain times of the year by normal weather conditions (clouds, fog, rain, etc.), and also by other natural processes such as pollen, smoke from wildfires, and by the normal scattering of light by molecules in our atmosphere. However, during many parts of the year, scenic resources are degraded by human-caused air pollution, reducing the scenic and natural beauty of the Gorge, and degrading the recreational appeal of the Scenic Area on which much of the local tourism economy depends.

Air pollution that impairs visibility may also have unwanted effects on natural resources such as local forests, and on cultural resources such as ancient Native American rock art. Air pollution that impairs visibility may also have adverse impacts on local agricultural commodities, which in turn affects the local economy. The foundation of the Columbia River Gorge Air Quality Project is the study and characterization of air quality in the Gorge, and the identification of air pollution sources, both inside and outside the Gorge, that significantly impact the National Scenic Area. Protecting "air quality" goes beyond just visibility impairing pollutants to include other air pollutants such as ground-level ozone that can also damage ecosystems and natural resources.

Air pollution (aerosols), whether it is man-made or natural, is said to be either *primary* or *secondary* in nature. Primary refers to gases or particles emitted from a source directly, while secondary aerosols refer to gases or particles that are formed in the atmosphere through a series of complex reactions. Primary particles include smoke from fires, soot from diesels, fly ash from the burning of coal, and wind blown dust. Primary gaseous emissions of concern include sulfur dioxides and nitrogen oxides that result from any type of combustion. Secondary aerosols include Sulfates and Nitrates, such as ammonium sulfate and ammonium nitrate formed in the atmosphere when sulfur dioxide and nitrogen dioxide gases combine with ammonia.



There are five atoms that play significant roles in the air quality chemistry that affects visibility: hydrogen (H), oxygen (O), nitrogen (N), Carbon (C), and Sulfur (S). Through complex sets of chemical reactions, gases are formed that react to form particles that reduce visibility, impact human health, affect ecosystems, or cause deterioration of materials such as metals or rock art. Sulfur dioxide reacts to form ammonium sulfate; nitrogen oxide forms ammonium nitrate; oxygen is converted to ozone; and carbon, hydrogen, and oxygen form a variety of hydrocarbon particles.



Your ability to see a scenic vista depends on the amount of light reaching your eye. Sunlight carries the image of a scenic view through the atmosphere to the person observing. Pollutants reduce the ability to see detail in a scenic vista by ***scattering*** and ***absorbing*** light. Nitrates and Sulfates are very efficient light scatterers. Organic compounds and fine soil also scatter light, and elemental carbon is a light absorber. The greater the concentration of these particles in the atmosphere the more light is scattered and absorbed, and the more the ability to see a scenic vista is impaired. There are many natural processes that also scatter light. Air molecules in pure air scatter light. Light reflected from the ground or from clouds can also impair an observer's view. Man-made pollutants add to this effect by further degrading visibility.

The study of air quality in the Gorge will focus on the role of these five main visibility-impairing aerosols. The study will evaluate daily, monthly, and seasonal changes of these particles, the meteorology that affects aerosol formation, and identify the geographic regions and emission source types that contribute these pollutants to the NSA.

The study will also evaluate ozone impacts within the Gorge. Ground-level ozone forms though a complex set of chemical reactions when volatile organic compounds and oxides of nitrogen react in the presence of strong sunlight. Ozone impacts can damage forests and other ecosystem resources as well as agricultural crops. The study will also evaluate the potential impacts from acidic aerosols on Native American rock art in the Gorge.

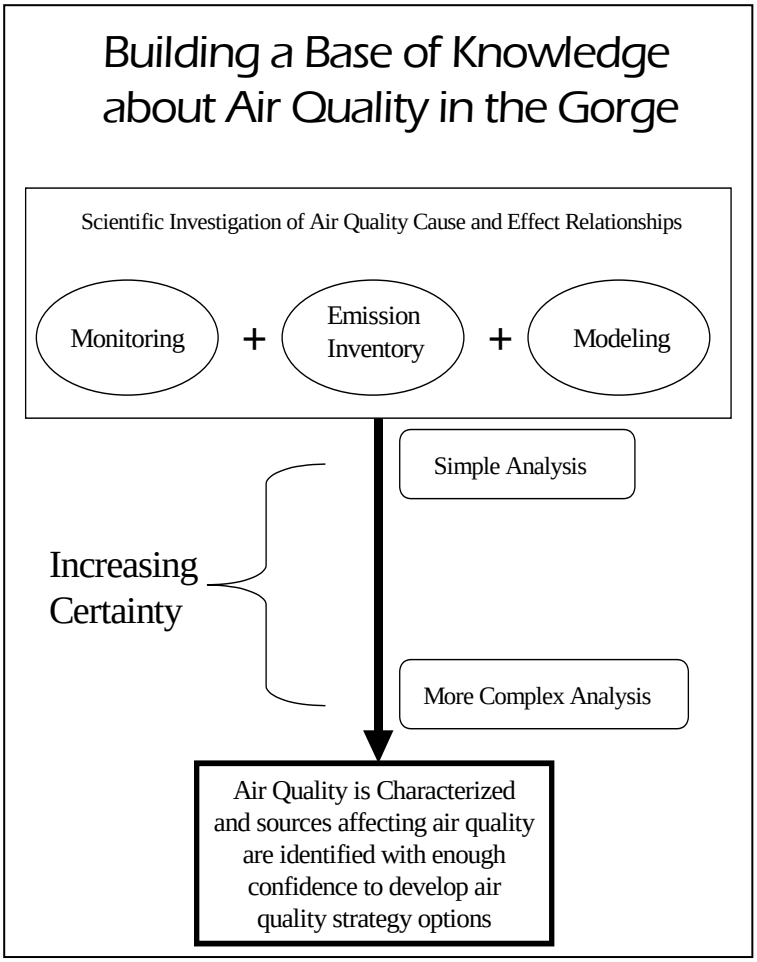
Building a Base of Knowledge about Air Quality

There are three related areas of scientific investigation that work in concert to provide answers about air quality: **Monitoring, Emission Inventory, and Modeling.**

- **Monitoring** – measures what's actually in the air, and provides information about which pollutants are impacting a specific location during a specific time. Types of ambient monitoring include optical measurements that measure light scattering and absorption of particulate matter, and their physical movement; and aerosol and gaseous measurements that help us understand the components that make up particles, and help identify their possible sources. Meteorological monitoring provides information on wind flow and the processes that move pollutants from source locations to areas of impaired air quality. Thus, monitoring provides information on both the physical and chemical processes influencing air quality.

- **Emission Inventory** – gives us information about the sources of air pollution, the type of pollutants they emit, where sources are located geographically, when pollution is being emitted and how much pollution is being emitted.

- **Modeling** – allows us to combine the emission information with meteorology and other factors to simulate actual measured air quality in the Gorge, and to test hypothetical emission reduction strategies for the future. Modeling and emission inventory techniques will be key analysis tools used to support the development of air quality strategy options.



To build certainty in our knowledge about sources affecting air quality, several forms of analysis will be employed – from simple to complex. The more complex the analysis, the more detail and refinement is required in the areas of monitoring, emission inventory, and modeling.

At each step in the analysis we will learn more about the emission sources, both inside and outside the Scenic Area. If each type of analysis produces the same or similar results, then our confidence in the results increases. Although each step in the analysis may give us information about cause and effect relationships, very often, especially in the early stages, an analysis may elicit additional questions.

Eventually we will reach a point in the analysis where reasonable conclusions can be made about contributing emission sources.

Summary of Existing Air Quality Knowledge: What we know

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.

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.

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, as well as the structure in side canyons and entry points, has not been well studied or documented. This detailed understanding is crucial to the success of computer modeling simulations that would be used to identify sources and their relative contribution to air quality in the Scenic Area.

