Air Quality Issues at
Shenandoah and Great Smoky Mountains National Parks

1993

I. **The Factual Foundation: Research and Monitoring Results**
Substantial research and monitoring have been performed at both parks over the last decade. Resources known to be impacted: visibility, streams, soils, vegetation

A. **Visibility:** Since 1948, when the National Weather Service started measuring visibility, annual average visibility in the Southern Appalachians has decreased 60% overall--80% in summer, and 40% in winter. Summer used to have some of the best visibility, and now it has the worst. The average annual visual range in the East is estimated to be one-fifth of natural visual range.

B. **Streams:** Based on extensive work at Shenandoah, most Shenandoah and Great Smoky Mountains National Parks streams are sensitive to acidification; i.e., they cannot neutralize acids because of "base-poor," weather-resistant bedrock. In the past, the thick soils in these parks have adsorbed the acids, but these soils are now approaching saturation. Upon saturation, the acids go from the air *through* the soils and into the streams, causing rapid acidification. This rapid acidification in streams has been monitored in Shenandoah, documenting streams' acidifying 2-3 times over and losing insect and fish life in the process. The researchers predict this acidification will occur in many southeastern streams in the next 10-20 years.

C. **Soils:** Studies show that certain high elevation soils in Great Smoky Mountains are *nitrogen-saturated*, causing leaching of toxic aluminum that both hurts vegetation (by inhibiting uptake of nutrients) and hurts biota in streams. The nitrates also contribute to acidification of streams.

D. **Vegetation:** Ozone is injuring vegetation. Field surveys on about 10% of Great Smoky Mountain's trails revealed 95 species with ozone-like injury. Researchers have fumigated 30 of these species and confirmed the ozone injury on 27 of these. The higher the elevation, the more severe the ozone concentrations, doses, and injury. Also, acid deposition is damaging the valuable spruce-fir ecosystem of the Southern Appalachias, according to the National Acid Precipitation Assessment Program (NAPAP). This forest shows serious decline symptoms.

E. **Overall perspective:** The Southeast has probably experienced greater air quality deterioration than any other region of the country in the last few decades, and this deterioration appears likely to continue, because of--

- substantial and continuing growth and development

- natural conditions that *predispose* the Southeast to harmful pollution impacts, including:
  - some of the most frequent and severe stagnation in North America (low/no winds, coupled with other conditions that result in serious regional pollution episodes - high SO_x, NO_x and O_3)
  - substantial *biogenic* emissions, especially organics from vegetation (responsible for the "blue" in the Blue Ridge and the "smoke" in the Smoky Mountains, both overwhelmed now by an *unnatural* white or gray haze); these organics help to oxidize pollutants to other harmful forms and make siting new sources more difficult: putting a NO_x source near these natural organics can cause an "explosion" of ozone, as discussed in the National Academy of Sciences' 1991 report Rethinking the Ozone Problem
  - abundant "solar radiation," i.e., sun - that increases chemical activity in the atmosphere
  - substantial "vertical mixing" - which can result in the mixing of "pollution aloft" into the lower atmosphere
  - low "acid neutralizing capacity" in mountain streams, making these streams particularly vulnerable to acidification from atmospheric acids

II. Applying The Facts to The Law: Are the Above Impacts "Adverse"?

The Federal Land Manager (FLM), the Assistant Secretary for Fish and Wildlife and Parks, and the Class I area Superintendent have an "affirmative responsibility to protect air quality related values (including visibility)" from "adverse impacts"

A. The legislative history of this provision instructs the FLM and the Superintendent to be aggressive, err on the side of benefitting the resources, participate in the permit process, and challenge inappropriate permits in court. The NPS Management Policies reinforce this instruction.

