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*Via Electronic Mail and U.S. Mail*

Dear Ms. Riggleman:

**COMMENTS ON THE DRAFT PSD PERMIT  
FOR THE WARREN COUNTY POWER PLANT  
BY THE SOUTHERN ENVIRONMENTAL LAW CENTER  
AND THE NATIONAL PARKS CONSERVATION ASSOCIATION  
AND REQUEST FOR AIR BOARD CONSIDERATION OF  
THE DRAFT PERMIT**

**I. Introduction**

Virginia Electric and Power Company (“Dominion”) has proposed to build a 1280-megawatt natural-gas fired electric generation facility in Warren County, Virginia (the “Warren County Plant”). As part of this proposal, Dominion has applied for a Prevention of Significant Deterioration (“PSD”) permit from the Virginia Department of Environmental Quality (“DEQ”). Virginia DEQ has published a draft PSD permit, along with a supporting engineering analysis, and has opened a public comment period on the draft permit, which closes November 24, 2010.

The Southern Environmental Law Center (“SELC”) and the National Parks Conservation Association (“NPCA”) offer the following comments on the draft PSD permit and supporting documentation. For the reasons stated in these comments, SELC and NPCA formally request direct consideration of the permit application by the State Air Pollution Control Board (the “Air Board”), pursuant to Va. Code § 10.1-1322.01. It is essential that the public be given the opportunity to meaningfully participate in the permitting process. This happens best when the final permitting decision is made at a public meeting of the Air Board, with Board members asking questions of the applicant and DEQ staff and ultimately casting their final, up-or-down votes in an open, public forum.

## **II. History and Background on the Warren County Plant Proposal**

On July 30, 2004, after considerable public input from SELC, NPCA, and others, a final PSD permit was issued for the construction of a much smaller natural gas-fired power plant at this same location in Warren County. Both SELC and NPCA raised significant concerns about what was then CPV-Warren's proposal. These concerns focused on the power plant's extremely close proximity to one of our nation's most treasured national resources, Shenandoah National Park. At the time we stated, "While CPV Warren should be commended for its efforts to reduce the environmental impacts of its proposed facility, there are certain places where a power plant or any other new major source of air pollution should not be constructed, regardless of the steps taken to mitigate its environmental impacts. Fewer than five miles from a national park that is in serious jeopardy due to air pollution is one such place." See Comments of SELC and NPCA on the Draft PSD Permit for the CPV-Warren Power Plant (March 5, 2004) (attached as Exhibit A).

Ultimately, we withdrew our opposition to the CPV-Warren proposal, after the power company agreed to certain concessions, which were formalized in a final PSD permit that sought to strike a balance between the need for environmental protection and the desire for new power generation. That balance, however, is threatened by what is now Dominion's Warren County Plant.

Instead of two natural gas combustion turbines ("CTs") with heat-recovery steam generators, Dominion now proposes to build three. And, whereas the original CTs would have been 180 megawatts each in rated capacity, Dominion now proposes 300 megawatt turbines. All together, the Dominion proposal is more than double the size of the CPV-Warren plant that was initially approved. This fact alone should give DEQ staff and the Air Board pause.

## **III. Retirement of Coal-Fired Units**

SELC and NPCA understand the importance of natural gas as a transitional fuel, moving us away from our over-reliance on coal. Natural gas, of course, is a fossil fuel, and burning it also contributes to global warming and to ground-level ozone pollution. Energy efficiency, conservation, and appropriately-sited renewables are our best, first choice for meeting future energy needs. However, natural gas-fired power plants emit approximately one-half of the heat-trapping carbon dioxide emissions of coal-fired units, and therefore will have a role to play in addressing global warming.

Human-induced global climate change threatens Shenandoah National Park – and all of Virginia – just as much as smog, soot, and acid rain. See Final Report: A Climate Change Action Plan, Governor's Commission on Climate Change (Dec. 15, 2008). As a result, it is imperative that DEQ and the Air Board insist that Dominion accelerate the retirement of older, coal-fired units *at this time*, when Dominion is proposing to dramatically expand its natural gas-fired portfolio.

If retiring nearby coal-fired facilities would offset emissions from the proposed Warren County Plant, then the Air Board must insist on those retirements. There is precedent for this practice within Virginia. *See* Final PSD Permit for the Virginia City Hybrid Energy Center, at 9, ¶ 30 (June 30, 2008). Accordingly, SELC and NPCA request that coal-unit retirements be specifically identified and made judicially enforceable as a condition within any final PSD permit.

#### **IV. Impacts to Shenandoah National Park Generally and the Role of the National Park Service**

According to DEQ, the Warren County Plant’s site is 7.1 kilometers (4.4 miles) from one of our nation’s most celebrated places, Shenandoah National Park. *See* Intra-Agency Memorandum from Anita Rigglesman to Amy T. Owens, at 1 (Sept. 30, 2010). The project site is also “about 11 km northwest [6.8 miles] of the nearest approach of the Appalachian Trail,” also a unit of the National Park System. The proximity of this facility’s smokestacks to Shenandoah National Park and tourists on the Appalachian Trail raises the likelihood of an adverse visual impact on the Park and Park resources.

Pursuant to Section 165 of the Clean Air Act, 42 U.S.C. § 7475, the National Park Service is the Federal Land Manager with the responsibility of protecting the Air Quality Related Values (including visibility) of Shenandoah National Park. As a result, it is essential that DEQ staff, the Air Board, and Dominion work with the National Park Service to assure that Shenandoah is fully protected. If the Park Service makes an adverse impact finding and concludes that the power plant’s impacts cannot be mitigated, then the Air Board should reject Dominion’s application. In addition to securing coal-unit retirements (as explained in Part III above), addressing any and all of the Park Service’s concerns must remain a paramount focus of the Air Board.

Of fundamental importance, the plant’s increased size makes the site even more problematic than it was with the smaller CPV-Warren proposal. DEQ approval of a new, large, industrial source of pollution virtually on the doorstep of the Commonwealth’s largest national park will send a troubling message that the rural and natural values making Shenandoah National Park a state, national, and international treasure will be sacrificed to industrial-scale development.

Notably, we have not opposed other natural gas-fired projects when those projects are more carefully sited. Dominion’s Bear Garden Power Station, for example, is moving forward in Buckingham County, with no opposition from SELC or NPCA. But the Warren County Plant’s proximity to Shenandoah National Park is a factor that cannot be ignored.

Not only is Shenandoah a treasured natural and cultural site, it provides economic benefits to the larger region. Year after year, Shenandoah and the Skyline Drive rank among the Commonwealth’s top tourism destinations. In 2008, non-local visitors spent more than \$58,000,000, supporting 1,170 jobs, and generating more than \$20,000,000 in labor income. *See* Daniel J. Stynes, Michigan State University, “National Park Visitor

Spending and Payroll Impacts, 2008,” at A-9, A-19, A-31 (Oct. 2009), available online at <http://web4.canr.msu.edu/mgm2/> (last visited November 23, 2010).

The Park and the broader community already have begun events to celebrate Shenandoah’s establishment 75 years ago. Publicity and events leading up to its official anniversary in 2011 likely will generate additional visitation to the National Park, and additional economic activity.

With some 70 overlooks along the Skyline Drive atop its spine, Shenandoah National Park was established and Skyline Drive was constructed for visitors to enjoy the remarkable views. Building a major industrial facility with its associated plumes is inconsistent with protecting the quality of that experience.

## V. Additional Impacts to be Addressed by the Air Board

### A. *PM<sub>2.5</sub> (Fine Particulate Matter)*

Because of its extremely small size, PM<sub>2.5</sub>, or fine particulate matter, can penetrate deep into the lungs, enter the blood stream, and cross the blood-brain barrier. As a result, PM<sub>2.5</sub> pollution causes more frequent and severe adverse health effects than PM<sub>10</sub>. *See* EPA, “National Ambient Air Quality Standards for Particulate Matter,” 62 Fed. Reg. 38652, 38665 (July 18, 1997) (noting that there are stronger links to the mortality and morbidity effects of particulate matter from exposure to PM<sub>2.5</sub> than PM<sub>10</sub>). EPA has recognized a significant correlation between elevated PM<sub>2.5</sub> levels and premature mortality. *See* EPA, “Implementation of the New Source Review (NSR) Program for Particulate Matter Less Than 2.5 Micrometers (PM<sub>2.5</sub>),” 73 Fed. Reg. 28321, 28324 (May 16, 2008). Older adults, people with heart and lung disease, and children are particularly sensitive to PM<sub>2.5</sub> exposure. *Id.*

Particulate matter is also a significant contributor to regional haze in the national parks. Visibility in Shenandoah National Park already suffers severely from power plant pollution. Skyline Drive was originally designed and constructed “to take full advantage of the surrounding scenic beauty. From some of the drive’s east-facing overlooks, visitors could see across a landscape of small towns and farms some 70 miles *to the Washington Monument.*” *See* NPCA, “Making Connections: Building a Healthy Future for Shenandoah National Park and Its Gateway Communities,” at 7 (Jan. 2010) (emphasis added) (attached as Exhibit B). Now, however, haze pollution frequently obscures these famous views.

According to a 2003 report, average visibility in Shenandoah has been reduced from 115 miles to 25 miles. *See* NPCA, “Shenandoah National Park: A State of the Parks Report,” at 3 (June 2003) (attached as Exhibit C); *see also* National Park Service, Shenandoah National Park website, at [http://www.nps.gov/shen/naturescience/visibility\\_and\\_haze.htm](http://www.nps.gov/shen/naturescience/visibility_and_haze.htm) (last visited November 23, 2010). This pollution threatens a vibrant tourist economy that is fueled by the Park. William Carson, who chaired the Virginia Commission on Conservation and Development in the 1930s, proclaimed that with the Park and Skyline Drive, “Scenery

[would become] ... Virginia's next big cash crop." See NPCA, "Making Connections," at 7. The *Frommer's Virginia* guidebook (7<sup>th</sup> ed. 2004), however, effectively discourages visits to Shenandoah to enjoy this iconic scenery, explaining that "high ozone levels frequently create obscuring smog during the summer."

EPA generally prohibits the use of PM<sub>10</sub> as a surrogate for PM<sub>2.5</sub> in determining what control technologies satisfy the Clean Air Act's Best Available Control Technology ("BACT") requirements. See 42 U.S.C. § 7479(3) (definition of BACT). Rather, a separate analysis for direct PM<sub>2.5</sub> controls must be conducted. See 73 Fed. Reg. at 28323 ("[T]he PM<sub>2.5</sub> PSD program will no longer use a PM<sub>10</sub> program as a surrogate, as has been the practice under our existing guidance.").

EPA has developed an NSR Manual, which delineates a five-step, "top-down," method that guides regulators in identifying all available control technologies, ranking them in order of control effectiveness, and selecting the best. See EPA, NEW SOURCE REVIEW WORKSHOP MANUAL: PREVENTION OF SIGNIFICANT DETERIORATION AND NONATTAINMENT AREA PERMITTING, (Draft Oct. 1990) (excerpt attached as Exhibit D). The five steps that are the hallmark of the BACT analysis are: (1) identify all control technologies; (2) eliminate technically infeasible options; (3) rank remaining control technologies by control effectiveness; (4) evaluate most effective controls and document results; and (5) select the most effective option as BACT. *Id.*

It is not clear from the draft PSD permit and supporting documentation whether this has been done for the Warren County Plant. For example, DEQ states that "direct PM<sub>10</sub> and PM<sub>2.5</sub> emissions from a natural gas-fired combined-cycle electric generating facility are usually identical for all practical purposes." See Memorandum from Mike Kiss to Janardan Pandey, at 4 (Oct. 4, 2010). The draft permit then sets identical emissions limits for PM<sub>10</sub> and PM<sub>2.5</sub>, at 211.5 tons per year for each pollutant. See Draft PSD Permit, at 7, ¶ 17. The engineering analysis also appears to focus on PM<sub>10</sub>, with little independent analysis of PM<sub>2.5</sub> emissions. See, e.g., Intra-Agency Memorandum from Anita Riggleman, at 30 (noting that a baghouse is unnecessary because, "The maximum PM<sub>10</sub> concentration, including condensable PM<sub>10</sub>, from combined cycle combustion units are approximately 0.002 gr/dscf, which is lower than 0.01 gr/dscf, which is a typical baghouse performance specification."). PM<sub>2.5</sub>, of course, is one-fourth the size of PM<sub>10</sub> and weighs significantly less than PM<sub>10</sub>. Having the same limit for both pollutants raises the possibility of unnecessarily high emissions of PM<sub>2.5</sub>.

Also disconcerting is DEQ's assessment that "no analysis was required for demonstrating compliance with the annual PM<sub>10</sub> NAAQS because the standard was revoked by EPA in 2006. Additionally, no Class I PSD increment analysis for PM<sub>2.5</sub> and 1-hour NO<sub>2</sub> was required because EPA has not yet promulgated these Class I PSD increments." See Memorandum from Mike Kiss at 10. Of course, it is important that nitrogen oxides and particulate matter impacts be rigorously assessed and controlled. It is not clear, based on DEQ's statement, the extent to which PM<sub>2.5</sub> and NO<sub>2</sub> controls might be undermined.

Moreover, on October 20, 2010, EPA published its Final Rule on PM<sub>2.5</sub> implementation in PSD areas. *See* 75 Fed. Reg. at 64864. The rule establishes increments, significant impact levels (“SILs”), and a significant monitoring concentration (“SMC”) for fine particulate matter. The rule is designed “to facility ambient air quality monitoring and modeling under the PSD regulations for areas designated attainment or unclassifiable for PM<sub>2.5</sub>.” *Id.* at 64865. This final rule is slated to become effective on December 20, 2010 – just one business day after the next, regularly scheduled meeting of the Air Board. *Id.* at 64864. Given these factors, DEQ, Dominion, and the Air Board should conduct an analysis of PM<sub>2.5</sub> Class I increment consumption at Shenandoah National Park.

In sum, DEQ should take care to ensure that all EPA requirements related to PM<sub>2.5</sub> are met, and the Air Board should follow up during its review to ensure the same. In particular, DEQ should directly conduct a top-down BACT analysis for PM<sub>2.5</sub>, and the Air Board should confirm its completion. If the analysis has not been done, DEQ staff should be directed to complete it, summarize the analysis as part of the engineering analysis, and revise the draft PSD permit as needed.

#### ***B. Nonattainment Concerns Related to Ground-Level Ozone Pollution***

DEQ states that Warren County “is currently designated attainment for ozone based on the 1997 standard.” *See* Memorandum from Mike Kiss, at 17. While this statement is technically correct, it ignores the fact that there are no monitors in Warren County to directly assess air quality impacts. Monitors nearby, however, suggest serious problems with ground-level ozone pollution in Shenandoah National Park. As the Air Board is well-aware, EPA is in the process of revising the National Ambient Air Quality Standard (“NAAQS”) for ground-level ozone. *See* EPA, Proposed Rule, “National Ambient Air Quality Standards for Ozone,” 75 Fed. Reg. 2938 (Jan. 19, 2010). EPA has explained that it intends to set the standard between 70 ppb and 60 ppb. *See id.* at 2938.

Even if EPA selects the most lenient option from among the variations identified in the proposed rule, many areas in the vicinity of Shenandoah National Park will fall into nonattainment. Loudoun County (77 ppb), Prince William County (71 ppb) and Shenandoah (73 ppb) are all likely to fail the new standard. *See* Michael G. Dowd, Virginia DEQ, PowerPoint Presentation, “Air Program Regulatory Update,” 21<sup>st</sup> Annual Environment Virginia Symposium, at 3 (April 7, 2010) (excerpt attached as Exhibit E). Frederick County, (69 ppb), Albemarle County (69 ppb) Rockingham County (67 ppb), and Fauquier (66 ppb) would fail the standard if EPA selects a mid-range option, such as 65 ppb. *Id.* at 4.

In short, air quality, according to monitors closest to Shenandoah National Park, is in serious trouble. Addressing the impact of the Warren County Plant on neighboring monitors should be of paramount concern to the Air Board. As DEQ recognizes, Lowest Achievable Emissions Rate (“LAER”), is required for facilities located in areas “where ambient pollutant concentrations exceed NAAQS.” *See* Intra-Agency Memorandum from Anita Riggelman, at 21. Given this power plant’s proximity to several likely nonattainment areas, a LAER-type analysis should be completed, with a particular emphasis placed on protecting the resources of Shenandoah National Park.

### ***C. Offsets for Nitrogen Oxides***

In addition to considering more stringent controls on the facility itself (*see* Part V.B., above) and coal-unit retirements (*see* Part III, above), the Air Board should also strengthen the requirement to obtain nitrogen oxide offsets from other sources within close proximity to Shenandoah National Park.

DEQ and the National Park Service have acknowledged that acidic deposition attributable to nitrogen-oxide emissions from the Warren County Plant is of serious concern. *See* Memorandum from Mike Kiss, at 14. DEQ has attempted to address this concern in Paragraph 23 of the draft PSD permit, through the retirement of nitrogen oxide offsets. SELC and NPCA question whether the Level 1 and Level 2 offset provisions in Paragraph 23 are sufficient to mitigate the adverse impacts to Air Quality Related Values in Shenandoah National Park. In addition to acidic deposition, there are also concerns about ground-level ozone pollution, particulate matter, and associated public health and environmental consequences.

Two concerns related to the offsets in the draft PSD permit are immediately apparent. First the ratio of offsets, combined with the large radius of the area from which offsets might be obtained, are not sufficient to address impacts to Shenandoah National Park. It is essential that input from the National Park Service, which is the expert agency with primary responsibility for protecting Shenandoah, be used to guide this analysis.