Of particular note are the predominantly west, and often strong, winds through the Gorge in the summer and the transition seasons. In a few months during the winter, the pattern reverses with moist easterly, and often strong winds bringing Columbia Basin air through the Gorge toward the west. In very general terms these wind and weather regimes are controlled by high pressure over the Pacific in the summer with relatively lower pressure in the Columbia Basin. This pattern reverses in winter with relatively lower pressure to the west and high pressure over the Columbia Basin. Winds tend to blow away from areas of higher pressure – this combined with the channeling effects of the Gorge is a significant contributor to the unique climate in the Gorge.

The meteorological parameters of most interest in the proposed technical studies are the 3-dimemsional wind components, including the turbulent intensities, and the 3 dimensional moisture fields (relative humidity). The wind fields determine the transport and dispersion of air pollutants, while the moisture fields affect gas-to-particle

conversion, particle growth, and deposition. Available meteorological information in or near the Scenic Area currently consists mainly of a few surface monitoring sites.

What We Don't Know: Physical and chemical processes in the Gorge

There is much that we do not know about the physical and chemical process of air pollution within the NSA. 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 NSA 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.

Other sources of air quality information

More detailed discussion of existing air quality knowledge and assessment needs is in Appendix A: "Columbia River Gorge Visibility and Air Quality Study, Working Draft: Existing Knowledge and Additional Recommended Scientific Assessment to Consider, June 2001."

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 NSA.

Improving our Understanding of Gorge Air Quality-Building Tools Needed For Strategy Development

Earlier this year the project technical team consulted several national experts in air science to help develop an initial approach for studying air quality in the Scenic Area. These independent experts helped the technical team evaluate existing knowledge of air quality in the NSA, and assisted the team in identifying areas where additional study is needed.

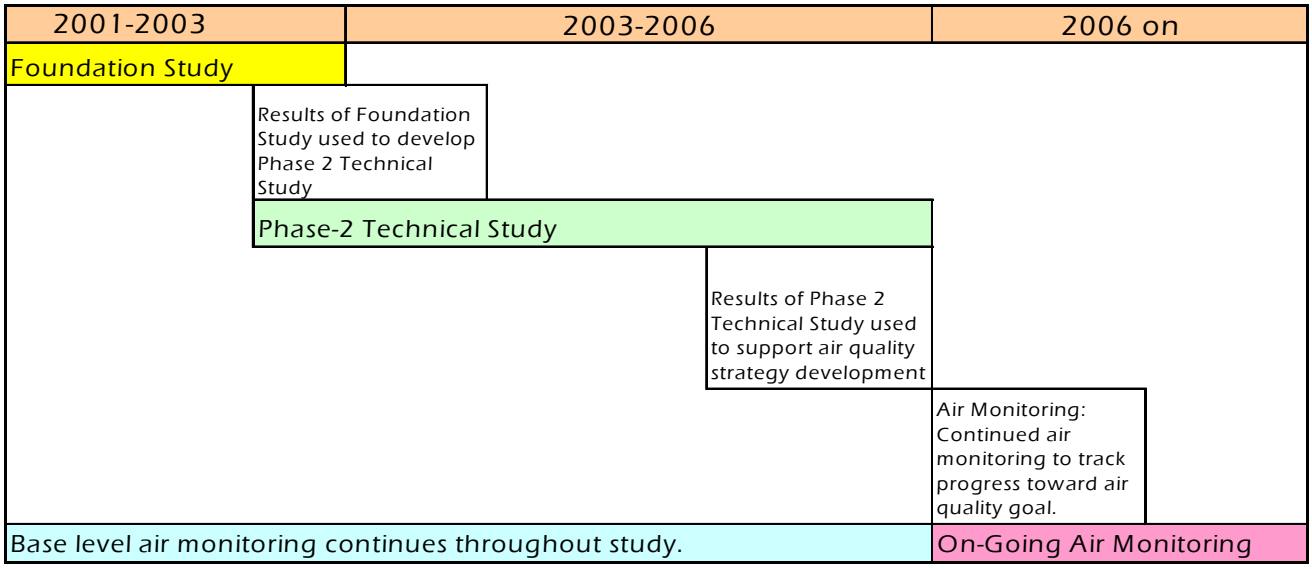
In March 2001, this initial technical assessment was presented to a work group of over 50 local, national, and international air science experts to get their ideas. This peer review workshop provided a forum for attendees to share their experience and expertise with our technical team. Attendees offered useful insight into our draft study plan, each drawing from their field of expertise in air monitoring, modeling, and chemistry. The technical team has drawn from all the suggestions offered at the workshop to develop a **phased approach** for improving our understanding of Gorge Air Quality and for building the

analytical tools needed for strategy development. Monitoring, modeling and emission inventory work necessary to meet the study objectives and goals are proposed to occur in each of three distinct phases of study.
The first phase of technical work, called the **Foundation Study**, will begin to better characterize the physical and chemical processes influencing air quality in the Gorge. The Foundation Study will lay the ground work for identifying emission sources, both inside and outside the Scenic Area, that significantly contribute to air pollution in the Gorge. The Foundation Study is not sufficient by itself to support the development of air quality strategies, but will allow decision-makers to make more informed choices about the next phase of scientific study.

Results of the Foundation Study will be used to develop the **second phase technical study**. The second phase study will be designed to refine and verify our understanding of the physical and chemical processes influencing air quality in the Gorge. The Phase-2 technical program will provide for the identification of contributing emission sources and source areas, and for the final development, testing, validation, and selection of air quality predictive models to be used by decision-makers in strategy development.

Once an air quality strategy has been developed, on-going air quality monitoring will be needed to track and evaluate progress in meeting air quality goals. This on-going monitoring is phase-3 of the technical study plan. Basic air monitoring at the west and east entrances of the NSA has existed for several years and will continue throughout the upcoming study phases. Depending on the final air quality strategy, it may be necessary to expand the monitoring network to better evaluate air quality trends in the NSA.

General Chronology of Phased Technical Study Approach.



Funding Strategy: Funding for technical study and on-going monitoring. Chronology assumes availability of funding.

The technical study program for the Columbia River Gorge Air Quality Project will not evaluate all air pollutant concerns, but will focus primarily on visibility and ozone. Separate state and federal programs exist that address air toxics and public health-based air quality standards.

Summary of Scientific Investigation

Phase 1-Foundation Study: The focus of the Foundation Study is to characterize the physical, meteorological and chemical processes governing air quality and visibility within the Scenic Area. The results of the study will guide the final development and recommendation of the Phase-2 study plan. Development of the Phase-2 technical study plan will begin as the Foundation Study nears completion.

The Foundation Study will:

- evaluate air quality information from both inside and outside the NSA.
- make gaseous, particulate, and visibility measurements to help define the role of various pollutants in air quality and visibility impairment and to resolve potential discrepancies between measured and reconstructed haze levels.
- expand monitoring to areas outside the NSA.
- make meteorological measurements within the Scenic Area to define meteorological features currently not well understood (e.g., wind flow over the rim, through the Gorge and side canyons).
- develop an initial conceptual framework of the physical and chemical processes governing air quality in the Scenic Area.
- refine emission inventories in areas and times that are important to the physical and chemical processes and important for supporting modeling work.
- conduct survey level source attribution modeling to give us an initial idea of *potential* source regions and *potential* source types (inside and outside the NSA) responsible for air pollution in the Scenic Area.
- evaluate the strengths and weaknesses of predictive model candidates.
- identify the key chemical and physical processes that must be emphasized to obtain adequate predictive modeling capabilities.
- identify modeling and measurement approaches for use in Phase-2.

The Foundation Study will not:

- result in the final selection of a model capable of predicting air quality under various emission management scenarios.
- identify specific sources that contribute to air pollution in the Scenic Area.
- provide sufficient information from which to develop air quality strategies.

Completion of the Foundation Study is anticipated to occur 18 to 24 months from date of funding.

Estimated Cost of the Foundation Study

Ambient monitoring -	$ 845,000
Meteorological monitoring -	$ 200,000
Emission inventory refinement -	$ 50,000
Model evaluation and survey modeling -	$ 210,000
Data - QA, analysis & management -	$ 125,000
Project management -	$ 75,000
Total:	$1,505,000
Already funded:	$ 450,000
Estimated additional funding needed:	**$1,055,000**

Phase 2- Next Steps After Foundation Study

Once funding is obtained, the Foundation Study will take approximately 18 to 24 months to complete. Results will guide development of the second phase technical study program. The Phase-2 Technical Study will provide the information and analysis tools needed for decision-makers to develop an air quality strategy for the Scenic Area.