B. **The NPS has defined the term "air quality related values" to include all values of an area affected by or dependent upon air quality. The Clean Air Act's legislative history incorporates into this term the Organic Act's "fundamental purpose to conserve unimpaired."**

C. The NPS' definition of "adverse impact" asks whether the impact--

a. Diminishes the class I area's national significance;

b. Impairs the quality of the visitor's experience; or

c. Impairs the structure and functioning of the ecosystem.

III. PSD New Source Review

Approximately 20 new power plants have applied for permits "near" Shenandoah in the last five years. "Near" Great Smoky Mountains NPS has reviewed over 25 major new sources during the last decade. Before 1990, NPS documented the resource impacts, asked for mitigation (e.g., offsets), but stopped short of finding "adverse impact" in a new source review.

A. Class I areas get highest degree of protection.

B. The Clean Air Act establishes <u>two tests</u> to protect Class I areas from pollution from "new sources" (including "major modifications" of existing sources).

1. In the <u>Class I increment test</u>, once baseline concentrations come under review by submission of a PSD preconstruction permit application, only the smallest increment of certain pollutants -- sulfur dioxide, nitrogen oxide and particulate matter -- may be added to the air by the proposed new source. A state shall not issue a permit to allow construction or modification of the source, when the FLM makes an adverse impact determination based on a projected violation of an increment -- an exceedance of the "maximum allowable increases for a class I area."

2. In the <u>adverse impact test</u>, the FLM is the expert whose opinion is to be given great weight from the state/EPA. Unless the Class I increment is violated, however, the State/EPA still hold ultimate decision-making authority, because the FLM must demonstrate "to the satisfaction of the State that the emissions from such facility will have an adverse impact on the air quality-related values (including visibility) of such lands."

C. The Clean Air Act's regulatory scheme is highly complex. Technical issues abound concerning both the increment and adverse impact tests. The Shenandoah and Great Smoky situations are raising many such technical issues.

1. *The Class I increment test concerns both the "new source review (NSR)" process and the "state implementation plan (SIP)" process. For example, are there Class I increment violations at Shenandoah National Park? Must a new source "significantly contribute" to these violations to be denied a permit? If so, what is a "significant" contribution? What models should be used? Should modeling include sources beyond 100 km? If the permit is granted, must the SIP nevertheless be revised?*

2. *The adverse impact test concerns whether and how to relate the emissions from the proposed new source to impacts on park resources. Importantly, all parties essentially agree that Shenandoah and Great Smoky Mountains National Parks are experiencing adverse impacts from air pollution. Virginia and Tennessee have rejected the FLM's adverse impact determination, however, because (a) the FLM has not demonstrated with adequate precision how each proposed source's emissions will affect park resources, and (b) EPA has not explained with adequate detail how the States should evaluate the adverse impact determination. Technical questions concern modeling, significant contribution, "generic" versus individual adverse impact determinations, burden of proof placement and standard, evaluation of offsets, and more.*

D. In Fall 1990, the Assistant Secretary for Fish and Wildlife and Parks for the first time concluded that (1) a Class I area, Shenandoah National Park, was experiencing "adverse impacts" from air pollution, and (2) the approximately 20 new power plants seeking air quality permits within 200 kilometers (km) of Shenandoah would exacerbate the "adverse impacts." the Assistant Secretary for Fish and Wildlife and Parks recommended that Virginia deny the permits unless the increases in pollution could be offset by decreases in pollution from existing facilities.

E. In November 1991, the FLM preliminarily concluded that (a) like Shenandoah National Park, Great Smoky Mountains National Park was also experiencing "adverse impacts" from air pollution, and (b) the emissions from a proposed new boiler at Tennessee Eastman would exacerbate the "adverse impacts." As in the Virginia situation, the FLM recommended that Tennessee deny the proposed permit unless offsets are obtained. The FLM also informed Tennessee that the FLM was preparing a Federal Register notice on the air quality problems at Great Smoky Mountains National Park.