Second, the draft PSD permit states that “to be eligible for credit as mitigation, Level 2 mitigation obtained cannot be mandated as part of: ... A source fulfilling their obligation under the Clean Air Interstate Rule.[CAIR].” CAIR, however, was struck down as unlawful by the U.S. Court of Appeals for the D.C. Circuit. *See North Carolina v. U.S. Environmental Protection Agency*, 550 F.3d 1176 (D.C. Cir. 2008). As a result, EPA is in the process of developing a new regulatory program, the Transport Rule. *See* EPA, “Air Transport,” at <http://www.epa.gov/airtransport/> (accessed November 19, 2010). The PSD permit should take care to emphasize that a source fulfilling its obligation under any other regulatory requirement, whether CAIR, the Transport Rule, or some other mandate, cannot be used to “count” as an offset. On this point, it is worth noting that EPA has proposed several regulatory obligations that could limit the availability of offsets.

**VI. Conclusion**

While natural gas is not as heavily polluting as coal, it still poses the risk of serious adverse impacts. This gas-fired facility, due to its proposed location, will likely degrade the natural, scenic, and economic values associated with Shenandoah National Park. The draft PSD permit fails to take into account the facility's close proximity to a national park that generates significant economic activity based on its clean air and beautiful views, both already stressed by existing pollution levels.

We urge DEQ to work with the National Park Service, the Air Board, and Dominion to significantly improve upon the draft PSD permit, incorporate the recommendations outlined above, and come to a resolution that fully protects Shenandoah National Park for generations to come. Further, we request that the Air Board make any final determinations with regard to this permit application.

Respectfully submitted,



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Sterling E. Rives III, Vice-Chair  
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Roger Chaffe  
Randolph L. Gordon, MD, MPH  
Jo Anne Scott Webb  
Manning "Chip" Gasch, Jr.

## List of Exhibits

- Exhibit A           Comments of SELC and NPCA on the Draft PSD Permit for the CPV-Warren Power Plant (March 5, 2004)
- Exhibit B           NPCA, “Making Connections: Building a Healthy Future for Shenandoah National Park and Its Gateway Communities” (January 2010)
- Exhibit C           NPCA, “Shenandoah National Park: A State of the Parks Report” (June 2003)
- Exhibit D           EPA, “New Source Review Workshop Manual: Prevention of Significant Deterioration and Nonattainment Area Permitting,” (Draft October 1990)
- Exhibit E           Michael G. Dowd, Virginia DEQ, PowerPoint Presentation, “Air Program Regulatory Update,” 21<sup>st</sup> Annual Environment Virginia Symposium (April 7, 2010)



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March 5, 2004

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Re: Prevention of Significant Deterioration (PSD) permit  
application submitted by CPV Warren LLC, Registration No. 81391

Dear Mr. Chewning:

The Southern Environmental Law Center, on behalf of itself and the National Parks Conservation Association, submits the following comments on the Prevention of Significant Deterioration (PSD) application of CPV Warren LLC to construct and operate a 580 megawatt (MW) combined cycle electric generating facility in Warren County, Virginia. The proposed facility would be located fewer than five miles from the Shenandoah National Park. It would also be located immediately adjacent to the current Northern Virginia nonattainment area for the one-hour ozone national ambient air quality standard (NAAQS), and the soon-to-be Northern Virginia and Frederick County nonattainment areas for the current eight-hour ozone NAAQS.

We note at the outset that this permit application fits within all three categories of permit applications warranting full board consideration set forth in 9 VAC 5-170-180(C). Accordingly, we request that the full board consider this permit application.

Warren County has no air quality monitors. Based on no data, it is currently designated an attainment area for all pollutants. The Shenandoah National Park, located immediately to the south of Warren County and fewer than five miles from the proposed facility, however, is in violation of the eight-hour

ozone standard based on 2001-2003 monitoring results<sup>1</sup> and will be designated a nonattainment area in April. Immediately northeast and east of CPV Warren's proposed location are Loudoun and Fauquier counties. Loudoun County is part of the Northern Virginia nonattainment area for the one-hour ozone standard and is currently in violation of the eight-hour ozone standard. Fauquier County borders on nonattainment of the eight-hour standard. It failed to attain the standard based on 1997 - 1999 monitoring results. The three-year average of monitoring results from 2001 through 2003, however, falls below the nonattainment threshold. Nevertheless, EPA has indicated that it intends to include Fauquier in the Northern Virginia nonattainment area. (Exhibit 1).<sup>2</sup> Frederick County, located immediately to the north of Warren County, is in violation of the eight-hour ozone standard based on 2001-2003 monitoring results, and will be designated a nonattainment area in April.<sup>3</sup>

Because of its close proximity to the Shenandoah National Park, CPV Warren has made significant efforts to mitigate the environmental impacts of its proposed facility. These include an agreement not to burn oil as a backup fuel, which will significantly reduce sulfur dioxide (SO<sub>2</sub>) emissions from the facility, and to secure offsets of its nitrogen oxide (NO<sub>x</sub>) emissions. While CPV Warren should be commended for its efforts to reduce the environmental impacts of its proposed facility, there are certain places where a power plant or any other new major source of air pollution should not be constructed, regardless of the steps taken to mitigate its environmental

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<sup>1</sup> Compliance with the eight-hour ozone NAAQS is determined based on the three-year average of the fourth highest reading. If this average equals or exceeds 85 parts per billion (ppb), the area is in violation of the eight-hour standard.

<sup>2</sup> In July 2003 Virginia sent recommended nonattainment designations to EPA. These recommendations included Fauquier in the Northern Virginia nonattainment area. In February 2004 Virginia sent its "final" nonattainment designations to EPA, recommending that Fauquier be excluded from the Northern Virginia nonattainment area based on 2001-2003 monitoring results. EPA will make final designations in April. It is noted, however, that EPA's December 2003 preliminary decision to designate Fauquier County nonattainment was primarily based on Fauquier being part of the Washington-Baltimore Combined Metropolitan Statistical Area rather than air quality monitoring results.

<sup>3</sup> Although Frederick County fails to meet the eight-hour ozone standard, it may have its nonattainment designation deferred in April due to its agreement to participate in EPA's Early Action Program.

impacts. Fewer than five miles from a national park that is in serious jeopardy due to air pollution is one such place.

Among the factors the Air Pollution Control Board (Board) must consider in deciding whether to grant an air permit for a new facility is "the suitability of the activity to the area in which it is located." Va. Code Ann. § 10.1-1307(E)(3). Because of its close proximity to the Shenandoah National Park, and the failure of CPV Warren to demonstrate the degree of impact its power plant will have on ozone formation and ozone standard violations in the park or in neighboring nonattainment areas to the east and north, as well as the other reasons discussed below, we urge the Board to deny CPV Warren an air permit to construct its 580 MW facility at its present location.

I. THE POTENTIAL IMPACT OF THE CPV WARREN FACILITY ON AIR QUALITY AND RELATED VALUES IN THE SHENANDOAH NATIONAL PARK, AND IN PARTICULAR OZONE FORMATION IN THE PARK, MAKES IT UNSUITABLE FOR CONSTRUCTION IN ITS PRESENT LOCATION

Fourteen years ago, when faced with permit applications to construct 15 new power plants around the Shenandoah National Park, the closest of which was located almost nine times further from the park than the proposed CPV Warren plant,<sup>4</sup> the Federal Land Manager for all Class I areas in the national park system issued an adverse impact determination. (Exhibit 2). The purpose of that determination was to notify Virginia that the natural resources of the Shenandoah National Park were under serious stress due to air pollution and to recommend that no new permits be issued unless appropriate steps were taken to ensure that pollution from new sources would not contribute to adverse impacts on these resources. At that time, visibility monitoring showed that visibility in Shenandoah was impaired by pollution more than 90% of the time. Chronic acidification had been documented in several well-studied streams in the park, with large changes in the chemical and biological composition projected in streams throughout the park due to the heavy level of acid deposition. A number of tree and plant species native to

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<sup>4</sup> The plant closest to the park permitted by Virginia was the Hadson Buena Vista power plant, 62 kilometers from the park and 15 kilometers from the James Face Wilderness Area, the only other Class I area in Virginia. The Virginia permit decision was later overturned by the Environmental Appeals Board because the Air Board failed to give adequate consideration to the adverse impacts the Hadson plant would have on the James Face Wilderness Area and Shenandoah National Park. *In the Matter of: Hadson Power 14 - Buena Vista*, 4 E.A.D. 258 (1992).

the park had demonstrated growth loss and leaf damage due high levels of ground-level ozone pollution. The National Park Service's message in the adverse impact determination was essentially this: Air pollution is overwhelming our ability to preserve and protect the wildlife and scenic beauty of this natural treasure. This park simply cannot tolerate any more pollution.

Last May, the National Park Service released *Assessment of Air Quality and Related Values in Shenandoah National Park (Air Quality Assessment)*. (Exhibit 3). After more than 500 pages of detailed analysis, that technical report concluded that conditions in the park are essentially unchanged from those on which the park service based its adverse impact determination in 1990. Perhaps most alarming was the finding that Shenandoah continues to have among the highest monitored concentrations of airborne sulfate particles, acidic deposition, and ground-level ozone of all national parks. *Air Quality Assessment*, p. xxv. Moreover, the National Park Service Air Resources Division has reviewed more PSD permit applications for Shenandoah than for any other national park by over 50 percent. *Air Quality Assessment*, p. IV-2.

#### A. Ozone Pollution in Shenandoah National Park

Ground-level ozone is of particular concern to Shenandoah. In April, EPA will designate the park as a nonattainment area because air quality there consistently fails to meet the eight-hour ozone standard to protect human health. Numerous scientific studies have found that one- to three-hour exposure to ozone can reduce lung function and make breathing more difficult, aggravate asthma and other respiratory conditions, and increase emergency room visits and hospitalizations for respiratory problems. *Rule to Reduce Interstate Transport of Fine Particulate Matter and Ozone (Interstate Air Quality Rule)*, 69 Fed. Reg. 4566, 4571 (January 30, 2004). Longer-term exposure, over six to eight hours, can damage the lining of the lungs and potentially lead to irreversible reductions in lung function. *Id.* Nor can exposure to ambient ozone levels below the eight-hour standard be deemed safe for all. "Health studies have shown that there is no clear threshold below which adverse effects are not experienced by at least certain segments of the population." *Id.* This is what summertime visitors face when they come to Shenandoah.

Ozone pollution is also having a significant impact on vegetation in the park. According to the Air Quality Assessment, "[m]any experts consider 25 parts per million-hour to be an important threshold above which vegetation begins to show effects." *Air Quality Assessment*, p. xxv. Between 1990-2000, maximum ozone exposure at Big Meadows was 87 parts per million-hour and the mean exposure during this time period was 47 parts per million-hour. *Id.* Twenty-six tree and plant species in the park have been found to be very sensitive to leaf damage due to ozone exposure and another 14 are slightly sensitive. (Exhibit 4). Certain tree species suffer growth loss due to ozone exposure. White Ash has displayed the greatest sensitivity to ozone exposure, and the composition of white ash in chestnut oak forests is projected to decrease by 50 percent over the next 100 years under current levels of exposure. *Air Quality Assessment*, pp. VIII-2 - VIII-3.

B. DEQ's Analysis of the Permit Application Fails to Examine the Potential Impacts of CPV Warren's NO<sub>x</sub> Emissions on Ozone Formation in Shenandoah National Park

Ground-level ozone is the product of a photochemical reaction between NO<sub>x</sub> and volatile organic compounds (VOCs). Nitrogen oxide emissions are the primary cause of ozone formation in Shenandoah and throughout the rural Southeastern United States, due in part to high levels of naturally occurring VOCs.

CPV Warren is seeking permission to emit in excess of 150 tons of NO<sub>x</sub> annually on the park's doorstep. Yet, despite all that is known about ozone problems in Shenandoah and the risk this pollution poses to park visitors and park resources, DEQ's Statement of Basis justifying its recommendation to grant this application provides no discussion of the likely impact NO<sub>x</sub> emissions from the CPV Warren power plant will have on ozone formation in the park. In fact, ground-level ozone is never mentioned.

It is generally recognized that there is currently no model available for accurately predicting single source contribution to ozone formation. Although this may make it difficult to draw precise conclusions about the likely contributions of CPV Warren's NO<sub>x</sub> emissions on ozone formation in the park, it is not a justification for ignoring this issue or failing to consider what is known about ozone formation in the park. For example,

it is known that ozone concentrations in Shenandoah are the product of ozone pollution formed outside the park and transported into the park, and ozone that is produced in the park. Although the majority of ozone impacting the park is the product of transport, studies have concluded that over 40% of observed ozone concentrations at Big Meadows is produced in the park. *Air Quality Assessment*, p. V-22. In addition, the proximity of stationary sources is "very important" in assessing deposition and air concentration in Shenandoah. *Air Quality Assessment*, p. IV-22. The Assessment goes on to conclude: "Not all emissions are equal; local, nearby emissions are *exceedingly important* and, generally, emissions within about 200 km are much more efficient in producing pollution in Shenandoah (on a per ton emitted basis) than those from farther away." *Air Quality Assessment*, p. IV-23 (emphasis added). This is particularly true with NO<sub>x</sub> emissions, where modeling has shown that sources located closest to the park have the greatest impact on NO<sub>x</sub> deposition and air concentration within the park. (Exhibit 5).

Given that NO<sub>x</sub> concentrations govern ozone formation in the Shenandoah National Park, and given that sources closest to the park have the greatest impact on NO<sub>x</sub> concentrations in the park, the Board should not grant a permit allowing a new major source of NO<sub>x</sub> emissions to locate fewer than five miles from Shenandoah National Park without confidence that this new pollution will not adversely impact air quality in the park. The Board cannot have such confidence based on this permit application record. In fact, the information the Board does have available requires the opposite conclusion - that CPV Warren NO<sub>x</sub> emissions will likely increase ozone formation and the adverse impact this pollution has on park visitors and vegetation, although this impact has not been quantified. Given what is known about ozone formation in the park and the likely contribution of this source to that problem, the Board should deny the air permit for this source in its present location.

II. THE BOARD SHOULD DENY THIS PERMIT IN THE ABSENCE OF A CUMMULATIVE IMPACT ANALYSIS TO MEASURE THE COMBINED IMPACTS OF THIS AND OTHER PROPOSED, PERMITTED, AND EXISTING SOURCES ON AIR QUALITY AND RELATED VALUES IN THE SHENANDOAH NATIONAL PARK

It is important to note that the CPV Warren plant is only one of a number of new power plants permitted or proposed for construction in recent years. Since 1999, Virginia has permitted 18 new power plants, totaling more than 10,000 MW of

new capacity. This represents approximately a 50 percent increase to the state's current generation totals. Of those 18, 8 already are operating, 1 is under construction, 5 have not yet begun construction, and 4 have withdrawn their proposal.

Since 1990, the National Park Service and others have asked DEQ to perform cumulative impacts analyses, including but not limited to ozone, in order to better assess the impacts of existing and proposed sources on Shenandoah. Shenandoah National Park Superintendent Doug Morris renewed this request in connection with this permit application. (Exhibit 6).

In 2002, DEQ convened the "Air Resources Impact Working Group" to identify options for measuring cumulative impacts. This was done in response to numerous requests for cumulative impact analyses in the face of the new wave of power plants proposed for construction in Virginia, the call for such analyses from State Corporation Commissioners so they could accurately measure the environmental impacts of proposed facilities in their permit decisions, and concern from legislators. The working group completed its report in November 2002. (Exhibit 7). No progress has been made to date, however, towards conducting the cumulative impact analyses sought. Had such analyses been performed, the Board would be in a better position to assess the potential impact of the CPV Warren facility on the Shenandoah National Park. Without these analyses, such an assessment is not possible. In the absence of this information, the Board should deny this permit.

### III. THE POTENTIAL IMPACT OF THE CPV WARREN POWER PLANT ON EIGHT-HOUR OZONE EXCEEDENCES IN THE NORTHERN VIRGINIA AND FREDERICK COUNTY NONATTAINMENT AREAS MAKES IT UNSUITABLE FOR CONSTRUCTION IN ITS PRESENT LOCATION

Warren County, which has no air quality monitors, is classified as an attainment area. Yet every air quality monitor in the jurisdictions surrounding Warren County to the south, east, and north (there are no monitors west of Warren County) have recorded three-year average ozone readings either exceeding or bordering on nonattainment.<sup>5</sup> As with ozone concentrations in

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<sup>5</sup> The actual eight-hour ozone standard is 80 ppb. See *Air Quality Assessment*, p. III-2. The 2001 - 2003 average for the monitors in Fauquier and Page Counties are 80 ppb and 82 ppb, respectively. (Exhibit 8). Due to rounding procedures, however, EPA has said that the three-year average must equal or exceed 85 ppb for an area to be designated nonattainment.

the Shenandoah National Park, the potential impact of this new major source of NO<sub>x</sub> on ozone concentrations in surrounding nonattainment areas has not been considered in the analysis of this permit application.

If Warren County was itself designated a nonattainment area (which might well be the consequence of locating an air quality monitor there), a new source wishing to locate in the county would, among other things, be required to "demonstrate, through an analysis of alternative sites, sizes, production processes, and environmental control techniques for such proposed source, that benefits of the proposed source significantly outweigh the environmental and social costs imposed as a result of its location, construction, or modification." 9 VAC 5-80-2050(A)(6). Although Warren County is not a nonattainment area, the Board should apply this standard to determine whether the CPV Warren plant is suitable for the area in which it will be located, given the potential impact of this major source of NO<sub>x</sub> emissions on neighboring nonattainment areas.