The states will work with the Stakeholder Advisory Committee (discussed in subsequent sections of this work plan) to evaluate and select the Phase-2 study plan. The states will also seek comment on the Phase-2 study plan from independent technical experts, stakeholder groups, tribes, and the public. A recommended Phase-2 study program will be submitted to the Columbia Gorge Commission for approval as an amendment to this work plan. Given the time needed for fundraising and to initiate and complete the Foundation Study, it is anticipated that the Phase-2 study program would be developed in the 2002-2003 time frame.

A range of technical study issues for Phase-2 has been investigated and is discussed in detail in Appendix A: "Columbia River Gorge Visibility and Air Quality Study – Working Draft: Existing Knowledge and Additional Recommended Scientific Assessment to Consider", June 2001, Green et al. The final recommended Phase-2 study plan will depend on the results of the Foundation Study and the sophistication needed to develop strategy alternatives. Completion of the Phase-2 technical work is anticipated to occur 24 to 36 months after completion of the Foundation Study.

Summary of Key Program Elements: Monitoring, Emissions Inventory and Modeling

Each phase of technical study will improve our knowledge in all three key areas needed for air quality analysis: Monitoring, Emissions Inventory, and Modeling. A general overview of these three programs is provided, followed by a summary of the Technical Foundation Study. A detailed description of the Technical Foundation Study, together with a detailed discussion of overall technical issues is included in Appendix A.

Monitoring Program

A monitoring program is proposed that will lead to understanding the physical and chemical processes occurring in the Scenic Area (i.e., a conceptual framework). This will help us identify emission sources that are contributing to impacts on visibility, cultural resources, agricultural health, ecosystem disturbance, and ozone effects on vegetation and humans. The monitoring will also help evaluate: 1) the chemical and physical processes that quantitative air quality predictive models must simulate, 2) provide information for input to these models, and 3) help evaluate the accuracy of the models. The monitoring will also help with the evaluation and development of the emission estimates for sources.

Many of the measurements in the monitoring program will be conducted within the Scenic Area and regions nearby. Because the Scenic Area is the receptor of pollutants emanating from many regions, it is important to measure air quality impacts and meteorological conditions inside the Scenic Area to better understand what, when, and where the pollutants come from.

The initial monitoring work and analysis of monitoring results is anticipated to be completed 18 months from date of commencement. The Phase-2 technical study will expand air monitoring to include greater refinement of air chemistry, and may involve one to two month summer and winter intensive studies. After the initial study is complete, a continuous long-term trends monitoring program will be needed to track the progress of any implemented strategy. All proposed monitoring is in addition to the routine long-term monitoring currently being conducted in the Scenic Area at the Mt. Zion (west end) and Wishram (east end) sites. Monitoring at these sites is cooperatively funded and operated by the USFS, WDOE, and ODEQ. It is anticipated that these sites will continue to operate for the long-term.

Emission Inventory Program

A good emissions inventory is a necessary component to understand air quality, identify contributing sources, and evaluate alternative emissions scenarios. An emissions inventory including SO2, NO_X, NH3, speciated VOC, and speciated primary PM is needed. This includes emissions from all potential source types affecting the Scenic Area – industry, mobile sources (e.g., vehicles, ships, trains, aircraft), area sources (e.g., woodstoves, outdoor burning, solvent use, agriculture), and biogenics (e.g. natural emissions from vegetation). Efforts are underway, as described below, to produce a more refined inventory for the Pacific Northwest; however, verification with measurements will be necessary to evaluate the accuracy of the inventory.

Oregon and Washington have been involved in emissions inventory preparation for many years. Inventories have been prepared in response to federal and state requirements for point source reporting, State Implementation Plans (SIPs) for visibility and individual criteria air pollutants, and various special studies. With the increased emphasis on

regional issues such as ozone and haze, Idaho, Oregon, Washington, and other agencies and institutions initiated the formation of the Northwest Regional Technical Center (NWRTC), and an initial demonstration project to test an applicable air quality model is in progress. An important part of this project will be the preparation and testing of an accurate emissions inventory.

The states have identified emission categories needing additional data or refinement. Some areas in need of additional work include residential woodstoves, residential outdoor burning, commercial marine vessels, railroads, and biogenics. The states have requested and received special funding to complete these inventories. In addition to the regional inventory projects that were funded, Oregon received special funding to obtain stack parameters for point sources, inventory emissions from aircraft, evaluate ammonia emission factors, and other work as resources allowed. Results from the funded work are expected during the summer of 2001.

The emission inventory will be modified and enhanced as needed to support further air quality assessment and strategy development for the NSA.

Air Quality Modeling Program

Air quality "models" use mathematical equations to estimate the contributions made to air quality from a variety of emission sources throughout a geographic area. Air quality models use current emissions and other factors such as meteorology, chemical transformation, and emissions transport characteristics to estimate ambient air quality impacts. Air quality models can also be used with a forecast of future emissions to estimate air quality conditions in the future.

Air quality models will provide the tools, together with the monitoring program, for 1) source apportionment (determining the source of emissions that impact the Scenic Area), and 2) prediction of future impacts needed to evaluate control strategy alternatives.

Source apportionment of current emissions.

Models can be used to help verify and describe the cause-and-effect relationships suggested by monitored data. When there is reasonable agreement between monitored values and modeled estimates, then there is good confidence that the physical and chemical processes influencing air quality are reasonably understood. A source attribution model is a mathematical model that tells us how much of an impact we can attribute to a source or type of sources. There are several types of attribution models. Some work in a forward manner from emission sources to receptors (locations in the Scenic Area). These models work by taking a known mix of emissions, transporting them by and through meteorological conditions, chemically transforming the pollutants, and finally depositing the resulting chemical species in the air or on the ground in locations of interest (receptors).

Other models work in the reverse. In this process, monitored data is analyzed for its chemical constituents, and an attempt is made to match that composition with what we know about the chemical profiles from a variety of emission sources. Essentially, each source category has a unique "finger print" that can suggest whether or not the source was responsible for all or part of the impact. Used alone, however, reverse attribution models in general can only identify types of sources (e.g., pulp mills versus diesel vehicles versus coal fired boilers) rather than specific individual sources.

Prediction of impacts from future emissions.

A major goal of the study is the development and application of a model or models that can be used to assess changes in air quality within the Scenic Area due to changes in emissions in source areas. (That is, the development of air quality models that can predict future impacts from changes in emission rates.) These types of models are known generally as air quality predictive models, and they are necessary for the development of control strategies. These models will generally be the same as the source attribution models, but instead of identifying current sources impacting the Scenic Area (and trying to reproduce the monitored impacts), they will be used to predict future air quality impacts from a variety of emission scenarios.

Types and refinement of models

Several different types of modeling are proposed to coincide with each phase of study. Modeling costs vary in part based on the number of air quality cases or episodes evaluated, and how finely resolved the inputs are (such as terrain and wind fields). Currently, it is reasonable to run models with a relatively coarse resolution, with inputs such as meteorology, terrain, land-use, and emissions allocated to 12 kilometer grids. A model using inputs at this resolution can adequately evaluate the transport of pollutants from regions outside of the Scenic Area to the entrances of the Scenic Area.

Because the terrain within the Scenic Area is complex, narrow and deep, models with inputs gridded at a much finer resolution are need to accurately see what happens to pollutants once they enter the Scenic Area. Higher resolution modeling sufficient to accurately capture the terrain, and other characteristics of the Scenic Area is being developed. The costs to run fine resolution models are high because of the added cost to refine the inputs to the model (including the emissions inventory), and the increase in computing needs and time. Both coarse and fine resolution modeling will be needed to accurately characterize chemical and physical processes in the Scenic Area.

Regional Haze modeling.