F. On February 5, 1992, the FLM published this preliminary determination of adverse impact in the Federal Register, setting forth the FLM's general concern about substantial pollution increases within 200 km of the park. Whereas the public comments on the 1990 Federal Register notice for

Shenandoah were overwhelmingly supportive, the majority of comments on the 1992 Great Smoky Mountains notice opposed the FLM's approach.

G. Since the Federal Register notices, the FLM has made final determinations of adverse impact in several cases. For example, on January 31, 1992, the FLM reached an adverse impact determination on the Hadson Power 14-Buena Vista project, a 60 MW cogeneration facility proposing to locate 56 km SW of Shenandoah and to emit 358 TPY SO_2 and between 478 and 797 TPY NO_x (depending on the effectiveness of new SCR technology). Of all the recent power plants, the Hadson-Buena Vista facility is the closest to Shenandoah, and even closer to a Forest Service Class I area (James River Face Wilderness Area). Hadson obtained greater than one-for-one SO_2 offsets, but failed to obtain total NO_x offsets. The FLM's adverse impact determination was limited to the NO_x emissions that would not be offset. The NPS comment letter also expressed concern about the visibility (pollution) and visual (aesthetic) impacts of the facility on the Blue Ridge Parkway, 5 km west of the proposed location of the facility. Rejecting the FLM's recommendations, Virginia issued the Hadson permit on April 8, 1992. On October 5, 1992, the EPA Environmental Appeals Board reviewed the Hadson permit (in response to petition for reconsideration), and remanded to Virginia based on the Commonwealth's clear error in rejecting the FLMs' adverse impact determinations.

H. The law is still unsettled on the burden of proof required to compel a reluctant permitting authority to accept an FLM's adverse impact determination. If the proof requirements are difficult to meet, the FLM might not be able to prevail despite substantial damage to the class I area's resources from air pollution.

IV. Additional Issues

A. Need for efforts outside the new source review (NSR) process to address these regional air pollution problems (e.g., interstate pollution commissions, state implementation plan revisions, regional multi-state meetings)

SAMI: SOUTHERN APPALACHIAN MOUNTAINS INITIATIVE: On June 11, 1992, EPA organized a meeting in Atlanta to discuss formation of a southeastern "geographic, or regional, initiative" to address air quality problems of the approximately 10 Class I park and wilderness areas in the Southeast, including Shenandoah and Great Smoky Mountains National Parks. Following this meeting, the states agreed to organize such an effort. Tentatively known as "SAMI," this effort is already trying to include class I sites in monitoring, modeling, and regulatory efforts. Ideally, SAMI will

assess current information and determine how to best achieve cost-effective pollution reductions in the region, taking into consideration all sources of pollution and all available regulatory (and other) programs.

B. Relevance of Clean Air Act Amendments of 1990 (CAAA)

1. CAAA did not rescind PSD, though the legislation did make small changes.
2. In the East, annual average impacts caused by SO_2 emissions are likely to be mitigated by 10 million TPY reduction mandated by the Acid Rain Title IV; however, NO_x emissions in the East are projected to increase over time despite CAAA, and the more limited NO_x reductions required by the legislation are now under consideration for delayed implementation.
3. Difficult to factor CAAA requirements into PSD process until measures are implemented and permits revised--difficulty is increased because of flexibility of market-based approach.
4. Effect of CAAA measures on particular Class I areas will not be known for years: many regulations must be developed, promulgated, implemented, and results analyzed.
5. Even with the most ambitious implementation of the CAAA, research shows acidification will not stop, significant visibility impairment will continue, and rural ozone will continue to damage park resources.
6. "Local" pollution increases may create new problems, even if CAAA measures diminish long-range pollution -- meteorology, topography, other factors important.
7. Effect of CAAA measures can and should be taken into consideration in developing regional strategies to protect Shenandoah and Great Smoky Mountains National Parks.

Future opportunities: NSR regulatory revisions; CAAA implementation and possible further amendment to protect parks, regional initiatives, such as SAMI and NPS regional initiatives.