As noted previously, over 10,000 MW of new generation capacity has already been permitted in Virginia since 1999. In light of this glut of new capacity, one can only conclude that, if needed at all,<sup>6</sup> there is a better alternative site for this proposed power plant, given its likely adverse impact on ozone concentrations in surrounding areas struggling to meet federal health standards.

IV. CPV WARREN'S AGREEMENT TO SECURE OFFSETS FOR ITS NO<sub>x</sub> EMISSIONS AS A CONDITION OF ITS WARREN COUNTY CONDITIONAL USE PERMIT IS NOT ADEQUATE TO PROTECT AIR QUALITY IN THE PARK OR NEIGHBORING NONATTAINMENT AREAS

A source locating in nonattainment areas must secure permanent offsets of its nonattainment pollutants before it can begin operation. 9 VAC 5-80-2050(A)(3)(a). These offsets must come from within the nonattainment area, 9 VAC 5-80-2120(A),<sup>7</sup> and

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<sup>6</sup> According to a January 13, 2004 press release, CPV has yet to secure any customers for the power generated by this or its already permitted 530 MW power plant planned for construction in Fluvanna County. (Exhibit 9).

<sup>7</sup> For ozone nonattainment areas, offsets for ozone-causing pollutants can be secured from nonattainment areas with an equal or greater nonattainment classification, so long as emissions from such nonattainment area contribute to nonattainment in the area where the source seeking offsets is located. 9 VAC 5-80-2120(A).

must be state and federally enforceable. 9 VAC 5-80-2050(A)(3)(c). To CPV's credit, it voluntarily proffered as a condition in its Warren County Conditional Use Permit (CUP) to secure offsets of its NO<sub>x</sub> emissions in order to mitigate the environmental impacts of its power plant, even though it is locating in an attainment area. (Exhibit 10). Although CPV and Warren County officials have both stated publicly that CPV will secure offsets in a ratio of 1.15:1, the quantity of offsets CPV must secure is not specified in the CUP.

Under appropriate conditions, an agreement to secure offsets can help alleviate concerns the Board may have about likely air quality impacts of a proposed new facility. Unfortunately, CPV Warren's agreement to secure offsets for its NO<sub>x</sub> emissions do not meet these conditions.

For one thing, the source or sources of these offsets have not been identified. The CUP states only that CPV must "obtain allowances and/or offsets for NO<sub>x</sub> emissions modeled to benefit Warren County that are as close to the plant as practical." Presumably, availability and cost are factors that will determine the practicality of securing offsets in close proximity to the plant. There is, of course, no guarantee that CPV will find available offsets at an acceptable price in a geographic area that will result in a net benefit to air quality in Shenandoah National Park and surrounding nonattainment areas.

Second, the conditional use permit speaks in terms of "allowances and/or offsets" and requires CPV to provide Warren County with "evidence of available emissions allowances/offsets and those purchased/traded." As the Board knows, CPV will be required to purchase NO<sub>x</sub> allowances for all of its NO<sub>x</sub> emissions as part of the regulations implementing the NO<sub>x</sub> SIP Call. Under the NO<sub>x</sub> trading program, these allowances can come from as far away as Alabama and Michigan. It appears from the wording of the CUP that CPV's purchase of allowances required by the NO<sub>x</sub> SIP Call regulations could satisfy the "allowances and/or offsets" condition of the permit. To the degree CPV secures offsets in excess of the allowances it will be required to purchase in order to operate, nothing in the CUP would prevent CPV from selling these offsets to nearby facilities as part of the NO<sub>x</sub> SIP call trading program.

Finally, there are no conditions in CPV's draft permit that require CPV to secure offsets and therefore nothing that makes CPV's commitment state and federally enforceable. Although

Warren County officials have stated the county intends to hold CPV to the offset requirement in its CUP, the wording of the condition in the CUP calls into question its enforceability. Moreover, Warren County is not in the business of enforcing air quality permits and has no capacity to assume this technically challenging role. This is particularly the case when it comes to air quality modeling and the complicated world of emissions offsets, allowances, and trading. There is no reason to question the sincerity of CPV's commitment to secure offsets that will benefit air quality in the Shenandoah National Park and surrounding areas. There are also no assurances, however, that CPV will be able to locate such offsets at an acceptable price or that these offsets will not subsequently be traded to other sources impacting air quality in these areas. Moreover, there is no assurance that a future owner will share CPV's commitment, should CPV decide to sell its assets.

In order for an agreement to purchase offsets to serve as adequate mitigation for the air quality impacts of CPV's NO<sub>x</sub> emissions, the air permit for this facility must require that 1) CPV secure offsets from within neighboring nonattainment areas or areas contributing to eight-hour nonattainment in these areas; 2) CPV demonstrate the offsets it secures will benefit air quality in the Shenandoah National Park; and 3) that the offset provisions are state and federally enforceable. Absent these conditions, the Board should not consider CPV's commitment to secure offsets as adequate to alleviate concerns about the likely adverse impacts its NO<sub>x</sub> emissions will have on ozone concentrations in the Shenandoah National Park and surrounding nonattainment areas.

V. THE CPV WARREN BACT STANDARD SHOULD BE SET AT 2.0 PPMVD WHEN OPERATING ABOVE 50 PERCENT OF LOAD, AVERAGED OVER A ONE-HOUR TIME PERIOD

The CPV Warren draft permit establishes the Best Available Control Technology (BACT) emission limit for NO<sub>x</sub> at 2.0 ppmvd, averaged over three hours, when operating at 80 percent load or greater, and 2.5 ppmvd, averaged over three hours, when operating at less than 80 percent load. While this would represent the strictest BACT limits for facilities of this type in Virginia, it is not as strict as recent BACT determinations for similar facilities in other parts of the country. The Ivanpah Energy Center facility recently permitted for Clark County, Nevada, is one such facility. (Exhibit 11). In that PSD permit, the BACT emission limit for NO<sub>x</sub> is 2.0 ppmvd,

averaged over one hour, whenever the facility is operating at greater than 50 percent load.<sup>8</sup>

The potential environmental impacts of proposed emissions and the benefits of reducing those emissions through control technology must be considered as part of the BACT analysis. The consideration of environmental impacts in the BACT analysis is not limited to the specific environmental impacts, or costs, of the available control technology operated in a manner to achieve maximum emission reductions, such as what waste products the technology will create. Rather, DEQ must also consider the emission reduction benefits resulting from operation of the technology in a manner to achieve maximum emission reductions. *New Source Review Workshop Manual* (EPA draft, October 1990) at B.2. EPA guidance further provides that if a source is proposing to locate next to a Class I area, it might be appropriate to require the most stringent control technology despite high costs that might otherwise justify eliminating that technology as BACT. *Id.* at B.74.

Given the plan to locate this facility within five miles of a Class I area in serious jeopardy due to air pollution, the CPV Warren permit should adopt the strongest possible NO<sub>x</sub> BACT emission limit, in addition to state and federally enforceable offset requirements as discussed above. The Ivanpah Energy Center PSD permit demonstrates that more stringent NO<sub>x</sub> BACT limits are appropriate and the CPV Warren permit should meet these limits. Specifically, the permit should limit NO<sub>x</sub> emissions to 2.0 ppmvd, averaged over one hour, whenever the facility is operating at greater than 50 percent of load.

#### VI. THE CIRCUMSTANCES OF THIS PERMIT APPLICATION REQUIRE THE BOARD TO DEVIATE FROM ITS SEPTEMBER 1987 SUITABILITY POLICY

Before granting an air permit allowing a new major pollution source to operate in Virginia, the Board must consider, among other things, "[t]he suitability of the activity to the area in which it is located." Va. Code Ann. § 10.1-1307(E)(3). In 1987, the Board adopted a "Suitability Policy" that states essentially that the suitability of a new facility for a particular area will be determined by local governing

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<sup>8</sup> The NO<sub>x</sub> BACT limit in the permit makes no reference to load. However, a separate provision defines "shutdown" as "the period beginning with the lowering of the electric load of a turbine below 50 percent of nameplate capacity and ending when combustion has ceased."

bodies and that the Board will not serve as a forum for those wishing to appeal local zoning or suitability determinations. (Exhibit 12). While deferral to local governing zoning and suitability determinations may be appropriate in many situations, it is not appropriate under the circumstances of this permit application.

The decision to locate the CPV Warren power plant on the doorstep of the Shenandoah National Park requires the Board to consider the potential impacts of the power plant on the park in making its suitability determination. Likewise, the Board must consider the potential impacts on neighboring nonattainment areas. Warren County officials focused on the impact of this facility on Warren County in making its zoning decision and issuing its CUP. The county was not in a position to consider fully the broader impacts of this power plant on the park and neighboring jurisdictions.

The Shenandoah National Park is a national treasure and a major economic driver for tourism dollars in Virginia. A recent study looking at visibility conditions alone concluded that poor visibility caused by air pollution is costing Virginia \$138 million annually. A 25 percent improvement in visibility could yield as much as \$30 million yearly in increased sales and tax revenues, and 800 jobs, for local communities surrounding the Shenandoah National Park. Clean Air Task Force, *Out of Sight: Haze in our National Parks*, August 2000; Abt Associates, *Out of Sight: The Science and Economics of Visibility Impairment*, August 2000, [www.clnatf.org/publications](http://www.clnatf.org/publications). Although the responsibility for protecting air quality and related values in the Shenandoah National Park falls in the first instance on the Federal Land Manager, the Board shares this responsibility.

There has been a disturbing pattern in recent years of reversals of adverse impact determinations made by career Park Service employees concerning power plant air permits. (Exhibit 13). The degree to which political considerations factored into these and other adverse impact evaluations made by career Park Service employees is unknown. What is clear in this case, however, is that the Shenandoah National Park is in serious jeopardy due to ozone pollution, that studies have concluded that major sources of NO<sub>x</sub> emissions closest to the park have the greatest impact on ozone formation in the park, and that neither the National Park Service nor the Virginia Air Quality Board has been presented with any information concerning the likely impact of this facility on ozone concentrations and ozone health

standard violations in the park. Despite this lack of information, the Department of Interior Assistant Secretary for Fish and Wildlife and Parks, the federal land manager for all Class I areas in the national park system, has elected not to make an adverse impact determination in this case. The Board should conduct its own review of the record as it concerns potential impacts of this facility on air quality in the park. Rather than taking a "what we don't know can't hurt us approach," the absence of data demonstrating that NO<sub>x</sub> emissions from CPV Warren will not increase ozone concentrations in the park should cause the Board to deny this permit application because the facility is unsuitable for the area in which it is located. The same is true for the absence of data concerning the likely impact of CPV Warren NO<sub>x</sub> emissions on ozone concentrations in other surrounding nonattainment areas.

#### CONCLUSION

In order to find CPV Warren permit application in compliance with Virginia regulations and the proposed power plant suitable for the place in which it will be located, the Board must make at least five major assumptions:

1. That Warren County is in fact in attainment of ozone health standards, despite air quality monitors surrounding Warren County regularly recording violations of the eight-hour ozone standard and the absence of air quality monitors in Warren County.
2. That a source emitting over 150 tons of NO<sub>x</sub> fewer than five miles from the Shenandoah National Park will have no impact on ozone concentrations in the park, despite studies showing that NO<sub>x</sub> emissions control ozone formation in Shenandoah and local sources have the greatest impact on NO<sub>x</sub> concentrations in the park.
3. That this major NO<sub>x</sub> emitter will not impact immediately adjacent nonattainment areas to the east, northeast, and north of Warren County.
4. That the cumulative impacts of this and all other permitted sources will not adversely impact air quality in the park and other surrounding nonattainment areas.
5. Finally, to the degree the Board is relying on offsets to deal with these unknowns, that the offsets will be real and

will be secured from sources that will benefit air quality in the Shenandoah National Park and throughout Northern Virginia, and that they will not be traded.

There is no information in this record to support any of these assumptions. While there is considerable information concerning the serious ozone pollution problems in the Shenandoah National Park and Northern Virginia, there is no information in this permit application record concerning the likelihood that the CPV Warren power plant will exacerbate these problems. Accordingly, we urge the Air Pollution Control Board to deny this permit on the ground that the proposed facility is unsuitable for the area in which it will be located.

Respectfully submitted,



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# Making Connections

Building a healthy future for Shenandoah National Park  
and its gateway communities



National Parks Conservation Association®  
*Protecting Our National Parks for Future Generations®*

# Making Connections

Building a healthy future for Shenandoah National Park and its gateway communities

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*Cover Photos*

Clockwise from top: View of Shenandoah National Park from Mount Vernon Farm near Sperryville, Rappahannock County (Gregory Dicum); Downtown Luray (Town of Luray); Hiker overlooking Shenandoah fall colors ([istockphoto.com/ntn](http://istockphoto.com/ntn)); Black bear in Shenandoah National Park ([istockphoto.com/Paul Tossier](http://istockphoto.com/Paul Tossier)); Sperryville (Gregory Dicum).

*Interior Portraits*

Lianne Crookshanks and Tony Williams photos courtesy of the subjects. All other photos of individuals quoted provided by Gregory Dicum.



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Since 1919, the nonpartisan National Parks Conservation Association has been the leading voice of the American people in protecting and enhancing our National Park System. NPCA, its members, and partners work together to protect the park system and preserve our nation's natural, historical, and cultural heritage for generations to come.

# Making Connections

This *Making Connections* report surveys important aspects of the interdependence between Shenandoah National Park and its neighbors, and offers insight into Shenandoah's positive economic influence on surrounding communities. National Parks Conservation Association (NPCA) intends *Making Connections* to be both a report and an invitation. Individuals, organizations, businesses, and the park all can benefit by getting more involved to value and connect more closely with what each contributes to the region.

We hope that when you read this report, you will want to get more involved. Here are some connections you can make:

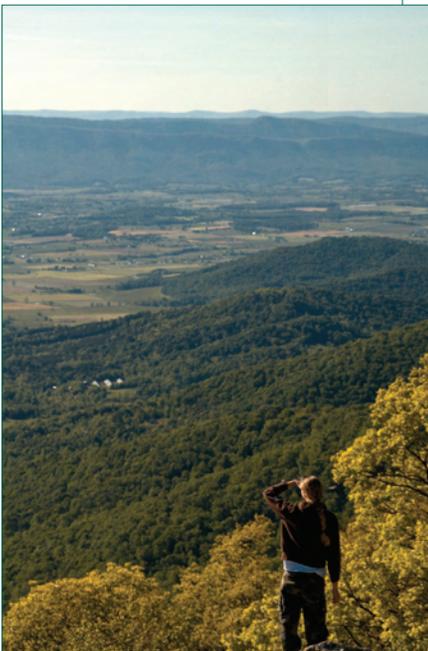
- **Participate in community planning.** Protect park and community values by speaking up early and constructively in public planning processes.
- **Engage in your community's economic development process.** Focus on the unique landscape and attractions such as native fish and wildlife, history, and heritage to recruit new businesses and strengthen existing ones.
- **Celebrate the 75th anniversary of the dedication of Shenandoah National Park in 2011.** Get involved in planning for this exciting celebration, and watch [www.nps.gov/shen](http://www.nps.gov/shen) for related announcements.
- **Keep up with the work of the Blue Ridge Committee for Shenandoah National Park Relations.** The committee provides for communication between the park and adjacent counties. There is a representative from each county bordering the park. Keep informed about park plans and identify opportunities to work together at [www.blueridgecommittee.org](http://www.blueridgecommittee.org).
- **Work through Virginia's Regional Planning Districts.** Four districts border the park (listed on the inside back cover) and offer information and expertise for the region. Connecting through these districts could help park neighbors explore ways to work together to maximize the benefits of park proximity.
- **Get involved in creating a "geotourism" initiative.** The National Geographic Society's Center for Sustainable Destinations at [www.nationalgeographic.com/travel/sustainable](http://www.nationalgeographic.com/travel/sustainable) promotes this concept as a way to foster stewardship-based tourism. A successful collaborative effort including Glacier National Park serves as a potential model for communities around Shenandoah. See [www.crownofthecontinent.net](http://www.crownofthecontinent.net).
- **Help schools take advantage of Shenandoah National Park's curricula and interpretive programs.** Many teachers don't have the resources to take students on park field trips. Sponsor a school or a class to learn from and explore our national park. Learn more at [www.nps.gov/shen/forteachers](http://www.nps.gov/shen/forteachers).
- **Choose clean air and water inside and outside the park.** The park's mountain streams are the source of many communities' drinking water and flow to the Chesapeake Bay. And cleaner air in Shenandoah will mean healthier air for our communities, farms, wineries—and children. Be involved with the Choose Clean Water coalition at [www.choosecleanwater.org](http://www.choosecleanwater.org), and join Virginians for Healthy Air at [www.npca.org/vahealthyair](http://www.npca.org/vahealthyair).
- **Take your family and friends to visit the park.** Enjoy and explore its many surprises. For schedules of programs and events, regularly check the park's web site at [www.nps.gov/shen](http://www.nps.gov/shen).
- **Join National Parks Conservation Association** at [www.npca.org](http://www.npca.org).