In response to the Federal Regional Haze Rule, predictive air quality models are being developed through the Western Regional Air Partnership (WRAP). The Regional Haze modeling is designed for large regional-scale transport at a coarse resolution (36 km). As part of the this effort, Idaho, Oregon and Washington have initiated the formation of the Northwest Regional Technical Center (NWRTC). This proposal is tasked with the

analysis of the transport, dispersion, and chemical transformation of airborne emissions throughout the Pacific Northwest with a focus on the development of Regional Haze Plans. Although, the products resulting from NWRTC efforts will be useful to the analysis of impact in the Scenic Area, such regional models will not provide the finer resolution (1 – 12 km) necessary to understand transport near and within the Scenic Area. Developing finer resolution capabilities for regional haze will be the responsibility of individual states. With respect to the Scenic Area, additional fine resolution modeling work as proposed in this study plan will complement the efforts of the NWRTC.

Proposed modeling.

As discussed above, there are two main objectives to the modeling component of the study:
1) to help understand current sources contributing to air pollution within the gorge.
2) to provide a modeling methodology for future use in quantitatively estimating air quality changes resulting from different emissions scenarios.

For objective 1, monitoring data, emissions inventories, chemical and dispersion modeling, back-trajectories and other methods, in combinations with meteorological and chemical transport modeling will be used. The results of these studies will form a conceptual framework of the physical and chemical processes affecting air quality in the Scenic Area, and draw conclusions regarding current sources of air quality degradation.. Chemical modeling will include chemical (fingerprint) models such as Chemical Mass Balance (CMB), and the ISOPART chemical transformation model. Thus, a variety of techniques will be used to gather information, rather than relying exclusively on results from a particular analysis or modeling exercise. Conclusions will be based upon a preponderance of evidence.

For objective 2, it is proposed to use a three-dimensional chemical transport photochemical model. The proposed model is the EPA Community Multiscale Air Quality (CMAQ) Dispersion Modeling System, together with its associated process modules. The WRAP regional haze modeling, as described above, will use the same model, and synergies should develop between the two efforts. As described in objective 1, CMAQ will be used in conjunction with the conceptual framework to better understand how processes work in the Scenic Area. CMAQ will be the primary model used for source attribution, and also the predictive model for evaluation of emission scenarios needed for control strategy development (not done as part of this study).

Other modeling tools may also be tested for use in informing some components of the study, most likely in the formation of the conceptual framework. If simpler modeling tools can be demonstrated to give equivalent results to more sophisticated methods, they may be applied to consider additional cases that cannot be addressed with the complex modeling system (CMAQ) due to resource constraints. Examples of simpler, less costly models include CMB, ISOPART, and CALPUFF run in both the forward and reverse mode.

A complete discussion of monitoring, modeling, and emission inventory programs is in Appendix A.

Long-Term Monitoring

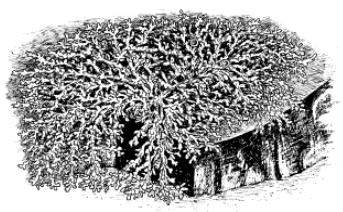
Phase 3-On-going Monitoring: The final phase is continuous long-term trends monitoring to track the progress of any implemented strategy. Progress toward the air quality goal will be checked at periodic intervals. If the agreed-upon rate of progress is not achieved, then the air quality strategy will be revisited and modified if necessary. To ascertain why the strategy is not achieving reasonable progress and to develop new or modified strategies, additional modeling and monitoring may be necessary. Phase 3 is ongoing. The number and general location of long-term monitoring sites cannot be determined until completion of the Foundation Study.

Economic Analysis - Econometric Modeling

Economic analysis is also needed for strategy development so that decision-makers and the public can evaluate cost-benefit issues associated with each air quality strategy option. Econometric modeling will be used to inform the strategy development process.

Econometrics uses statistical theory in application to real world economic problems. It allows us to estimate the strength of economic relationships as well as forecast economic variables based on historical data, which allows businesses, consumers, and decision-makers to better understand the economic environment in which they participate. Common econometric tools include shift-share analysis and input-output modeling. These tools can be applied to various air-quality improvement scenarios to forecast their respective economic impacts. These analysis tools will be used by decision-makers to evaluate the cost information needed to weigh cost-benefit questions associated with each strategy option. It is important to note that economic impacts need not be negative. Reducing air pollutants can produce economic benefits. For example, reducing air pollution in the Scenic Area would likely benefit both the tourism and agricultural industries.

The Advisory Committee will be convened in 2002 to begin work on air quality issues. One of the first issues addressed by the Committee will be an evaluation of growth forecasts within the Scenic Area and region. These include expectations for future growth and change in population, demographics, businesses, and employment. Information on population growth and economic change will be developed in consultation with appropriate states agencies, local government, as well as local economic experts. Economic analysis will rely on an evaluation of existing economic data for the Gorge and region.



REGIONAL STRATEGY DEVELOPMENT

PUBLIC/STAKEHOLDER/TRIBAL INVOLVEMENT PROCESS

MAKING DECISIONS ABOUT AIR QUALITY- Roles and Responsibilities

The Columbia River Gorge Air Quality project will rely on a collaborative decision-making process. This means involving the public, stakeholder groups, tribes, local government, local business, and others in making decisions about resource protection in the NSA. Each state and federal agency, local government, stakeholder group, and Indian nation has a role in developing the regional air quality strategy. Project oversight and management is the main responsibility of the state environmental agencies and the Southwest Clean Air Agency, with guidance from several partners such as Gorge area counties, state community & economic development agencies, the U.S Forest Service, and local tribes. Local elected officials, stakeholder groups, tribes, and the public will be involved at multiple levels in the decision-making process and will help guide the development of the air quality strategy. These groups will have the added responsibility to become better informed about Gorge air quality, and to participate in the collaborative process.

Role of State Agencies, Southwest Clean Air Agency, and the U.S. Forest Service

Under the Scenic Area Management Plan, the states of Oregon and Washington have the responsibility to develop an air quality strategy that meets the purposes of the Scenic Area Act. For the purposes of this work plan, "the states" includes the Oregon Department of Environmental Quality (ODEQ), Washington Department of Ecology (WDOE), and the Southwest Clean Air Agency (SWCAA). The Southwest Clean Air Agency serves in the role of a state environmental agency and is responsible for enforcing federal, state, and local outdoor air quality standards and regulations in Clark, Cowlitz, Lewis, Skamania, and Wahkiakum counties of southwest Washington state. In doing this work, these agencies must rely heavily on other partnerships as well. The NSA Management Plan calls for a partnership with the U.S Forest Service, which will offer its expertise and perspective throughout the strategy development process. The Oregon Department of Community and Economic Development and the Washington Office of Trade and Economic Development are two important partners as well. Their expertise is needed to help evaluate economic factors when options for air quality strategies are evaluated.

Strategy Development

The states' goal is to develop an air quality strategy that meets the dual purposes of the Scenic Area Act, and that reflects to the greatest extent possible the broad range of interests and values held by people, tribes, businesses, local governments, and others within the Scenic Area. To accomplish this, the states will establish an **Advisory**

Committee representing a cross section of the many different interests that have a stake in the future of the National Scenic Area. The following sections discuss Committee membership and describes the public process they will use to develop a preferred air quality strategy for the Scenic Area.

The committee will use a consensus process to develop a recommended air quality strategy for the Columbia River Gorge National Scenic Area. This means working hard to find common ground on a strategy that is both equitable and successful. The Committee will recommend a preferred strategy to the Oregon DEQ, Washington DOE, and the Southwest Clean Air Agency, which will in turn seek concurrence on the strategy from the Columbia River Gorge Commission. Building consensus among varied interests means that the strategy recommendation is one that the community, businesses, and other interests can support. The states will place great weight on a strategy recommendation developed through this collaborative process. However, the states do have the obligation to evaluate initially whether the recommendation reasonably meets the purposes of the National Scenic Area Act.