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*A park and its gateway are really a single destination, with similar history, scenery, and climate.*

— Jonathan Tourelot  
*National Geographic Traveler*



The rural character of the surrounding countryside is part of Shenandoah National Park's appeal.  
Photo: istockphoto.com/titoslack

“If you visit a national park,” writes Jonathan Tourtellot in a National Geographic ranking of 55 park areas, “you’ll often spend plenty of time just outside the park, too—eating, sleeping, parking, shopping, sightseeing—in the town or region that geographers call the gateway. A park and its gateway are really a single destination, with similar history, scenery, and climate. The way park and gateway interact can make all the difference in the quality of your trip and in the sustainability of the destination.” (Tourtellot 2005)

Perhaps no park better illustrates this connection than Shenandoah National Park. Long and slender, Shenandoah is designed for people to look *out* of. Its central feature is Skyline Drive, a 105-mile roadway with 75 overlooks. The visual character of the surrounding communities and countryside are key to park visitors’ experience.

Shenandoah National Park and its neighboring communities share a landscape. The surrounding communities and countryside are as essential to the park and the “park experience” as the park is to the character of this region.

### **Connections: Local Economies, Landscapes, and the Park**

Drawing on economic data compiled by state and federal agencies, interviews with local residents and leaders, and a variety of research reports and assessments, this report outlines three findings:

#### **Finding 1: Shenandoah National Park provides benefits for surrounding communities.**

Shenandoah is an ecological core for the surrounding landscape and a source of economic benefit for nearby communities. The park provides clean water, fish and wildlife habitat, and a backbone of undeveloped land for the surrounding region. Tourism, recreation, and Park Service spending bring economic benefits.

#### **Finding 2: Much of Shenandoah National Park’s appeal comes from the surrounding communities and landscape.**

The surrounding landscape, farms, and small towns are a crucial part of Shenandoah’s visual appeal, and they help attract visitors to the park. Fish and wildlife that inhabit the park also depend upon areas beyond park boundaries. What happens outside the park affects the experience of park visitors and area residents.

#### **Finding 3: Attractive places and quality of life are at a premium in today’s economy.**

The attractiveness of the region’s communities and their surroundings is an economic advantage. Global economic trends drive this dynamic, as do growth of “transportable,” non-labor sources of income such as dividends and retirement payments, and improvements in communication technology that make it easier for people to live and work where they want.

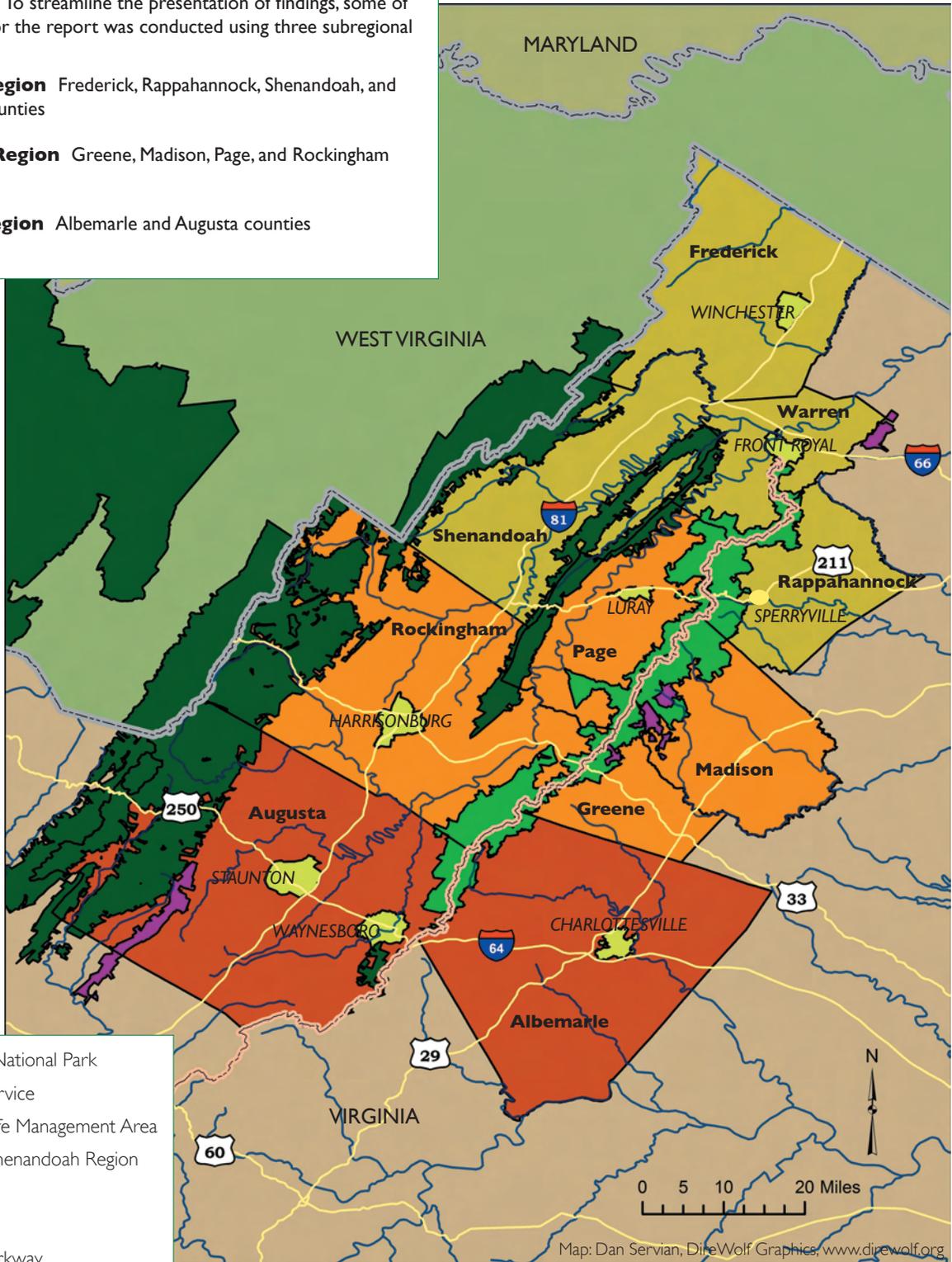
### **Making Connections for a Bright Future**

*Making Connections* concludes that the value of Shenandoah National Park to local communities goes well beyond its appeal for visitors. The closing section identifies opportunities for cooperation to create more economic success for area residents while protecting the park and the landscapes that make this region so attractive.

**Figure 1: Shenandoah National Park and Its Gateway Region**

Shenandoah National Park's gateway region, as identified in this *Making Connections* report, consists of 10 counties in the Piedmont and Shenandoah Valley. To streamline the presentation of findings, some of the data analysis for the report was conducted using three subregional areas:

- North Region** Frederick, Rappahannock, Shenandoah, and Warren counties
- Central Region** Greene, Madison, Page, and Rockingham counties
- South Region** Albemarle and Augusta counties



**Legend**

- Shenandoah National Park
- U.S. Forest Service
- Virginia Wildlife Management Area
- Counties in Shenandoah Region
- Cities
- Major roads
- Blue Ridge Parkway
- Rivers and streams

Map: Dan Servian, DireWolf Graphics, [www.direwolf.org](http://www.direwolf.org)

## Finding I — Key Points

- Shenandoah contributes to wildlife viewing, hunting, and fishing revenues in the region.
- The park provides the kinds of outdoor recreation that Virginians value.
- Shenandoah is a long-standing attraction for visitors to the region, and creates local economic benefits.
- Travel-related economic activity is growing and important in local communities.



**John Shaffer**, Luray  
Marketing Director, Luray  
Caverns

“Many don’t realize the additional benefits our communities will receive from the park in the future. As recreational opportunities and scenic landscapes become more scarce in the East, the park will become an even more important treasure.”

## Shenandoah National Park provides benefits for surrounding communities.

Many of Shenandoah National Park’s most popular hikes follow cool mountain streams and lead to beautiful waterfalls. More than 800 freshwater springs bubble to the surface in the park, combining in their downhill course to form the headwaters of 70 watersheds that flow into three major drainages: the Shenandoah, James, and Rappahannock rivers. Waters originating in the park feed aquifers that supply water for surrounding communities. Water is perhaps an apt illustration of many of the benefits Shenandoah provides to surrounding communities. It is a daily reality, and easy to take for granted.

### Wildlife Viewing, Hunting, Fishing Bring Economic Activity

The cold, clear streams that originate in the park spawn a fishery that extends beyond park boundaries. A centuries-old draw for visitors, trout fishing continues to lure anglers to the region, giving nearby communities a share of more than \$800 million that anglers spend in Virginia each year, and the state’s 14,700 fishing-related jobs. (U.S. Department of the Interior, *et al*)

Each year, more than two million wildlife watchers in Virginia infuse \$960 million into the state’s economy. A good share of this spending happens in the counties surrounding Shenandoah National Park, where wildlife viewing is a popular activity.

Although not allowed inside the national park, hunting also benefits the area economy. Several hundred black bears inhabit the park at any given time, and bears move freely between the park and surrounding lands. During the 2008 hunting season, two of every five black bears were taken in the ten-county Shenandoah region. (Virginia Dept. of Game and Inland Fisheries) If a proportionate amount of the \$17 million that bear hunters spend in Virginia each year goes to these counties, bear hunting may funnel \$6.5 million into the local economy in spending on food, lodging, equipment and transportation. (Wright)

### Outdoor Recreation is a Draw for Residents and Visitors

Outdoor recreation is popular, though demand sometimes outstrips access in this fast-growing state. In a 2006 survey, residents ranked “trails for hiking and walking”



Taking in the view from Shenandoah. Hiking is a popular park activity, and among Virginians’ favorite forms of outdoor recreation. Photo: [istockphoto.com/SKLA](http://istockphoto.com/SKLA)

### Virginians’ Favorite Outdoor Recreation Activities

(Top five activities ranked by percent of households participating)

1. Walking for pleasure 72%
2. Visiting historic sites 56%
3. Driving for pleasure 55%
4. Swimming 44%
5. Visiting nat. areas, parks 44%

(Virginia DCR—Department of Conservation and Recreation )

and “access to natural areas” as the second and third most needed recreation opportunities in the state. (Virginia DCR)

Virginians place high value on the state’s protected areas, stating the two most important reasons to protect natural areas are “conserving natural resources” and “providing people places to explore and enjoy nature and their cultural heritage.”

Plenty of residents take advantage of that opportunity to explore—80 percent of households visit a natural area, preserve, or refuge each year. About a third of Shenandoah’s visitors are Virginia residents. Nine of ten residents who backpack in Virginia do so on protected public lands. (Virginia DCR)

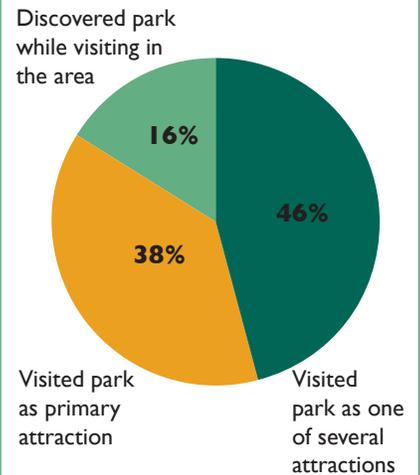
### Shenandoah National Park Generates Economic Value for Neighboring Communities and Businesses

Visitors find Shenandoah National Park in a variety of ways. For some, it is their primary destination. Others enjoy the park as one of a number of attractions on their vacations. Still others discover the park by happenstance, often directed there by people in the surrounding communities.

No matter how they find Shenandoah, visitors spend money in and around the park, primarily on travel-related services such as lodging, meals, and fuel. Because almost two-thirds of Shenandoah’s visitors go on to explore other attractions in Virginia, they generate additional economic activity in the region.

“We have a very loyal local crowd,” notes CeCe Castle, owner of Brookside Restaurant, between Luray and the park entrance at Thornton Gap. “But we couldn’t survive without travelers. We do 65 percent of our business from May to October, and depending on when the leaves peak, October is right up there with July and August as one of our best months. From Maine to Georgia, in the mountains, the high season is always going to follow the fall colors.”

**Figure 2: Shenandoah National Park as Primary Visitor Destination**



Shenandoah National Park draws around a million visitors a year. Many park visitors also enjoy other attractions in the area. A significant portion of park visitors discover Shenandoah while visiting the area. The attractiveness of surrounding communities is important to the park, as well. (Source: Littlejohn)

**Figure 3 Economic Impacts of Shenandoah National Park Visitor Spending and National Park Service Jobs, 2006**

Shenandoah visitor spending and National Park Service payroll for employees create local economic benefits. Estimates of these impacts include both direct effects (e.g., businesses selling goods and services directly to park visitors) and secondary effects (e.g., household spending of income, and sales to related businesses in the local region).

2006 Impact of Visitor Spending		2006 Impact of Park Employment	
Recreation visits	1,076,150	Park Service jobs**	218
Spending by non-local visitors*	\$41,073,000	Salary plus payroll benefits	\$11,656,000
Local Impact of Visitor Spending		Local Impact of Park Payroll Spending	
Jobs**	819	Jobs**	317
Personal income***	\$14,260,000	Personal income***	\$14,634,000
Value added****	\$22,050,000	Value added****	\$16,619,000

\*Visitor spending is estimated using spending averages from park visitor surveys and local area economic multipliers.

\*\*Includes full-time and part-time jobs. Seasonal positions adjusted to an annual basis. Park Service jobs do not include employees of park concessions.

\*\*\*Covers wages and salaries, including income of sole proprietors and payroll benefits.

\*\*\*\* “Value added” is the sum of personal income, profits and rents of private firms, and indirect business taxes accruing to regional/local government. This does not account for Park Service purchases from local businesses.

(Source: Stynes)



Shenandoah National Park’s ranger-led interpretive programs give visitors the opportunity to explore and learn about the park’s natural and historical features. Photo: John F. Mitchell, NPS

The local economic impact of visitor spending in Shenandoah’s gateway communities is added to by Park Service payroll and by purchases from local businesses. As these dollars are spent and re-spent locally, the impact of these expenditures and payroll on the local economy is multiplied. (See Figure 3, p. 5.)

In 2009, Shenandoah National Park began spending \$30 million in stimulus funds authorized by the American Recovery and Reinvestment Act—primarily for infrastructure and roads projects—bringing an extra measure of economic activity to local communities. And, despite the economic downturn, Shenandoah’s year-to-date visitation numbers in September 2009 were up ten percent over the previous year.

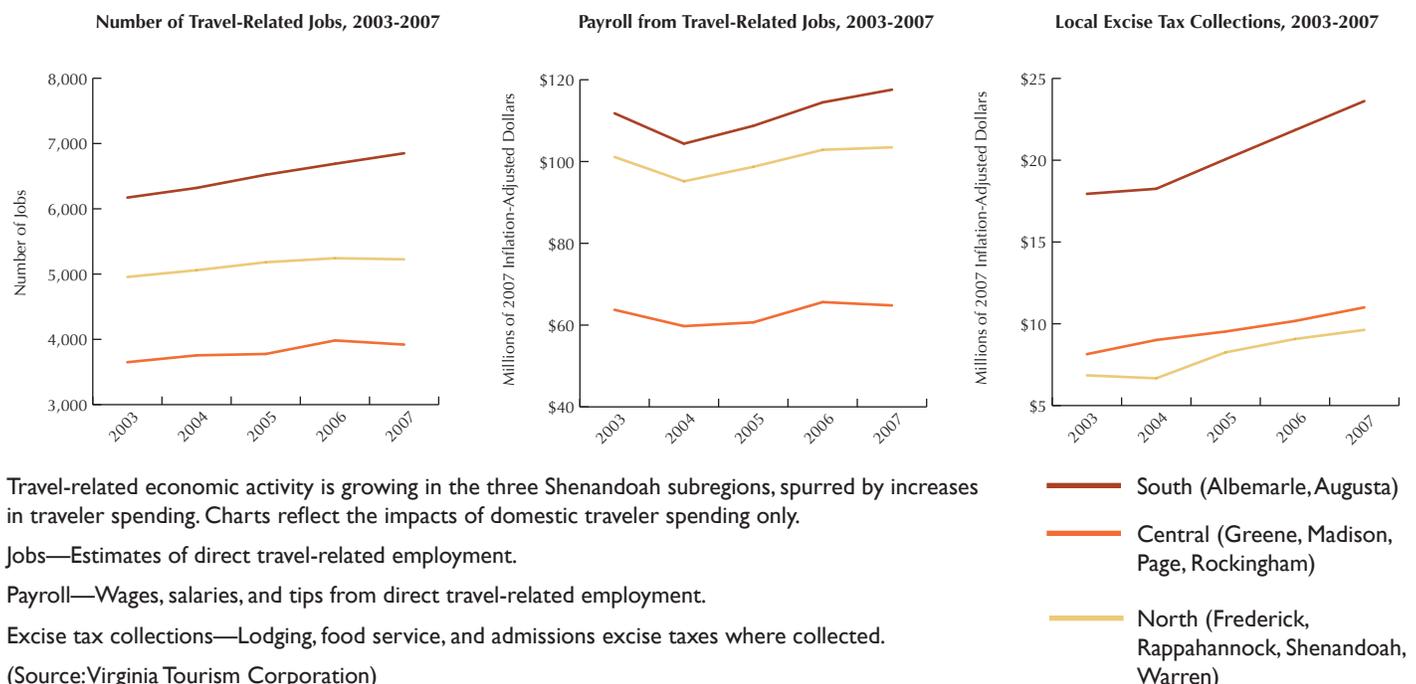
### Travelers’ Contributions to Local Economies are Growing

Between 2003 and 2007, tourist expenditures grew in each of the three sub-regions surrounding Shenandoah National Park. At 20 percent, growth in the North region was on par with the growth of travelers’ expenditures in Virginia as a whole. During the same time period, traveler spending grew by 23 percent in the Central region, and 32 percent in the South region. (Virginia Tourism Corporation)

As tourist expenditures grew, they supported a modest expansion in the number of travel-related jobs and modest payroll growth. Local and state tax collections have risen simultaneously. Receipts from excise taxes, which are administered by counties and independent municipalities, have been growing at a rate that has kept pace with, or outstripped, the growth in travelers’ spending. (See Figure 4.)

Excise taxes—levied by some localities on lodging, food service, and admissions to attractions—augment local government general funds, helping communities keep up with infrastructure and other costs. Lodging excise tax receipts in excess of two percent contribute to marketing and tourism business development.

**Figure 4: Travelers’ Contributions to Local Economies, 2003-2007**



### Much of Shenandoah National Park's appeal comes from the surrounding communities and landscape.

In Shenandoah National Park, history is never far away. A good share of the park's 500 miles of hiking trails pass through old farmsteads and ruins. President Herbert Hoover's retreat, Rapidan Camp, is among the park's most popular attractions. Former resorts—like Skyland—and the rustic handiwork of 1930s Civilian Conservation Corps workers house many park concessions and visitor facilities.

In the early 1930s, park booster William Carson declared in a radio address, "Scenery is going to be Virginia's next big cash crop." As the chair of Virginia's Commission on Conservation and Development, Carson orchestrated the design and construction of Skyline Drive to take full advantage of the surrounding scenic beauty. From some of the drive's east-facing overlooks, visitors could see across a landscape of small towns and farms some 70 miles to the Washington Monument.

#### Development Could Threaten Shenandoah's Views

Shenandoah was designed to appeal to East Coasters as driving vacations boomed in popularity during the early decades of the 20th century. For most park visitors, taking in the view from Skyline Drive is still the focal point of their trip. In a 2001 survey, the following reasons for visiting Shenandoah garnered the most "extremely important" and "very important" ratings:

- Viewing the scenic drive and overlooks (87%);
- Enjoying solitude and natural quiet (75%);
- Viewing wildlife and plants (72%); and
- Experiencing wilderness (71%). (Littlejohn)

For generations, the view from Skyline Drive's overlooks and many of the park's trails has been forests, mountain vistas, and open farmland dotted with small towns. But that is changing as development expands the footprint of the region's towns and cities, and, in some places, takes over open agricultural land.

Development of land in Virginia has been concentrated in recent decades, driven by rapid population growth. More than a quarter of the land area developed since the settling of Jamestown—for houses, commercial establishments, industrial facilities and the like—was developed between 1990 and 2006. If population growth trends continue, the state projects that the 40 years following 2006 will see the development of more land than in the previous 400 years combined. (Virginia DCR 2006)

These projections do not bode well for the areas surrounding Shenandoah National Park. For more than 30 years, population growth in the northern and central parts of the park's region has outpaced even rapidly growing Virginia. In the southern part of

#### Finding 2 — Key Points

- Shenandoah National Park depends upon the surrounding landscape and communities for its visual appeal.
- Habitat for park fish and wildlife extends beyond park boundaries to nearby public and private lands.
- Poorly planned development may isolate park habitat, make views less attractive, and diminish the appeal of the park's neighboring communities.
- The character, culture, and vitality of surrounding communities help maintain quality of life for local residents and attract visitors to the region and park.



Photo: istockphoto.com/sborisov



Photos: NPS

## Air Pollution Shrouds the View from the Top

Downwind from major industrial and urban areas, Shenandoah National Park's air quality is often poor. Effects include:

- Hazy skies that obscure views;
- Acid deposition, which harms native fish;
- Ozone pollution that damages sensitive plants and may slow forest growth.

Despite improvements spurred by the federal Clean Air Act, visibility and sensitive streams remain degraded. Ground-level ozone pollution is among the worst of any national park. And climate change threatens to exacerbate these problems.

the region, population has grown more slowly than Virginia's, but still faster than the national average. (U.S. Bureau of Economic Analysis)

Chris Miller, president of the Piedmont Environmental Council, says trends in private land conservation in the region are encouraging. "Landowners have protected hundreds of thousands of acres visible from Shenandoah National Park," notes Miller. "Many of the conservation easements specifically reference maintaining views from the park as a primary purpose. I estimate that the region is between 20 and 30 percent of the way to protecting private lands that are important viewshed and buffer areas for the park."

Across the ten-county region, more than 188,000 acres are held in conservation easements, which protect land from development while maintaining compatible uses such as farming. (Virginia DCR Land Conservation Data Explorer)

## Park Wildlife Need Habitat Inside and Outside the Park

The 72 percent of visitor survey respondents who valued the opportunity to view wildlife and plants during their Shenandoah visits (Littlejohn) likely left the park satisfied. Since the park's establishment, the forest has retaken a landscape once cleared for farming, timber harvest, grazing, and other uses. As the forest recovered, native plants and wildlife came back.

Virginia white-tailed deer, once all but wiped out in the region, are again abundant in the park. In 1937, an estimated two black bears made their home in the park. Today, the park's black bear population ranges up to several hundred. Introductions of wild turkey on adjacent private lands helped return a healthy population of these birds in the park, where they join some 30 year-round resident bird species, and about 170 species found in the park seasonally. (National Park Service)

The park is now one of the largest intact tracts of eastern deciduous forests in the northern Blue Ridge Mountains. Because it straddles the northern and southern Appalachians, and varies some 3,500 feet in elevation, it is also home to a remarkably diverse array of plant communities and animal species.

The Virginia Natural Landscape Assessment, a project of the Virginia Department of Conservation and Recreation, identifies Shenandoah and some adjacent lands as areas of outstanding habitat integrity, linked to other high-quality habitat to the south and west in the George Washington National Forest. These linkages are critical for species such as black bears and bobcats—as is maintaining habitat on private lands surrounding the park. These animals rely on a range of natural areas to allow them to adapt to changing conditions and food availability.

Many of Virginia's growing population of 16,000 bears live in and around Shenandoah National Park. Seven of the eleven counties with the highest concentrations of bears are in the region covered by this report. (Sajecki) According to park wildlife experts, as Shenandoah's forests matured to produce



Native eastern brook trout. Bears and bobcats are not the only animals that depend on habitats in and outside the park. Brook trout, American eels, and other aquatic species range up and down streams that flow through park and private lands. Photo: iStockPhoto.com/invs572517

plenty of food for bears, land use outside the park also encouraged healthy bear populations: “The mosaic of agricultural lands, woodlots and tree-lined streams created nearly ideal conditions for the bear population to expand and disperse.” (National Park Service)

Aquatic species, such as brook trout and American eels, also rely on linkages between the park and private land. Eels must travel upstream through private lands to reach park streams, where they develop into adults. The health and resilience of the park’s brook trout populations depends on high-quality downstream habitat, which allows connectivity with trout populations at lower elevations. (Wofford) Maintaining habitat connections may help native fish be more resilient to climate change.

### Protecting the Landscape Protects the Region’s Future

How and where development occurs affects the scenic appeal of the region, wildlife habitat, quality of life for local residents, and the viability of agriculture.

“Private land conservation,” observes Piedmont Environmental Council’s Chris Miller, “can help sustain all of these values. The communities adjacent to the park are working hard to designate and protect scenic byways, recognizing that the journey to and from the park is as important to visitors as the destination itself. Nearly 90,000 acres of conservation easements in the Piedmont region are directly adjacent to designated scenic byways.”

Keeping farmland farmed has not been easy in some of the area’s counties. Mirroring a statewide trend, every county in the region saw average farm size shrink between 1992 and 2007. The number of farms grew in every county, while the number of acres farmed increased in only three counties. (See Figure 5.)

According to an American Farmland Trust analysis, nearly every county in the Shenandoah region contains a sizeable area of prime and unique farmlands. Pressure for development is particularly strong in Augusta, Frederick, Rappahannock, and Shenandoah counties. (American Farmland Trust)



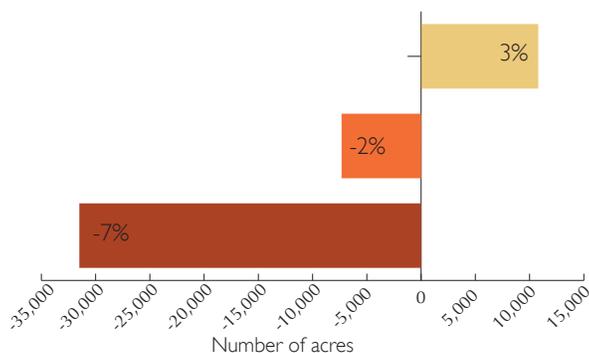
**Marshall Jones,**  
Front Royal

Smithsonian National  
Zoological Park Conservation  
and Research Center

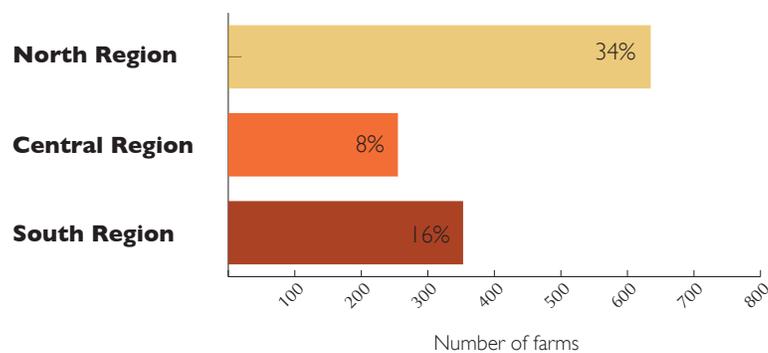
“If you look at how national parks are done in some other countries, villages and private land are included. I think that is sort of an unspoken idea that a lot of people have here. We’re an extension of the park. When you stand on Skyline Drive, you see the beautiful farms and rolling country. That’s what we want to see here—rural views and rustic towns.”

**Figure 5 Trends in Farms and Farmland**

**Change in Farmland Acreage, 1992-2007**



**Change in Number of Farms, 1992-2007**



In most of the region’s counties, farmland acreage declined or held steady between 1992 and 2007. The only counties to post gains in farm acreage were Warren (22%), Shenandoah (13%), and Madison (2%). Rappahannock (-18%), Greene (-16%), and Albemarle (-16%) experienced the biggest proportionate losses. Every county saw gains in the number of farms. Warren County (87%) topped the list, followed by Rappahannock (33%) and Madison (28%). (Source: U.S. Census of Agriculture)



**Julena Campbell, Luray**  
Ranger, Shenandoah National  
Park

“The story of the human history of the area is essential to this park. We drew on many oral histories from local residents to create the park history exhibit at Byrd Visitor Center.

“Now, families come up to the visitor center and you’ll hear parents say, ‘This is your great-grandmother,’ or, ‘This is the cabin your great-grandfather grew up in.’ Seventy years after the park was created, people can come up and explore their personal connections to the land—go to the cemetery where their great aunt is buried, or find the cornerstone of great-grandfather’s house, or the tree he might have planted when he was a little kid.”

## Local Character and Culture Support Quality of Life and Attract Visitors to the Region and Park

Nationwide, 86 percent of fruits and vegetables, and 63 percent of dairy products are produced in urban-influenced areas, which puts important food production squarely in the path of development. (American Farmland Trust)

That, says Andrew Haley, who owns Blueridge Artisans gallery in Sperryville, is where the local food movement comes in. “Agriculture is a tough go here. It’s hard to fight cheap corn from California and virtually free strawberries. I think the conventional wisdom is that you just can’t do it, but we’re seeing amazing counter-examples—organic farmers who are going gangbusters taking their produce to local farmers markets around here and in D.C. People care a lot less about what it costs than about knowing it was locally produced without a lot of poisons.”

Eric Bendfeldt, community viability specialist with the Virginia Cooperative Extension, says that developing regional markets is a springboard for farmers to transform low-profit commodity agriculture businesses. “Differentiating products—for example, raising hormone-free, local beef, or organic seasonal vegetables—helps farmers increase the value of their products, keep more of that value for themselves, and diversify into other crops.”

This local agriculture transformation is helping invigorate communities, says Bendfeldt, noting that the “concept of developing local food systems within a regional foodshed is all about maintaining quality of life.” Affirming the links between farming and local culture, the 2008 inaugural “Harvest” in Berryville welcomed visitors to celebrate local food, farming, and history. The festival was spearheaded by, and proceeds supported, nonprofit groups dedicated to land, cultural, and historic preservation.

Elsewhere in the region, *Flavor* magazine and *Edible Blue Ridge* serve up stories about local food, wine, culture, and sustainability. Online networks have sprung up to guide residents to fresh, regional offerings in both the Shenandoah Valley and Piedmont. Over the past two years, the Piedmont Environmental Council, in partnership with many state and local organizations, has distributed “Buy Fresh Buy Local” guides to over 250,000 households in the communities adjacent to the park.



In 2005, local producers created the Shenandoah Valley Produce Auction. This centralized market has opened doors for more farmers to go into vegetable production. “Diversification,” notes Virginia Cooperative Extension’s Eric Bendfeldt, “helps make farms less susceptible to economic pressures.” Photo: Virginia Cooperative Extension

## Finding 3

### Attractive places and quality of life are at a premium in today's economy.

Howard Thompson of Evergreen Outfitters tells a familiar story when he recounts how he and his wife, Andy, moved to Luray from Alexandria. “When we were living in northern Virginia, we’d come out here most weekends, backpacking and camping. We bought our house in Luray in 1998 and weekendened it until 2003 when we sold everything in Alexandria and moved out. We were going to get rid of one place, and it was far easier for us to part ways with northern Virginia, the traffic, and the city.”

Interviews with business owners and other residents suggest that the same recreation opportunities, natural beauty, and small-town pace of life that attract weekenders and visitors, draw some of those visitors to move permanently to the area. And they are a large part of the area’s appeal to long-time residents.

#### Newcomers Contribute to Local Economies

Between 2000 and 2008, each of Shenandoah’s three subregions attracted new residents faster than the rest of the counties in Virginia as a whole. (See Figure 6.) With the sole exception of Charlottesville, more people moved into each of the counties and independent municipalities in the region than moved away during that time period.

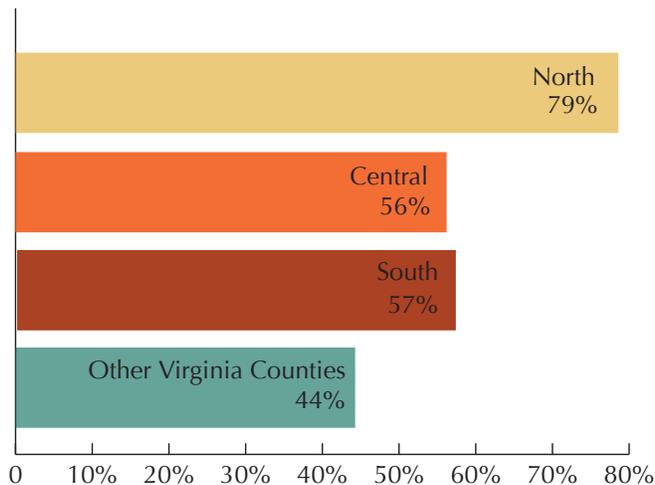
A decline in the percentage of seasonal homes in most counties in the region may offer evidence that more people are, like the Thompsons, opting for permanent rather than seasonal residences. Only three counties in the region saw significant increases in the proportion of seasonal homes between 1990 and 2000: Albemarle, Page, and Rappahannock. (See Figure 7.)

#### Finding 3 — Key Points

- New residents and small businesses contribute to growth and vitality in local economies.
- The Shenandoah region is attracting new residents faster than the rest of the state.
- Economic changes have placed a premium on community attractiveness—including natural beauty, high-quality public lands, outdoor recreation, and small, friendly communities. These changes are expected to continue.

Figure 6 Population Growth through Migration

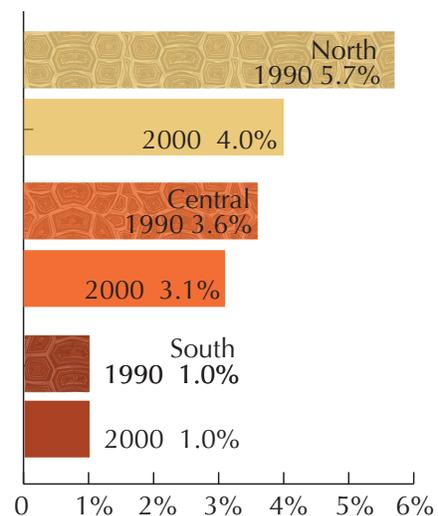
#### Percent Population Growth Due to Net Migration, 2000-2008



Net migration refers to the difference between the number of people moving into the area, and the number of people moving away. Strong net migration rates can be an indicator of the attractiveness of an area or the strength of its economy. (Source: U.S. Census Bureau)

Figure 7 Trends in Seasonal Homes as a Proportion of all Homes

#### Seasonal Homes as a Percentage of All Homes, 1990 & 2000



A declining share of seasonal homes may indicate an influx of permanent residents. (Source: U.S. Census Bureau)



**Lianne Crookshanks**  
Waynesboro

Director of Tourism

“It’s stunning to see the sun come up over the Blue Ridge Mountains. I wake up to that every morning. That’s why I came here, and why I’m raising my kids here.”

Some of those newcomers are starting small businesses, and, as in other parts of the country, small businesses carry the bulk of the load in employment growth in the Shenandoah region. Across the region, 86 percent of firms have fewer than 20 employees. Between 1995 and 2005, firms with 10-19 employees showed the fastest growth in the North and South subregions. In the Central subregion, firms with 20-49 employees grew the most quickly as a share of all firms. (U.S. Census Bureau, County Business Patterns)

**Economic Changes Place a Premium on Quality of Life**

Over the past 30 years, the structure of local economies throughout the region has changed in similar ways, with personal income growth concentrated in non-labor income and the services and professional sectors. Government and manufacturing have also been growing in some areas. (See Figure 8.)