As the regional policy-making body for the Columbia River Gorge National Scenic Area it is the responsibility of the Columbia River Gorge Commission to decide if the recommended strategy meets the purposes of the National Scenic Area Act. If the Commission concurs with the proposed strategy, the strategy will be taken forward by the states for implementation. If the Commission finds the proposed strategy does not meet the Act's purposes (fails to concur), they will send it back to the states and Advisory Committee for further work. The Commission would provide a clear explanation of where they believe the strategy is deficient in meeting the purposes of the Act.

Role of Elected Officials, the Public, Tribes, and others

There are many opportunities for elected officials, tribes, stakeholders, and the public to participate in developing the air quality strategy. These are described in more detail throughout this work plan. In brief, key elected officials, tribes, as well as stakeholder and community interest groups will serve directly on the advisory committee. Other elected officials, stakeholder groups, and the general public will participate through meetings, public forums, workshops, and other venues. However, the main avenue for input will be through the stakeholder advisory committee process.

Stakeholder Advisory Committee

Responsibilities and Membership

The Advisory Committee will have the responsibility to review the results of our scientific investigation, evaluate options for improving air quality, evaluate the results of economic analysis, and weigh cost-benefit questions as they consider different strategy options. The Committee will make a recommendation to the states for a preferred air quality strategy that meets the stated goals.

First Steps for the Advisory Committee

The Advisory Committee will be convened in 2002. In addition to addressing questions of Committee structure, groundrules, and leadership, the Committee will have several other important issues to address over the first 18 months. These include:

Funding: A critical early role for the Advisory Committee will be to work with the states to evaluate funding sources.

Pollution Prevention: The technical study needed to characterize Gorge air quality and develop analysis tools will take several years. During that time, the Advisory Committee will evaluate possible voluntary measures that could be taken quickly to reduce emissions believed to impact the Gorge. Existing air quality data and results from the Technical Foundation Study may be useful in evaluating candidate emission sources for pollution prevention measures.

Education: The states will work with the Committee to develop a common understanding of air quality issues in the Gorge.

Review Foundation Study: The Committee will review the results of the Technical Foundation Study as they become available. This work may be useful in the Committee's pollution prevention efforts.

Growth and Change: The Committee will assist the states in reviewing expectations for future growth and change in the Gorge and in the Region. This will include developing agreed upon forecasts for population and employment.

Phase-2 Technical Study: The Committee, either in full or through a subgroup, will work with the states to select the Phase-2 Technical Study Plan. The organizational structure of the Advisory Committee, including the establishment and make-up of any subcommittees will be addressed during the Technical Foundation Study period as the Committee works with the states to develop the second phase technical study program. Every effort will be made to ensure that the selected organization promotes close communication among all the participants and ensures a defensible scientific foundation for the project.

Committee Membership

The Advisory Committee will have broad representation reflecting the many diverse interests in the National Scenic Area, and those who may be impacted by decisions made in developing the regional strategy. The challenge of developing any broadly based advisory group is in having a representative cross section of interests while keeping the group to a size that can function effectively. Interests not identified for Committee membership can still be a valuable resource to the Committee.

The following interests have been identified as Advisory Committee members, and will be invited to serve by the states. The Committee Membership has been developed by the Inter-Agency Project Coordination Team after reviewing public comment. The Advisory Committee will develop recommendations by consensus. Therefore, a strict "balance of interests" is not as crucial as it would be were the Committee to use a "majority vote". The Project Team has sought a fair representation of interests and perspectives within the Committee to address both purposes of the Scenic Area Act. Interests (sectors) represented on the Committee include:

- One representative from Wasco County.
- One representative from Klickitat County.
- One representative from Hood River County.
- One representative from Skamania County.
- One representative from Multnomah County.
- One representative from Clark County.
- One representative each (Oregon and Washington) from major industry within the National Scenic Area (NSA).
- One representative each (Oregon and Washington) of major industry outside the NSA (but which may impact the NSA).
- One representative from an environmental organization located within the NSA.
- One representative from an environmental organization located outside the NSA (Oregon).
- One representative from an environmental organization located outside the NSA (Washington).
- One representative from a recreational organization.
- Two "citizens at large" from Oregon.
- Two "citizens at large" from Washington.
- One representative for Ports within the NSA.
- One representative for the Port of Portland.
- One representative each (Oregon and Washington) from agricultural interests within the NSA.
- One representative from METRO Regional Government (representing the greater Portland/Tri-County area).
- One representative from the Columbia Gorge Economic Development Association.
- One representative from the Regional Transportation Council (Clark County Transportation planning group).
- One representative from the Columbia River Gorge Visitors Association.
- One representative from the Warm Springs Indian Nation$^{\Psi}$
- One representative from the Umatilla Indian Nation$^{\Psi}$
- One representative from the Yakama Indian Nation$^{\Psi}$
- One representative from the Nez Perce Indian Nation$^{\Psi}$
- One representative from the U.S. Forest Service
- One representative from the U.S. Environmental Protection Agency

[Ψ] *Note: As sovereign nations, the Warm Springs, Umatilla, Yakama, and Nez Perce tribes will also participate at the state and federal level through the routine government-to-government consultation process.*

Committee Selection

Each sector (or interest group) invited for Committee membership will be asked to select one representative and one alternate to serve on the Committee. In most cases (with the exception of County government) the states will solicit nominations from each sector and select from those nominees to fill the Committee seats. If more than one group desires to represent their sector, the states will select the group they believe will best represent the majority of interests from that sector. The states will solicit and select representatives for "Citizen's At Large". Due to their role as elected public officials, the states will consult with the six Gorge area counties regarding the selection of Citizen's At Large. The six Gorge area counties will appoint their own representatives to the Advisory Committee.

Role of States and the Forest Service in Committee Process.

The Oregon Department of Environmental Quality, the Washington Department of Ecology, and the Southwest Clean Air Agency will not serve on the Advisory Committee but will provide staffing support, providing information and analysis as needed. The Oregon Department of Economic and Community Development and the Washington Department of Trade and Economic Development will also help staff the Committee and will be a resource on economic issues. The U.S. Forest Service will serve on the Advisory Committee and will also provide staffing support.

Advisory Committee - Decision Making Process

Using a Consensus Process

Why use a **consensus process**? The directive under the Scenic Area Act to "protect," "enhance," and "support" valued resources and local economies is very broad and subject to some interpretation. The states wish to develop a decision-making approach that allows the Advisory Committee, stakeholders, and the public to find common ground to the greatest extent possible, and achieve a balance of community interests that still meets the desired goals. Of all approaches considered, the consensus process offers the best chance to achieve win-win solutions for meeting both purposes of the Scenic Area Act.

A collaborative decision-making process requires that all participants commit to work in good faith toward consensus recommendations. Consensus is a process of *"give & take,"* of finding common ground and creative solutions to meet the purposes of the Scenic Area Act in a way that all interests can support. Consensus is reached if all interests at the table support an idea, or can at least say; *"I can live with that."* In a consensus process, the first goal is for the Committee to understand the perspectives of each stakeholder interest. From that understanding, the group works to develop solutions that address each other's needs.

What Happens if the Committee Can Not Reach Consensus on an Issue?

It is likely that any impasse will involve an important issue that must eventually move to resolution. While the states hope that all issues can be resolved by the Committee, it is important that contested issues have a means of moving forward. The states and Advisory Committee will go to great lengths to reach decisions through consensus. However, if the Advisory Committee can not reach consensus on an issue (reaches an impasse), the Committee will document the issue and differences of opinion involved, and submit the issue to the Oregon DEQ, Washington DOE, and Southwest Clean Air Agency (SWCAA) for resolution. In resolving any impasse, the three environmental agencies will consult with the U.S. Forest Service, the Oregon and Washington Economic Development Agencies, and other affected stakeholders.

Every decision-making process has its strengths and weaknesses, however the states believe that the consensus process has the best chance of building a strategy with broad public acceptance. Also, knowing that the three environmental agencies ultimately would resolve an impasse may motivate Committee members to reach consensus.