National and global shifts toward a more services-oriented economy continue to filter through this region. Improvements in communication technology and changes in workplace management have made it easier for people to live and work where they want.

At the same time, “transportable,” non-labor sources of income, especially dividends, interest, rent, and age-related payments such as retirement, have become more important. (See Figure 8, p. 13.) Some of the growth in non-labor income is driven by an expanding share of retirement-age residents, and the advance of baby boomers toward retirement.

These shifts place a premium on a community’s quality of life—its attractiveness and ability to draw and retain residents. Research from around the country and interviews conducted for this report suggest that natural beauty, public lands, outdoor recreation, and small, friendly communities top the list of what long-time residents and newcomers alike appreciate.

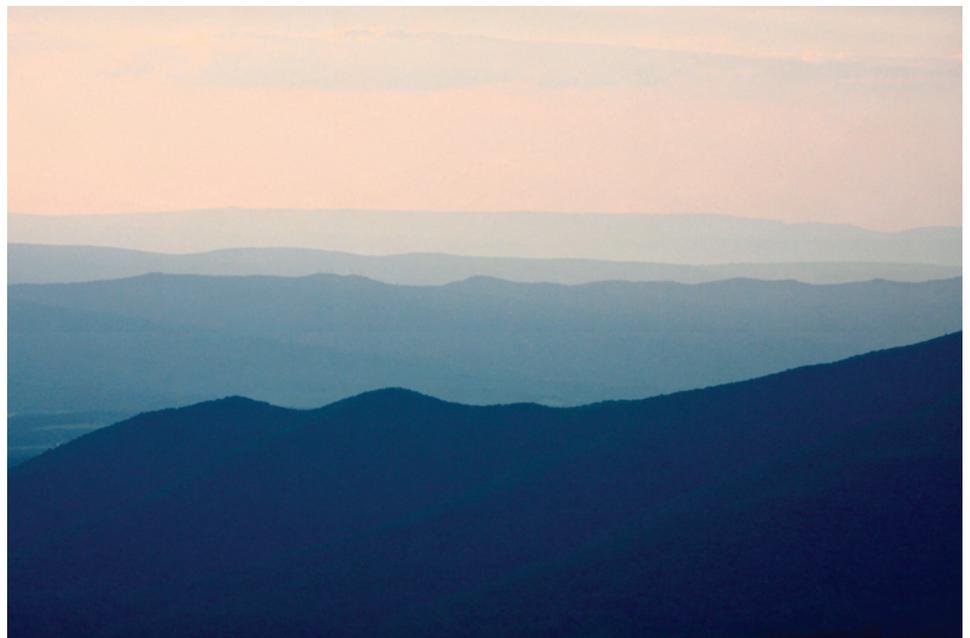
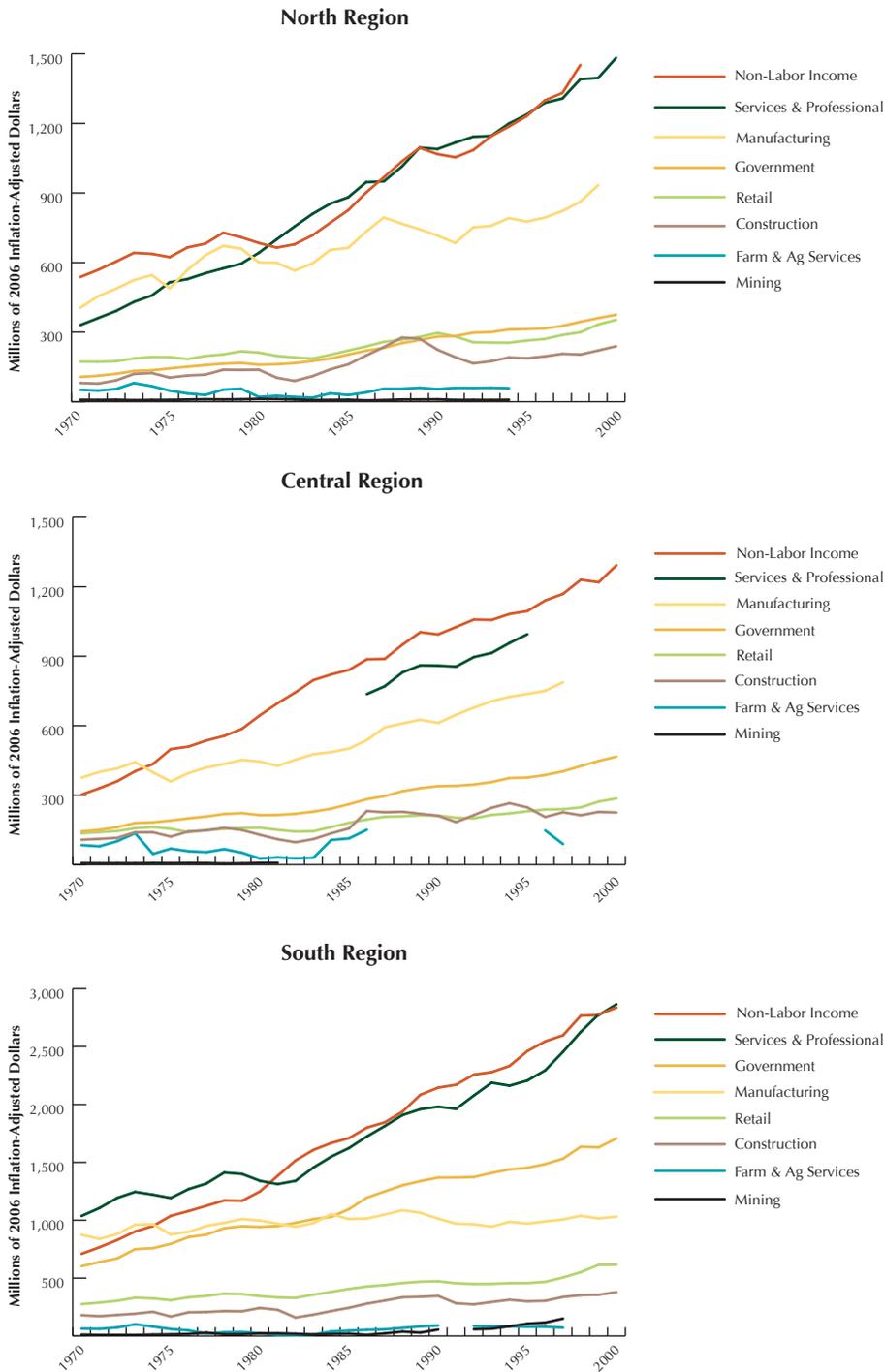


Photo: Gregory Dicum

**Figure 8: Income by Source or Industry Sector, 1970-2000**

Personal income growth has been led by non-labor income (payments such as dividends, interest, rent, and government payments such as Medicare or Social Security) in all three regions, closely followed by the services and professional sector. Manufacturing is of growing importance in the North and Central regions, while government is gaining strength in the South. (Source: Economic Profile System compilation of data from U.S. Bureau of Economic Analysis Regional Economic Information System 2006)



Note: Missing portions of lines in the graphs in these graphs indicate gaps in data, often due to restrictions on disclosure of company-sensitive information or difficulties aggregating data across multi-county regions.



**Tony Williams**  
Stanardsville

Greene County Director of Economic Development

“Proximity to Shenandoah National Park is one of Greene County’s greatest selling points, as businesses stress quality of life as much as the cost of doing business. Who wouldn’t want to work and live near such beauty?”

“The community here understands its great natural resource and has created a comprehensive plan to preserve it. Designated areas for commercial and retail growth will maintain the open spaces that give this county much of its appeal, and sustain both economic growth and the county’s natural beauty.”



**Lee Wolverton**  
Waynesboro  
Editor, *News Virginian*

“I see the park as an economic opportunity for the town. There is plenty of room for more integration with the park and for attracting more park visitors who are passing through.

“Precisely how that would coalesce into a vision, and what it would look like, I’m not sure. But I think both the park and the city could show more leadership in figuring out an answer.

“How to turn the area to the east of the city into a gateway? Maybe a center that focuses on the park—some displays and exhibits, something to give people a reason to stop and check it out.”

In 2005, when National Geographic assembled a panel of experts to rate 55 national park destinations and their gateway communities on a broad-based stewardship index, Shenandoah ended up on the “rock bottom” list. Its score of 48 out of a possible 100 ranked it above only two other park areas.

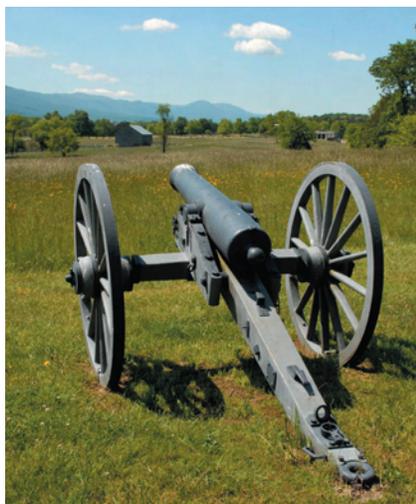
Among the challenges and opportunities panelists identified: Protecting Shenandoah’s famous vistas; getting a handle on traffic; coordinating and improving marketing and tourist services; encouraging day visitors to spend time in nearby communities; and addressing environmental challenges such as air quality.

Business and community leaders interviewed for this report agree there are plenty of opportunities to work together more closely, for mutual benefit. The following recommendations offer a starting place for leveraging local resources for a more prosperous and attractive future.

### ■ Create more collaborative relationships between the park and local communities, and among communities.

Cliff Miller, owner of Mount Vernon Farm, which encompasses more than 800 hundred acres surrounding Sperryville, says he thinks the town and the park are “good neighbors, but we’re not coordinating nearly as much as we ought to.” How could the region move forward in a more coordinated way? Some examples:

- Create joint visitor centers in neighboring communities, focusing on the park and opportunities and services outside the park. Give local businesses print materials and updates so they can offer better information about the park.
- Take the park’s top-notch interpretation and educational staff and resources on the road, offering programming in surrounding communities.
- Use successful programs as models to help promote local businesses. In 2009, for example, park staff offered educational programs about hiking with children. Evergreen Outfitters loaned demonstration gear for the classes.
- Develop a regional brand identity to provide a unified public face for a region that includes Shenandoah National Park. In the same way as “Handmade in America” drew attention to traditional crafts in western North Carolina and eastern Tennessee, or the “Crooked Road” draws visitors to southwestern Virginia, a regional identity could help Shenandoah and its neighbors.



Civil War cannon at New Market battlefield. The Shenandoah region is full of rich resources that could be better connected through coordinated marketing, signage, and tour packages and itineraries. Photo: iStockPhoto.com/Visionofmaine

- Identify resources that are unique to the area, and connect and focus on these. “Geotourism” is a possible organizing concept, encouraging citizens and visitors to get involved in building a sense of regional identity and stewardship around what is unique to the area.

## ■ **Maintain and enhance the character of the park and surrounding communities and landscapes.**

Maintaining the region’s attractive qualities while providing for economic growth is a priority that communities and the park can share. For example:

- Revisit guidelines for, and the operation of, park concessions and services to ensure roots in local culture, history, and nature; and services and goods that appeal to today’s visitor and connect to surrounding communities.
- Be smart about growth and development on private land. Each county must work out an approach that fits its circumstances. Conserving open spaces and farmland adds to the region’s appeal, contributes to the viability of agriculture, protects fish and wildlife, sustains the visual character of the park, and increases land values overall.

Many jurisdictions have land conservation programs, comprehensive plans, and zoning ordinances that could be tweaked to include protecting views from park trails and scenic overlooks as an element. Conservation programs for private land should consider potential impacts on park viewsheds, wildlife habitat, and other elements critical to the health of the park.

- Focus on community and economic development that enhances residents’ quality of life. Support entrepreneurship and small business, and enhance communication infrastructure. Prioritize education and health care.
- Push for full funding for Shenandoah National Park. Each year, the 392 parks in the U.S. National Park System receive less funding than they need to protect natural and cultural resources and provide visitor services. While some progress has been made in the past two years—and stimulus funding provided an additional boost in 2009—steady increases are needed to protect and restore Shenandoah and other national treasures.

In Shenandoah, an annual budget shortfall of about \$5.5 million leaves important management and maintenance functions undone, and creates a backlog of deferred projects. Cutbacks mean fewer rangers and interpretive programs; lack of visitor centers at key locations; campground closures; decreased maintenance of Skyline Drive and overlooks; and decreased ability to deal with oncoming challenges such as climate change.

- Visitors prize Shenandoah’s natural aspects, and think of the park as more than just the landscape surrounding Skyline Drive. These values should guide park management decisions, as well as inform the tourism marketing efforts of surrounding communities. A 2001 survey of park visitors asked about the most important attributes to consider in planning for the preservation of Shenandoah for future generations. The top responses were clean air, forests, clean water, wildlife, natural quiet, and wilderness/backcountry. (Littlejohn).
- Support local farmers, artists, craftspersons and business owners who are working to maintain and revive local culture and community character.



**Howard Thompson Luray**

Owner, Evergreen Outfitters

“Our business wouldn’t make it without locals and it wouldn’t make it without tourists.

“I think that people are realizing that tourism is a driving factor for the economy as it stands at this moment here in the county. The kind of industry that once used to drive the economy probably isn’t feasible here anymore.

“Being as close as we are to the metro DC/northern Virginia area, we get lots and lots of people coming out visiting the park, the river, the town. There’s been a lot of good progress made right here in the town of Luray, revitalizing the downtown business district, and the greenway, the walking trail that goes through town.

“I think we are very fortunate to have the park here. For business, obviously, it’s a good source of people coming in. And I just think I’m very lucky to have such an awesome playground right in my backyard.”



**Martha Bogle, Luray**  
Superintendent, Shenandoah  
National Park

“One of the challenges the park shares with adjacent landowners is invasive plants. We all have the same problems with weeds. We don’t want them sharing theirs with us, and we don’t want to share ours with them.

“The crew here in the park has years of experience dealing with invasive plants. I was talking with an organic farmer the other day, whose land abuts the park. I encouraged him to pick up the phone and call our exotic plant management team for advice about a particular challenge he is having.

“We’re neighbors, and if we can help each other out, everyone will be better off.”

## ■ Work together toward common goals.

From his vantage point at Blueridge Artisans in Sperryville, Andrew Hayley has observed a pattern that disturbs him. He calls it the “park, what park?” phenomenon. Hayley says that, whether it’s locals who take the park for granted or 30-somethings from D.C. for whom the brown Park Service signs along their driving route ring no bells, Shenandoah’s invisibility is a detriment to both the park and neighboring communities.

A 2000 National Park Service survey found that lack of advertised information about parks may detract from park visitation. When asked what the Park Service could do to encourage visitation, 41 percent responded that more advertising is necessary. At 12 percent, the next most common responses were lower fees, more parking, and free transportation. (National Park Service Social Science Program)

Increasing Shenandoah’s visibility is an example of a common goal that could unite the park and neighboring towns. Here are a few others:

- A park visitor survey revealed that 48 percent rated existing traveler information as poor or very poor. (Littlejohn) As a step in the right direction, Shenandoah National Park could participate in 511 Virginia, the regional traveler information system sponsored by the Virginia Department of Transportation ([www.511virginia.org](http://www.511virginia.org)).

Another study found that travelers especially wanted information about driving Skyline Drive, seasonal attractions, and recreational opportunities in and outside the park. (U.S. Department of Transportation)

- About 300 non-native plant species have been documented in the park. Some are invasive problem species that pose a similar threat to native species and natural areas in the park and to farms and natural areas outside the park.
- The same air-borne pollutants that plague the park diminish air quality in surrounding communities. Shenandoah’s notoriously hazy skies are caused by high concentrations of airborne sulfate particles, and ozone concentrations damage plants, and decrease forest productivity. Because air quality in Shenandoah is protected by federal clean air law, communities around the park can leverage the park’s protected air quality status to improve air quality in the broader region. The Virginians for Healthy Air network of small businesses provides an organized forum for such advocacy ([www.npca.org/vahealthyair](http://www.npca.org/vahealthyair)).

## Collaborating for Mutual Benefit

Anticipation of the 75th anniversary of Shenandoah National Park’s dedication already has spurred extraordinary collaboration among people and organizations in the area. As this 2011 anniversary comes and goes, and America prepares for the 2016 celebration of the first 100 years of its National Park System, Shenandoah National Park and its neighbors have the opportunity to continue down this path of increasing cooperation—protecting the park, the landscapes, and the character that make this region so attractive, and cultivating greater economic success.