Other Important Principals in Designing a Collaborative Decision-Making Process

Trust and Ownership: An important part of the advisory process will be to provide a *learning environment* for all participants to develop basic knowledge about Gorge issues. The process could provide for ongoing help and "tutoring" for sectors that have less technical and/or policy resources. The process will place some of the "doing" with the participants, through work groups, team assignments, and other methods, so that they build ownership of the information and the outcomes. It is recognized that there may be some tension between various sectors participating in the stakeholder group. The states will evaluate the need to work with these interests prior to beginning the decision-making process to build trust and assure them a fair process.

Public Accessibility: The Committee meetings will be open to the public. The Committee will be encouraged to dedicate time within each meeting agenda for public comments and questions. To make the meetings accessible to as many as possible, the Committee will be encouraged to hold meetings in several locations both inside and outside the Scenic Area.

Ground Rules

Ground rules are established to help support a collaborative and constructive process. Ground rules should be developed by the advisory group itself, with guidance from a professional facilitator, the committee chair, and/or the project coordination team. Examples of some key ground rules that could be agreed to include:

- *Strive for broad consensus on issues.*
- *Commit to participate constructively.*

- *Evaluate and define common goals.*
- *Identify areas with greatest potential for conflict and discuss ways to address these issues.*
- *Agree to set aside the time required for meetings and between-meeting review of information, to participate actively and constructively at meetings, to strive to reach agreement within the group on recommendations and to respect the ground rules.*
- *Achieve closure on issues as they are processed.*
- *Understand and document continuing concerns and inability to support elements of the results.*
- *Close the loop on comments and questions. Ensure that participants can see how their interests and inputs were involved in shaping the results (even if they do not like the outcome).*
- *Consult regularly with broad constituencies and attempt to provide inputs and reactions to ideas that represent those interests.*
- *Achieve political consistency and support for outcomes, without allowing "end runs" around the advisory process to achieve individual sector changes.*

Support for outcomes is particularly important to the success of any collaborative decision making process. Decision-makers must uphold their commitment to work through the consensus process, and not attempt to effect a different outcome once a consensus recommendation has been reached. The commitment to this collaborative process can be defined specifically in a Committee Charter.

It is important to afford the Advisory Committee every opportunity to reach consensus; and if they can not, to have any resolution by the states reflect the values of the Committee to the greatest extent possible. The following groundrules would help meet these objectives and are included here for consideration by the Committee:

- **Cooling-Off Period**: If consensus can not be reached, the issue would be tabled for a reasonable amount of time, allowing a "Cooling Off" period. The Cooling-Off period allows for additional discussion with constituencies, the gathering of new information, or perhaps just sufficient time to consider options more carefully. The Committee would then revisit the issue and strive again for consensus.

- **Guiding Principles**: If ultimately the Committee fails to reach consensus on an issue (reaches an impasse), then the issue will be documented and sent to the three state environmental agencies for resolution. While the Committee may not be able to agree on the issue itself, they may reach agreement on some basic guiding principles to be used by the states in resolving the issue. These guiding principles would reflect the key values and priorities being weighed by the Committee.

- To lessen the possibility of polarization among Committee interests, the Committee will not have the option of using a majority vote to resolve disputed issues.

Develop a Group Charter

A Committee Charter is a useful tool that can help support a collaborative decision-making process. A Charter would describe and document overarching issues such as a goal statement, commitment to collaborative decision making process, ground rules, etc. A Charter can help instill a sense of ownership and common ground. Outside a Charter, the group will agree on meeting structure, and approximate meeting schedules.

Committee Mission

The states, with assistance from a professional facilitator, will develop an initial draft Charter for the Committee. Issues addressed by the initial Charter will include a "Mission" or "Goal" statement for the Committee. The goal and mission of the Committee is the same as that given to the states; to develop an air quality strategy that protects and enhances the scenic, natural, cultural, and recreational resources of the Gorge while also protecting and supporting local Gorge economies in a manner consistent with the first purpose of the Scenic Area Act.

The charge to "protect and enhance" resources and "protect and support" economies can be broadly defined, and is open to some interpretation. It is the Committee, with assistance from stakeholders and the public, who will ultimately set the goal for this work. Through the strategy development process (evaluation of options for air quality improvement and associated costs), the Advisory Committee, together with stakeholders and the public will define what it means to "protect, enhance, and support" air quality and local economies in a way that is consistent with the purposes of the National Scenic Area Act. The states and Gorge Commission must also concur.

Role of Facilitation and Mediation

The Committee will use a professional facilitator to assist in the collaborative process. A facilitator will help guide the process to ensure all stakeholder interests are heard. If asked to serve in a mediation role, the facilitator will be able to act as a negotiator to help resolve conflicts within the group, or to help the Committee pursue ideas for strategy options. The states and Committee will work together to select an appropriate facilitator.

Special Issue Workgroups

The committee will need to evaluate many complex issues. The committee will have the option to form subgroups as needed to focus on specific issues and ideas, and bring back recommendations to the full committee membership. A subgroup allows stakeholders with expertise in certain fields to focus intensely on a complex question or issue. The full committee provides the integrating structure where issues and ideas can be understood together and in context. For example, the Committee could establish a special workgroup to consult with social service agencies in evaluating the impact on low-income homeowners from open burning or woodstove strategies. Other special issue groups may include meeting with electric utilities to discuss air quality and energy issues.

Defining a leadership structure for the Advisory Group

When the Committee is formed, members will need to discuss several issues regarding group structure and process, including group leadership. The use of a Committee Chair is a common leadership approach for an advisory committee, and the selection of the Committee Chair is a vital first step. The role of Committee Chair is a difficult one and the success or failure of a committee greatly depends upon the ability of the chair to facilitate a fair and equitable process for discussion and decision-making. There are several key concepts common to the function of any Committee Chair:

- The chair must be perceived as neutral and fair, and should not have a vested interest in most issues being considered by the Committee. This does not mean that the chair will have no interest, but the role of chair is to ensure an open and fair process for decision-making, not lobby for a particular outcome. If a conflict of interest exists on a particular topic the chair should acknowledge it and have someone else facilitate that discussion.

- The chair needs to keep the Committee on task and keep each meeting agenda moving. The chair needs to be clear on what action, if any, the committee is being asked to take on each agenda item. The chair also ensures an opportunity during each meeting for members of the public or other visiting stakeholders to voice their opinion.

- The chair should work with all committee members to ensure that each viewpoint is being expressed. In general, the chair should elicit opinions from committee members before voicing his or her own. The chair must be accessible to Committee staff to discuss issues as they rise and anticipate problem areas.

Appointing a Chair: Typically, committee chairs are appointment by the lead agencies (in this case Oregon DEQ, Washington DOE, and SWCAA) based on nominations from the advisory group. Other options could be explored as well.

Evaluation of Strategy Options - Selection of Strategy Recommendations

The Committee will have several tools at their disposal to develop options for an air quality strategy:

- The results of the scientific investigation will have characterized air quality in the Gorge and identified those emission sources (both inside and outside the Gorge) that significantly contribute to air quality impacts in the National Scenic Area.

- Predictive modeling tools will be available to estimate future air quality trends in the Gorge and test the effectiveness of various emission reduction strategies. The

modeling tools will evaluate the amount of air quality improvement that can be expected from any collection of strategies.

- ❖ Economic models will be used to evaluate the potential costs and economic consequences of various strategy options. This analysis will provide the cost information needed to weigh questions of cost-benefit. The states will work with the Committee and economic experts to develop appropriate criteria for the cost benefit evaluations.

Developing Air Quality Strategy Options

Based on results of the air quality study, and using the predictive modeling tools, the Committee will evaluate future air quality in the Scenic Area. The Committee will begin by evaluating air quality improvement in the Gorge that can be expected from existing state and federal programs, such as new federal emission standards for cars and trucks. The Committee, with input from stakeholder groups and the public, will then consider whether any additional emission reductions are needed. Some of the existing programs that will be evaluated include:

- Regional Haze Program: The Gorge will likely benefit from the federal Regional Haze Program which is designed to improve air quality in Class I areas (Mt. Hood, Mt. Adams).
- Ozone Strategies: Ozone plan updates for Portland/Vancouver and Seattle may produce an air quality benefit in the Gorge.
- 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 Mt. Hood and Mt. Adams Class I areas, the Gorge will benefit indirectly from the New Source Review program.
- National Programs for On-Road Mobile Sources (Cars & Trucks) and Heavy Duty Diesel Vehicles and Engines.
- National Programs for Nonroad Engines, including new standards for locomotives and marine vessels.
- National Air Toxics Emission Standards: Maximum Achievable Control Technology Standards for some major point sources (Air Toxics Rules).

It is unknown at this time what affect these programs will have on air quality in the Columbia Gorge, or when any benefits may be achieved. Many of these programs are scheduled to phase in over 10 to 30 years or more. The time frame in which benefits are expected from these programs will be a key issue for discussion by the Committee.

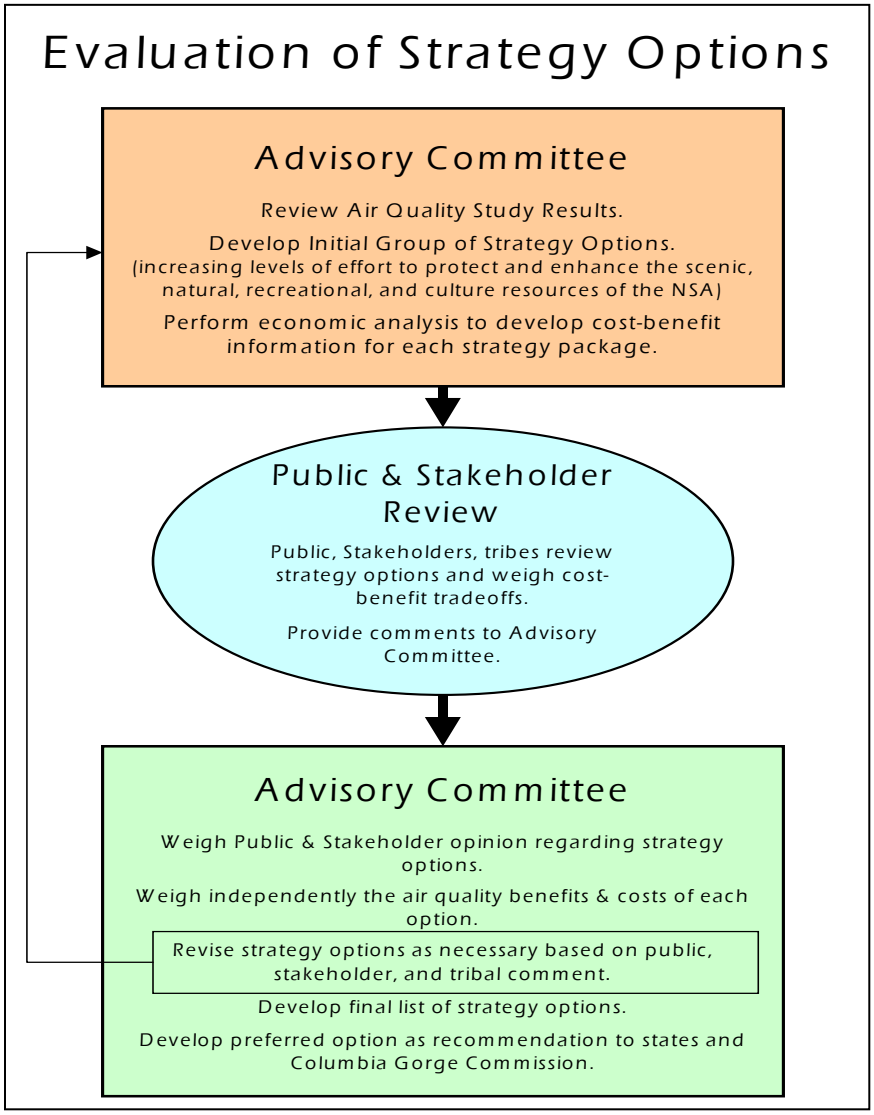
Predicting the Future

One of the most important pieces of information the Committee will use in developing air quality strategy options are the assumptions and forecasts of future growth and change within and outside of the NSA. Forecasts for population, housing, and anticipated changes in economics and employment will all affect estimates of future emissions and air quality. In developing strategy options, the Committee will evaluate the various

assumptions for anticipated growth and change that will influence future emissions. Air quality forecasts will be based on growth and other planning assumptions agreed upon by local governments, the states, and the Committee.

Evaluation of Strategy Options - Public, Stakeholder, and Tribal Involvement

Public and stakeholder involvement is a vital part of the strategy development process. Initial strategy options developed through the committee process, including the associated cost-benefit analysis, will be taken before the public and stakeholders for review and comment. Feedback from the public will help inform the Advisory Committee as they develop their recommended strategy.



Goal Setting

The charge to "protect and enhance" resources and "protect and support" economies is subject to some interpretation. The Advisory Committee, together with stakeholder groups and the public, will use the strategy analysis process to define what it means to "protect, enhance, and support" resources and local economies in a way that is consistent with the purposes of the National Scenic Area Act. The Committee will begin by evaluating the effect of existing programs on air quality. If the Committee believes additional measures are needed for the Scenic Area, they will develop a series of strategy options, each providing an increasingly greater level of air quality protection. Once the air quality benefit of each option is understood, economic modeling and analysis will be performed to assess the economic impacts of the various strategies. From these analyses will come important cost-benefit information needed to weigh air quality and economic questions. It is through this process of

evaluation and the weighing of cost-benefit tradeoffs that the Committee, stakeholders, and public will define what it means to meet the purposes of the Scenic Area Act.

Final Selection of a Preferred Regional Air Quality Strategy

Once public, stakeholder, and tribal input are gathered, the Committee will refine and finalize the strategy options. Strategy options may be presented for public comment several times as they are refined. In brief, the Advisory Committee will:

- *Evaluate public and stakeholder input regarding the initial strategy options,*
- *Evaluate independently the air quality benefits and costs of each strategy option, and*
- *Develop and recommend to the states a preferred regional air quality strategy that meets the objectives of the Gorge Area Management Plan and meets the dual purposes of the National Scenic Area Act.*

Next Steps

The Advisory Committee will make a recommendation to the Oregon Department of Environmental Quality, Washington Department of Ecology, and Southwest Clean Air Agency for a preferred air quality strategy. The three environmental agencies will make an initial assessment as to whether the recommendation meets the purposes of the National Scenic Area Act. Barring any clear conflict with the Scenic Area or Clean Air Acts, the states will accept the recommendation of the Committee.

The Columbia River Gorge Commission has responsibility under the Scenic Area Management Plan to protect natural, scenic, cultural, and recreational resources. The Commission will rely on the three state environmental agencies to develop an air quality strategy for the NSA. However, as the regional policy-making body for the Scenic Area, the Gorge Commission must 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 it is consistent with those purposes.

It is the intention of the three environmental agencies to work with the Advisory Committee to develop a strategy based on sound science, with public input and involvement, that meets the purposes of the Scenic Area Act. Then bring the strategy to the Gorge Commission for their concurrence that the strategy indeed meets the dual purposes of the Act. Once the Commission has concurred, the states and other agencies as necessary will carry out implementation of the strategy. If, however, the Commission believes that the recommended strategy does not meet the intent of the Act, the strategy will be returned to the states and Advisory Committee for further evaluation, with specific guidance from the Commission on outstanding issues to be resolved.

Unified Strategy

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, will 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 not be precluded from taking appropriate early action to reduce emissions. The Committee will carefully consider questions of geographic fairness when developing a comprehensive strategy for the Scenic Area.

Once adopted, each emission reduction measure 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 such as emission control devices for major industrial facilities might be phased in on a multi-year schedule due to cost and other factors. The final air quality strategy will describe the various timelines for implementing individual emission reduction measures.