## Bibliography

- American Farmland Trust. Farming on the Edge: Sprawling Development Threatens America's Best Farmland. (<http://www.farmland.org/resources/fote/default.asp>, and Virginia state map at [http://www.farmland.org/resources/fote/pdfs/map\\_virginia.pdf](http://www.farmland.org/resources/fote/pdfs/map_virginia.pdf).) Accessed August 13, 2009.
- Littlejohn, M. Shenandoah National Park Visitor Study, April 2001. Visitor Services Project Report 127. National Park Service, April 2002.
- National Park Service. Bear Issues and Management Natural Resource Fact Sheet. Shenandoah National Park: National Park Service, September 2008.
- National Park Service Social Science Program. The National Park Service Comprehensive Survey of the American Public—Technical Report. National Park Service, June 2001. (<http://www.nature.nps.gov/socialscience/pdf/NatSurvTechRep.pdf>.) Accessed August 15, 2009.
- National Parks Conservation Association. The U.S. National Park System: An Economic Asset at Risk. Washington, DC: May 2006.
- Sajewski, J. Virginia Department of Game and Inland Fisheries black bear project leader. Personal communication. 2009.
- Stynes, D. National Park Visitor Spending and Payroll Impacts 2006. National Park Service and Michigan State University, October 2007.
- Tourtellot, Jonathan. "Destination Scorecard: How Do 55 National Park Regions Rate?" National Geographic Traveler, July/August 2005.
- U.S. Bureau of Economic Analysis. Regional Economic Information System, Table CA30, 2006.
- U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.
- U.S. Department of Transportation John A. Volpe National Transportation Systems Center. Shenandoah Alternative Transportation Planning Study Final Report. Shenandoah National Park, Virginia: National Park Service. 2005.
- Virginia Department of Conservation and Recreation. 2006 Virginia Outdoors Survey. ([http://www.dcr.virginia.gov/recreational\\_planning/documents/vopsurvey06.pdf](http://www.dcr.virginia.gov/recreational_planning/documents/vopsurvey06.pdf).) Accessed August 15, 2009.
- Virginia Department of Conservation and Recreation, 2006. Introduction to the Virginia Conservation Lands Needs Assessment ([http://www.dcr.virginia.gov/natural\\_heritage/vclna.shtml](http://www.dcr.virginia.gov/natural_heritage/vclna.shtml)). Accessed August 13, 2009.
- Virginia Department of Conservation and Recreation Land Conservation Data Explorer. (<http://www.vaconservedlands.org/gis.aspx>). Accessed November 8, 2009.
- Virginia Department of Game and Inland Fisheries. Virginia Five Year Virginia Bear Harvest by County. (<http://www.dgif.virginia.gov/wildlife/bear/2008-2009-bear-harvest-by-county.pdf>) Accessed August 15, 2009.
- Virginia Tourism Corporation. 2007 Estimates for Impact of Travel on Virginia (<http://www.vatc.org/research/2006VAStateEstimates.pdf>), and Virginia Locality Economic Impact Data (<http://virginiascan.yesvirginia.org/localspending/>). Accessed August 15, 2009.
- Wofford, J., Shenandoah National Park fish and wildlife biologist. Personal communication. 2009.
- Wright, B.A. Virginia Survey of Hunter Harvest, Effort, and Attitudes 1998-1999. Manassas, VA: Center for Recreation Resources Policy. George Mason University, 2000.

## Further Information

Technical appendices containing analysis of economic performance in the North, Central, and South sub-regions are available at [http://www.npca.org/mid\\_atlantic/who\\_we\\_are/regional-publications.html](http://www.npca.org/mid_atlantic/who_we_are/regional-publications.html).

Download detailed economic profiles of the counties in this region from the Headwaters Economics website at <http://www.headwaterseconomics.org/eps/>.

## Resources

### Regional Commissions

Virginia's regional commissions promote coordination among local governments, provide data and analysis on a regional level, and develop strategic plans in concert with local governments, businesses, citizen organizations, and others. Regional commissions may be a resource for coordinated action.

#### Central Shenandoah Planning District Commission, Staunton

[www.cspdc.org](http://www.cspdc.org)

#### Northern Shenandoah Valley Regional Commission, Front Royal

[www.lfpdc7.state.va.us](http://www.lfpdc7.state.va.us)

#### Rappahannock-Rapidan Regional Commission, Culpeper

[www.rrregion.org](http://www.rrregion.org)

#### Thomas Jefferson Planning District Commission, Charlottesville

[www.tjpd.org](http://www.tjpd.org)

### Land Trusts

Land trusts provide information and resources to landowners to encourage conservation. They also arrange for conservation easements to financially benefit landowners and protect farmland, forests, scenic open space, and wildlife habitat.

#### Land Trust of Virginia

[www.landtrustva.org](http://www.landtrustva.org)

#### Piedmont Environmental Council

[www.pecva.org](http://www.pecva.org)

#### Potomac Conservancy

[www.potomac.org](http://www.potomac.org)

#### The Nature Conservancy

[www.nature.org/virginia](http://www.nature.org/virginia)

#### Valley Conservation Council

[www.valleyconservation.org](http://www.valleyconservation.org)

#### Virginia Outdoors Foundation

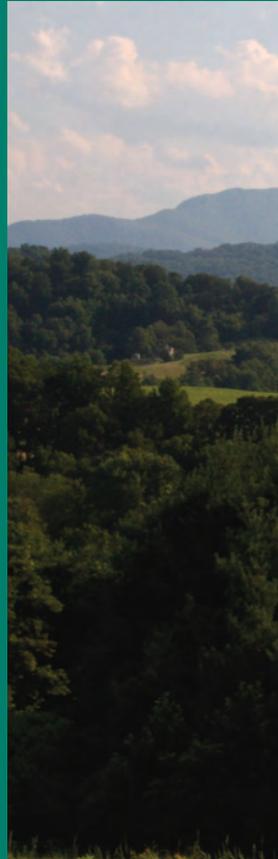
[www.virginiaoutdoorsfoundation.org](http://www.virginiaoutdoorsfoundation.org)

In 2006, National Parks Conservation Association (NPCA) commissioned a survey of the U.S. National Park System and its contributions to the American economy. The findings were striking: Every tax dollar spent on America's national parks generates at least four dollars in quantifiable value to the public. Plus, America's 392 national parks support some \$13 billion in local economic activity and more than 250,000 private-sector jobs, fueling economic growth in nearby communities. Taking its cue from this larger analysis, NPCA commissioned an examination of the economic relationship between Shenandoah National Park and ten neighboring counties.

This report draws on data compiled by state and federal agencies, interviews with local residents and leaders, and an analysis of economic change and performance. It outlines three findings:

- Shenandoah provides a range of benefits for surrounding communities;
- The park depends upon the surrounding communities and landscape for much of its appeal; and
- Today's economy puts a premium on attractive places and quality of life.

*Making Connections* concludes by identifying opportunities for leveraging local resources and proximity to the park to create a more prosperous and attractive future.



**National Parks Conservation Association®**  
*Protecting Our National Parks for Future Generations®*

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STATE  
OF THE  
PARKS®

june 2003

# SHENANDOAH NATIONAL PARK

A Resource Assessment



NATIONAL PARKS CONSERVATION ASSOCIATION





## STATE OF THE PARKS®

More than a century ago, Congress established Yellowstone as the world's first national park. That single act was the beginning of a remarkable and ongoing effort to protect this nation's natural, historical, and cultural heritage.

Today Americans are learning that national park designation alone cannot provide full resource protection. Many parks are compromised by incompatible development of adjacent lands, air and water pollution, skyrocketing visitation, and rapid increases in motorized recreation. Park officials often lack adequate information on the status of and trends in conditions of critical resources. Only 10 percent of the National Park Service's budget is earmarked for natural resource management, and only 6 percent is targeted for cultural resource management. In most years, only 7 percent of permanent park employees work in jobs directly related to park resource preservation. One consequence of the funding challenges: two-thirds of historical structures across the National Park System are in serious need of repair or maintenance.

The National Parks Conservation Association initiated the State of the Parks® program in 2000 to assess the condition of natural and cultural resources in the parks, forecast the future condition of those resources, and determine how well supported the National Park Service is to protect the parks—its stewardship capacity.

The goal is to provide information that will help policy-makers and the National Park Service improve conditions in national parks and ensure a lasting legacy for future generations.

The National Parks Conservation Association, established in 1919, is America's only private, nonprofit advocacy organization dedicated solely to protecting, preserving, and enhancing the U.S. National Park System for present and future generations. NPCA identifies problems and generates the support needed to resolve them.

- \* 300,000 members
- \* 9 regional offices
- \* 32,000 local activists

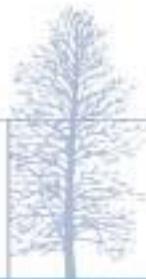


Cover photo: Laurence Parent

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## SUMMARY AND RECOMMENDATIONS



### REPORT SUMMARY—WILDLANDS AND HISTORY THREATENED

Born from a desire in the 1920s to establish additional national parks in the East, Shenandoah National Park initially consisted of a collection of properties that seemed to hold promise. Today, the park is a remarkable slice of southern Appalachian natural history and natural beauty. Shenandoah supports a rich mix of mountain forests and streams, outstanding wildlife habitat, artifacts that testify to prehistoric and more recent cultures, a wide range of historic buildings as well as those built by the Civilian Conservation Corps, and a dazzling array of recreation opportunities. It is the destination of choice for 1.5 million people each year.

But beneath its magnificence, Shenandoah is a park in jeopardy. Years of inadequate funding coupled with serious threats to the park's resources are taking a toll. The challenge is to conserve what exists now, and in some cases to restore degraded resources, to ensure that the park remains healthy.

The most significant challenge is that rising costs

are outpacing budgets, eroding the National Park Service's purchasing power and constricting its ability to conserve and manage Shenandoah. As one example, despite abundant archaeological sites, park staff have not completed even a baseline study and have no money to hire an archaeologist.

Shenandoah also faces increasingly serious effects from poor air quality and invasions of aggressive non-native species—threats that arise in large part from outside the park. Ground-level ozone pollution threatens the health of flora, fauna, park visitors, and staff. On many days, the air in the park is no different than the air in Richmond, Virginia, or Washington, D.C. Acid rain threatens trout species, and haze caused by air pollution has reduced average annual visibility at scenic overlooks from about 115 miles to less than 25.

Non-native plant species now account for an estimated 20 percent of all those documented in the park. Many non-native species have out-competed natives and are well established including destructive insects. Two of the most destructive, the non-native gypsy moth and hemlock wooly adelgid, are having a pro-

found effect on the park's forests. In fact, the woolly adelgid has killed a majority of the towering hemlock forests throughout the park.

Shenandoah is also feeling the effects of land development adjacent to its long, highly irregular, and largely unbuffered border. Originally envisioned as a much larger park surrounded by farms, development is now up against the park's boundary. This has fragmented vital wildlife habitat, severing natural travel corridors and hindering access to food.

#### STATE OF THE PARKS® ASSESSMENT

The State of the Parks assessment describes a variety of threats to Shenandoah. In the chart on page 4, up arrows indicate conditions will likely improve over the next ten years, down arrows indicate conditions will likely deteriorate during that time, and flat arrows indicate no change is likely.

The findings in this report do not reflect past or current park management. Many factors that affect resource conditions are a result of both natural and human influences over long periods of time, in many cases before a park was established. The intent of the State of the Parks® program is to document the present status of park resources and determine which actions can be taken to protect them into the future.

#### RATINGS

Current overall conditions of Shenandoah's known natural resources rated 65 out of a possible 100 as based on 80 percent of the information requirements of the assessment methodology (see Appendix). Ratings were assigned by a panel of three NPCA employees based on an evaluation of park research data. The negative ten-year outlook is based on the severity and pervasiveness of the air pollution and invasive non-native species problems.

The greatest threats to Shenandoah's natural resources include ground-level ozone pollution and acid deposition, both arising almost entirely from outside the park. Air quality, specifically ozone and acid deposition, is a dominant driver for the low ratings because the effects influence more than one category. Emissions from cars, trucks, and industrial sources

## SHENANDOAH AT A GLANCE

- More than 100 nationally significant archaeological sites provide evidence of about 10,000 years of human occupation
- Established in 1935 on land that was home to early settlers and formerly grazed, farmed, and logged
- Preserves Rapidan Camp, a National Historic Landmark, and summer retreat of President Herbert Hoover
- Rated globally outstanding for its biological distinctiveness and recognized as one of the world's richest broadleaf temperate forests
- Nearly 200,000 acres provide habitat for more than 2,000 native species, estimated to be more than in all of Europe
- Gone: bison, elk, river otter, eastern timber wolf, cougar, red fox, gray fox
- Restored: white-tailed deer, black bear, wild turkey, bobcat

#### KEY CHALLENGES:

- Air pollution: Average visibility reduced from 115 to 25 miles with visibility as low as one mile; third worst summer visibility of any national park monitored
- Non-native species: The woolly adelgid, an Asian beetle, is destroying the park's hemlock forests; 20 percent of plant species are non-native
- Peoples and Cultures: Collaboration of park staff with NPS ethnographic personnel is needed to improve understanding of local peoples and resource issues
- Unfunded annual operating needs: \$6,700,000



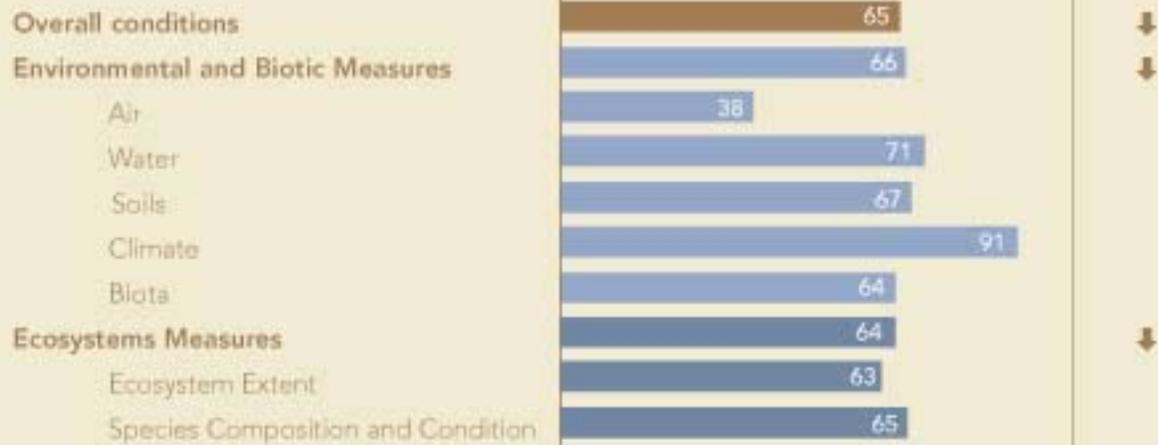
EVALUATION

RESOURCE CATEGORY

CURRENT

TEN-YEAR OUTLOOK

NATURAL RESOURCES



CULTURAL RESOURCES



STEWARDSHIP CAPACITY



0 20 40 60 80 100

including power plants are the source of the high levels of ozone found at Shenandoah. Some of the park's plant species are especially sensitive to ozone, and exposure is greater for forests growing on ridge tops.

Acid deposition has significantly affected soils and aquatic resources in the park and remains the number one known threat to overall water quality. Acid levels have risen so high in some streams that even the native brook trout, an acid-tolerant species, is at risk.

Invasions of aggressive non-native species have also taken a toll on native plants and wildlife. It is clear that some of these species are so well established that they cannot be eradicated. Limiting the spread of these existing species will require significant financial resources and personnel. Additional invasions may occur, especially as land along the park's borders is increasingly developed.

Current overall conditions of the park's known cultural resources rated 56 out of a possible 100.

Management of the park's rich storehouse of cultural and historic resources suffers greatly from lack of adequate funding and sufficient staffing. Park staff make decisions based on incomplete data because they do not have information from baseline archaeological and historic preservation studies.

No money is available to hire additional permanent staff to guide proper management of many of the park's historic and cultural resources. Consequently, the park has difficulty meeting its goals and objectives.

The park's current overall stewardship capacity—the ability of the National Park Service to protect resources in the park—rated 63 out of a possible 100.

The low score for stewardship capacity reflects the erosion in park funding that is affecting management of natural, cultural, and historic resources and visitor services. The park's most important planning document, the General Management Plan, is also significantly out of date.

#### KEY RECOMMENDATIONS

NPCA believes it is essential that the Park Service, its Shenandoah partners, and local supporters join with decision makers and legislators to overcome funding



The hemlock woolly adelgid is one of the most destructive invasive species at the park.

and staffing shortfalls at the park. It is clear that additional funds and staff expertise are required to supplement ongoing efforts to protect Shenandoah for the benefit of present and future generations.

NPCA also recommends that efforts be directed at the following priorities:

#### Natural Resources

- Build on the exceptional ongoing monitoring program by increasing its overall scope to include monitoring the park's only endangered species, the Shenandoah salamander, and the park's soils. Congress should provide funding and staffing increases to support these enhancements.
- Continue to monitor the park's plant and fish species that are sensitive to ozone and acid.
- Incorporate information obtained from air, water, soils, and species monitoring into an independent, scientific assessment of the effects of existing and proposed power plant pollution on Virginia's natural resources and human health. The Commonwealth of Virginia must establish a moratorium on permits for new power plants, including one proposed five miles from the park's northern gateway, until a comprehensive impact assessment is completed and analyzed.
- Complete the draft plan to combat invasive non-

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native species and preserve native ones and secure the appropriate level of funding for this effort.

- Join with a community group for a "good neighbor" campaign that provides information and educates residents about the effect on park resources of new and potentially incompatible land development.
- The Virginia Department of Environmental Quality and the U.S. Environmental Protection Agency must strictly enforce existing emissions and air quality standards. Congress and the General Assembly must support timely and significant reductions in power plant pollution.

#### Cultural resources

- Congress should provide funding for the park to hire a staff archaeologist and make the Archaeological Technician position permanent.
- Establish a historic preservation maintenance team.
- Initiate with NPS headquarters and regional offices an internal partnership to identify needs and further the park's ethnography efforts.

- Congress should provide sufficient funding to complete the nomination of cultural landscapes to the National Register of Historic Places.