Regional Strategy Implementation

Once the Columbia Gorge Commission concurs on the recommended strategy, the states, as well as other agencies as needed, will move forward to implement the strategy. At this time we can not presume to know what the final strategy recommendations will be. A comprehensive strategy may involve both regional and local emissions sources affecting Gorge air quality. Such a strategy could combine measures that rely on both state rules and local ordinances, in addition to existing federal programs. The final strategy may also include a combination of mandatory and voluntary measures. The states will work with local governments as needed to adopt local ordinances as part of the strategy. Both state and local rulemaking efforts will include a separate public involvement process. The states will exercise their authority to regulate emission sources both inside and outside the Scenic Area should it be necessary under the final strategy.

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 NSA will be tracked to ensure that improvement is made as expected.

Estimated Funding Level Needed

Estimates of resources needed to fund the Technical Foundation Study and for supporting the strategy development process are provided below. Results of the Technical Foundation Study will be used by the states and Advisory Committee to design the Second-Phase Technical Study Plan (anticipated in 2003 to 2004). A budget for the second-phase study will be available at that time. Current cost estimates for the Phase-2 Technical Study range from approximately $2 million to $9 million, with the most likely cost ranging from $3-6 million. The Foundation Study will allow technical staff and the Committee to better refine these estimates.

Project Task	Estimates Range of Costs	Time frame for Funding
Technical Foundation Study	Approximately 1,000,000	2001-2002
Phase-2 Technical Study	To be determined	To be determined
Econometric Modeling and Analysis Evaluating three-five strategy options	60,000 to 150,000	2003-2006
Public/Stakeholder Advisory Process Three air quality agencies support and staffing for Advisory Committee and decision-making process. Public, Stakeholder and tribal outreach and involvement.	$350,000	2003-2006
Total Estimated Cost Range	Approximately $1.44 million plus cost of Phase-2 technical work.	

Funding levels are general estimates only and may be revised as additional information becomes available.

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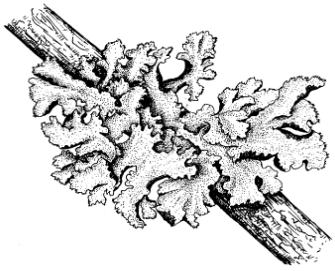

GLOSSARY

Key words described here are those commonly used in discussions of air quality and visibility. Not all appear in the work plan document, but are included for general interest and information.

Air pollutant: An unwanted chemical or other material found in the air.

Air pollution: Degradation of air quality resulting from unwanted chemicals or other materials occurring in the air.

Air Quality Values (AQRVs): including visibility, flora, fauna, cultural and historical resources, related values odor, soil, water, and virtually all resources that are dependent upon and affected by air quality. "These values include visibility and those scenic, cultural, biological, and recreation resources of an area that are affected by air quality"

Apportionment: to distribute or divide and assign proportionately

Dry deposition: Also known as dryfall, includes gases and particles deposited from the atmosphere to water and land surfaces. This dryfall can include acidifying compounds such as nitric acid vapor, nitrate and sulfate particles, and acidic gases.

Emissions: Release of pollutants into the air from a source.

Extinction: the attenuation of light due to scattering and absorption as it passes through a medium.

Extinction budget: Apportioning the extinction coefficient to atmospheric constituents to analysis estimate the change in visibility caused by a change in constituent concentrations.

Fine particles: Particulate matter with an aerodynamic diameter of 2.5 microns or less (PM2.5). Fine particles are responsible for most atmospheric particle-induced extinction. Ambient fine particulate matter consists basically of five species: sulfates, ammonium nitrate, organics, elemental carbon, and soil dust.

Haze: an atmospheric aerosol of sufficient concentration to be visible. The particles are so small that they cannot be seen individually, but are still effective in scene distortion.

Humidity: Water in air, as a gas. Often measured as a percentage, compared to the maximum amount of water vapor the air can contain at that temperature.

Hydrocarbons: compounds containing only hydrogen and carbon. Examples: methane, benzene, decane, etc.

Impairment: The degree to which a scenic view or distance of clear visibility is degraded by man-made pollutants.

IMPROVE: Interagency Monitoring of PROtected Visual Environments.

Integrating nephelometer: an instrument that measures the amount of light scattered (scattering coefficient).

Light-absorbing carbon: carbon particles in the atmosphere that absorb light. Black carbon.

Light extinction budget: the percent of total atmospheric extinction attributed to each aerosol and gaseous component of the atmosphere.

Monitoring: Measurement of air pollution and related atmospheric parameters

National Ambient Air Quality Standards: Permissible levels of criteria air pollutants established to protect public health and welfare. Established and maintained by EPA under authority of the Clean Air Act.

Nephelometer: an instrument used to measure the light scattering component of light extinction.

Particulate matter: Dust, soot, other tiny bits of solid materials that are released into and move around in the air.

Perceptible: Capable of being seen.

Photochemical: Any chemical reaction which is initiated by light. Such processes are process important in the production of ozone and sulfates in smog.

Rayleigh scattering: the scattering of light by particles much smaller than the wavelength of the light. In the ideal case, the process is one of a pure dipole interaction with the electric field of the light wave.

Reconstructed light extinction: The relationship between atmospheric aerosols and the light extinction coefficient. Can usually be approximated as the sum of the products of the concentrations of individual species and their respective light extinction efficiencies.

Regional haze: A cloud of aerosols extending up to hundreds of miles across a region and

promoting noticeably hazy conditions. Condition of the atmosphere in which uniformly distributed aerosol obscures the entire vista irrespective of direction or point of observation. Is not easily traced visually to a single source.

Scattering (light): an interaction of a light wave with an object that causes the light to be redirected in its path. In elastic scattering, no energy is lost to the object.

Scattering efficiency: The relative ability of aerosols and gases to scatter light. A higher scattering efficiency means more light scattering per unit mass or number of particles, this in turn means poorer visibility. In general, fine particles (diameter less than 2.5 microns) are efficient scatterers of visible light.

Secondary aerosols: aerosol formed by the interaction of two or more gas molecules and/or primary aerosols.

Secondary particles: form in the atmosphere by a gas-to-particle conversion process.

Smog: A mixture of air pollutants, principally ground-level ozone, produced by chemical reactions involving smog-forming chemicals. See also haze.
SO2:

Soot: Black particles with high concentrations of carbon in graphitic and amorphous elemental forms. It is a product of incomplete combustion of organic compounds.

Stable air mass: an air mass which has little vertical mixing. See temperature inversion.

Stagnation periods: lengths of time during which little atmospheric mixing occurs over a geographical area, making the presence of layered hazes more likely. See temperature inversion.

Standard visual range: reciprocal of the extinction coefficient. The distance under daylight and uniform lighting conditions at which the apparent contrast between a specified target and its background becomes just equal to the threshold contrast of an observer, assumed to be 0.02.

Sulfates: those aerosols which have origins in the gas-to-aerosol conversion of sulfur dioxide; of primary interest are sulfuric acid and ammonium sulfates.

Sulfur dioxide: a gas (SO2) consisting of one sulfur and two oxygen atoms. Of interest because sulfur dioxide converts to an aerosol that is a very efficient light scatterer. Also, it can convert into acid droplets consisting primarily of sulfuric acid.

Temperature inversion: in meteorology, a departure from the normal decrease of temperature with increasing altitude such that the temperature is higher at a given height in the inversion layer than would be expected from the temperature below the layer. This warmer layer leads to increased stability and limited vertical mixing of air.

Total light extinction: The sum of scattering (including Rayleigh scattering) and absorption
coefficients.

Unstable air mass: an air mass that is vertically well mixed. See also stable air mass, temperature inversion.

Visibility: refers to the visual quality of the view, or scene, in daylight with respect to color rendition and contrast definition. The ability to perceive form, color, and texture.

Visual range: the distance at which a large black object just disappears from view.

Wet deposition: The deposit of atmospheric gases and particles (incorporated into rain, snow,
fog, or mist) to water or land surfaces.

APPENDIX A

Columbia River Gorge Visibility and Air Quality Study, Working Draft: Existing Knowledge and Additional Recommended Scientific Assessment to Consider, June 2001. Provides a more detailed discussion of existing air quality knowledge and technical assessment needs for the Columbia River Gorge NSA.