#### Stewardship capacity

- Initiate the process to produce a General Management Plan.
- Secure funding for a full-time volunteer program coordinator to increase the effectiveness of the volunteers.
- Continue community outreach activities, especially for local planning and zoning issues.
- Congress should provide sufficient funding for the eight full-time equivalents (FTE) interpretive staff positions needed to carry out work under existing plans.



LOCATED ASTRIDE THE BLUE RIDGE MOUNTAINS, SHENANDOAH IS AN EXCELLENT EXAMPLE OF THE CENTRAL APPALACHIAN BIOREGION AND A WINDOW INTO A LANDSCAPE IN THE MIDST OF CHANGE.

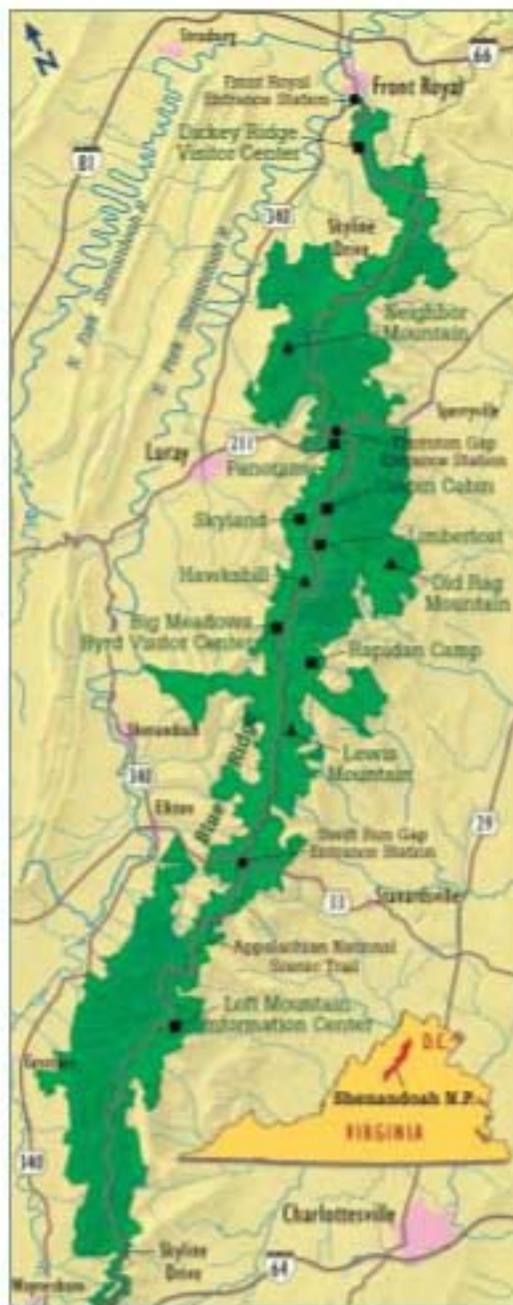
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## PRIDE OF THE BLUE RIDGE

Magnificent broadleaf forests, tumbling mountain streams, rare wildlife and plant species, artifacts reminiscent of times gone by, 101 miles of the famed Appalachian Trail—all are among the diverse array of natural, historical, and cultural treasures protected within the boundaries of Shenandoah National Park. Located astride the picturesque Blue Ridge Mountains, this narrow strip of land, no more than a mile across in some places, is both an excellent example of the Blue Ridge/Central Appalachian bioregion and a window into a landscape in the midst of change, where old farmsteads giving way to renewing forests face the pressures of land development.

As one of the first national parks established in the eastern United States, Shenandoah was viewed as an opportunity for restoration of a spectacular blend of forest types. Today, the park is a veritable ecological mixing bowl, where more than 100 northern and southern species of trees coexist. The forests combine with mountain streams to provide much-needed habitat for black bears, bobcats, wild turkeys, native brook trout, and nearly 200 species of neotropical migratory birds. All told, scientists have recorded approximately 2,000 different plants and wildlife in the park, some of which are exceedingly rare or, like the endangered Shenandoah salamander, exist only in the park.

When the park was established in 1935, it was far from untouched by human hands. People have long helped shape this landscape, beginning about 10,000 years ago with hunter-gatherers and continuing through American Indian occupation and European settlement. Intense resource exploitation characterized late 19th and early 20th century uses in the region. Much of what became parkland was grazed by live-



Shenandoah is 101 miles long and no more than a mile wide in some places.

Credit: Matt Kania

THE UNITED  
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stock, logged, reforested, and farmed.

Congress authorized establishment of Shenandoah in 1926, but it took nearly ten years before land for the park was secured. Unlike many western national parks that were carved from existing public lands, Shenandoah was pieced together from parcels of private property that were donated, sold to, or condemned by the Commonwealth of Virginia before being turned over to the Department of the Interior. To this day, a few people still resent the park because some families were involuntarily resettled to communities outside park boundaries.

Private contractors began constructing the 105-mile Skyline Drive in 1931. The Civilian Conservation Corps (CCC) sculpted the landscape of Skyline Drive, built overlooks and comfort stations, and planted

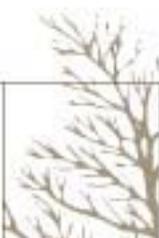
thousands of trees, shrubs, and flowers—sometimes replanting relic shrubs in careful configurations to mimic the natural landscape.

In 1976, Shenandoah received additional protection when Congress designated 40 percent of the park as wilderness in tribute to its remarkable wildland and recreation values. The United Nation's Educational, Scientific, Cultural Organization has proposed that Shenandoah National Park be designated an International Biosphere Reserve because of its high species richness. World Wildlife Fund includes the park as part of the Appalachian/Blue Ridge Forests Ecoregion, rated as Globally Outstanding for its biological distinctiveness and recognized as one of the world's richest temperate broadleaf forests.



The Civilian Conservation Corps sculpted the landscape of Skyline Drive, building overlooks and comfort stations and planting thousands of trees.





## THE SHENANDOAH ASSESSMENT



### NATURAL RESOURCES— SPECIES AND ECOLOGICAL INTEGRITY AT RISK

The relatively low scores associated with Environmental and Biotic Measures (66)\*, and Ecosystems Measures (64)\* reflect historical use and invasive degradations, the significant risks that the park's natural resources face from poor air quality and acid deposition, the pervasiveness of non-native species, and incompatible land development along the park's border, which is largely unbuffered by protected areas. Although the park has undergone substantial changes, Shenandoah has demonstrated its resilience through its exceptional species richness. However, the ability to tolerate ongoing threats is suspect as fish kills, hybrid species, susceptibility to invasives, and losses of state-designated rare species attests.

**NATIVE BIODIVERSITY—  
ENDURING OLD LOSSES, FACING NEW ONES**  
Shenandoah, where north meets south, represents a fine example of central Appalachian biodiversity. The

park's varied topography, geology, exposure, and moisture conditions create a landscape of diverse habitats suitable for a wide variety of species, including many rare plants and animals. According to some accounts, the total number of native species found in Shenandoah exceeds that in all of Europe.

Although the park's species list is not complete, scientists have identified about 2,000 native and non-native plant and animal species (not including varieties or subspecies) within park boundaries. Because invertebrates and non-vascular plant species have yet to be systematically inventoried, it is likely that the list, including rare species, will grow. As recently as 1998, three vascular plants—Bush's sedge, smooth blackberry, and nut rush—were added to the list.

The Virginia Department of Natural Heritage found that 59 native species considered rare by the state have been recorded in Shenandoah, but recent survey work indicates that only 56 remain. Two state-endangered species, variable sedge and small whorled pogonia, exist at the park; the latter is also listed as threatened by the federal government. The endemic sword-leaved phlox was recorded at two places in the

\*66 out of a possible 100 is based on 76 percent of the information requirements of the assessment methodology and ecosystems measures 64 out of a possible 100 is based on 66 percent of the information requirements of the assessment methodology (See Appendix)

park but is now found at just one of those sites.

The Shenandoah salamander, a federally endangered species, occurs in the park. The smooth green snake, listed by Virginia as rare, inhabits Big Meadows, and the state-threatened wood turtle also lives in the park. Shenandoah provides habitat for nearly 200 neotropical migratory bird species, both as a nesting site and as a flyover corridor. Virginia considers several of these species rare.

As settlers moved into the area, an unknown number of native mammal species were extirpated, and many more saw their population numbers dwindle dramatically. The American bison, elk, beaver, river otter, eastern timber wolf, eastern cougar, gray fox, red fox, and white-tailed deer were all gone from the area by the time the park was established, while wild turkey, black bear, and bobcat numbers were near zero.

Since the park's establishment, some of those species have been successfully reintroduced or have recovered naturally. White-tailed deer, black bear, wild turkey, and bobcats now maintain fairly healthy populations. Beaver and otter are both occasionally seen in the park, although neither species maintains a permanent residence, and there have been unconfirmed sightings of cougar. Confirmed sightings of the non-native coyote could spell trouble for the bobcat, since research indicates downturns in its populations when coyotes are present.

#### TERRESTRIAL COMMUNITIES AND SYSTEMS—INVASIVE SPECIES TAKE A TOLL

The landscape of Shenandoah has changed significantly over time. When the park was established, some lands had been heavily logged or used for marginal agriculture. Since then, the Park Service has allowed the forest to recover a more natural character. Visitors to Shenandoah now walk under a near-continuous canopy of trees. The park is a land of constant change, where both human and natural impacts continue to alter the ecology.

Non-native invasive species have taken a toll on the park's terrestrial systems. These invaders can dramatically change the systems in the park by outcompeting or damaging natives. One of the most signifi-

cant events in the history of American forests was the invasion of the non-native chestnut blight, a fungus from Asia. In a matter of a few years, this alien species reduced the magnificent American chestnut from a large canopy species dominant throughout eastern U.S. forests to the morphology of a small understory shrub by killing the chestnuts before they can fully mature. Along the Blue Ridge, five insect species went extinct with the demise of the American chestnut, bears and other foragers lost an important food source, and local communities saw the end of the chestnut economy.

Non-native invasive species, such as Tree-of-heaven, continue to alter the make-up of plant communities. Although the park has made great strides in combating these encroachers and has managed to eradicate several, these species remain one of the top threats to park resources.

A visitor from 1940 would hardly recognize today's Shenandoah National Park. Surveys conducted at that time describe a dramatically different landscape where American chestnut and red oak stands dominated, while cove hardwoods and pines each accounted for just 6 percent of the forest mix, and yellow poplar stands were absent. Today's blend includes chestnut oak and northern oak at 59 percent, yellow poplar at 16 percent, cove hardwoods at 15 percent, and pitch pine at 3 percent.

Eastern hemlocks are found in Shenandoah too, mostly in pure stands on moist sites. The hemlocks are now severely threatened by a non-native, invasive beetle, the hemlock wooly adelgid, which is capable of killing a hemlock within just four years of infestation. All hemlock-dominated stands in the park are infested. It appears that except for remnant trees in isolated areas and a few places where park staff are attempting to control the adelgid, the hemlock stands soon will be gone from the park.

The park boasts a number of rare community types at places such as Big Meadows, Hawksbill, and Neighbor Mountain. Lumberlost, site of the oldest and largest red spruce stands in the park and home to the only population of alder-leaved buckthorn in Virginia, is losing a significant piece of its majesty to the wooly

adelgid, which has infested its towering hemlocks.

Fire has always been a part of Shenandoah's natural landscape, limiting the growth of some species while encouraging others. Fire plays a critical role in nutrient cycling and the maintenance of a healthy forest ecosystem, but decades of active fire suppression have left the park with high fuel loads and a larger proportion of older class vegetation. Recently, park staff developed a new Fire Management Plan that uses prescribed fire as a tool. The most notable result thus far is successful species regeneration of rare plant species at Big Meadows.

#### FRESHWATER COMMUNITIES AND SYSTEMS—SOURCE OF CLEAN WATERS AND VALUABLE HABITAT

Freshwater communities are important to park health and visitor experiences. Most of the popular hiking trails are near cool mountain streams, and on any number of hot summer days, park visitors enjoy the cool trails of White Oak Canyon or fish for native brook trout in the upper reaches of the park's streams.

About 95 percent of Shenandoah's freshwater communities are mountain stream habitats. Approximately 850 springs combine to flow downhill and form many highly oxygenated streams that are home to 30 species of fish, including the native brook trout, which is especially well adapted to the park's naturally acidic, higher-elevation mountain streams, and the abundant blacknose dace, which is sensitive to acidic waters. Two species of non-native trout, the brown and the rainbow, are present in the park and may be adversely affecting native brook trout in several streams. As one example, the tiger trout, a hybrid between a female brown trout and a male brook trout, has been found in several streams that are habitat for brook trout.

A freshwater community of particular note is Big Meadows swamp, a representative of a globally rare wetlands type. The swamp is home to rare plant species that are found nowhere else in the park. Included are the gray birch, which reaches the southernmost terminus of its range in the swamp, and the pale green orchid.

#### COOPERATIVE SCIENCE AT WORK

Shenandoah National Park has a long-standing cooperative agreement with the University of Virginia to conduct watershed monitoring and research as part of the Shenandoah Watershed Study. Under this program, precipitation quantity and chemical composition are measured at two sites, the chemical composition of stream water at 14 sites, and stream water discharge at five sites. Data and analysis have concluded that nitrate concentrations in stream waters increased dramatically following defoliation caused by the gypsy moth infestation of the late 1980s and early 1990s, indicating that the efficient use of nitrogen as a nutrient by the park's regenerating forests has been disrupted. The effect of the nitrate release was an episodic increase in stream water acidity and an inability to neutralize it. As of 1999, the affected stream's chemistry had not returned to pre-defoliation levels, but monitoring continues. The Shenandoah Watershed Study enabled this rapid assessment of gypsy moth effects and continues to make important contributions to the park's science program.



#### FORECAST

The assessment's low scores for the current condition of the park's natural resources and the forecast that conditions are likely to decline over the next ten years reflect the serious nature of threats to those resources. Research at Shenandoah suggests that the park's ecological integrity is in jeopardy from threats that arise largely outside the park. Many of these threats, such as air quality degradation, require action from Congress, states including Virginia, and nearby communities. For example, since deregulation in 1998 Virginia has approved permits for 16 new power plants. The state is con-

tinuing to accept new proposals, including one for a power plant five miles from the park's Front Royal gateway. Without external support, the challenges facing the park will never be adequately addressed. The major threats are briefly described below.

**Air quality affects on visibility.** Since its establishment, Shenandoah's spectacular views have been recognized as a key resource and visitor attraction. In 1924, surveyors of the then-proposed national park reported:

The single greatest feature is a possible skyline drive along the mountaintop...looking down westerly on the Shenandoah Valley from 2,500 to 3,500 feet below, and also commanding a view of the Piedmont Plain stretching easterly to the Washington Monument, which...may be seen on a clear day.

Today, the views from Skyline Drive and other points of interest in the park are not what they once were. Some haziness caused by photosynthesis is nat-

ural to the Blue Ridge Mountains. However, regional and local haze dominated by fine sulfate particles from power plants and other industrial sources has reduced natural visibility—from an estimated range of 115 miles to an annual average of less than 25 miles. In summer, the average visual range is now 15 miles compared to the historic average of 77 miles and can be less than one mile on particularly hazy days.

This impairment ranks Shenandoah as the third worst park for visual range after Great Smoky Mountains and Mammoth Cave national parks among those parks that conduct visibility monitoring.

**Acid deposition.** Wet and dry acid deposition is a major, pervasive threat to the health of Shenandoah's ecosystems. The rate of acid deposition in Virginia's mountains is among the highest in the country, and Shenandoah National Park has one of the highest wet and dry deposition levels in the entire National Park System. Despite national reductions in sulfur pollution as a result of the 1990 Acid Rain Program, streams in Shenandoah continue to become more acidic and less able to support fish.

Nitrogen oxide and sulfur dioxide, primarily from power plants, are the dominant emissions contributing to acid deposition. Soils in Shenandoah's watersheds tend to retain acid deposits, eventually leaching the acidity once they have become acid-saturated. Increased soil acidity causes the release of more soluble forms of aluminum, which kills a trees' fine roots reducing its uptake of nutrients.

Acid deposition has significantly affected aquatic resources in the park and remains the number one known threat to overall water quality. Acid levels have risen so high in some streams that even the native brook trout, an acid-tolerant species, is at risk.

**Ozone pollution.** Ground level ozone, distinct from the ozone layer in the upper atmosphere, can adversely affect the health of both humans and vegetation. High levels can cause lung damage and trigger asthma attacks in humans.

Ozone levels are particularly high in the eastern United States during the summer months when outdoor recreation is at its peak. Most people are surprised to learn that occasionally in some parks,

A hemlock dying from the effects of insect infestation, and a tulip poplar showing signs of ozone damage.



## RECOMMENDED ACTIONS

While there are some actions the park can take to mitigate resource threats, action is not the responsibility of the Park Service alone. Most of the major resource threats arise from outside the park's borders. It is incumbent upon local, state, and national decision makers to ensure that this natural treasure exists for future generations to study and enjoy. NPCA recommends the following:

- Continue and enhance monitoring of air, soils, and stream water to track and address acidification and its related effects. Sulfates, nitrates, pH, and metals (especially aluminum and mercury) should be regularly measured at representative sites.
- Monitor plant and fish species that are sensitive to ozone and acid.
- Incorporate information obtained from this work into an independent, scientific assessment of the impacts of existing and proposed power plant pollution on Virginia's natural resources and human health. The Commonwealth of Virginia must establish a moratorium on permits for new power plants, including one proposed five miles from the park's northern gateway, until an impact assessment is completed and analyzed.
- Congress must require significant and timely reductions in sulfur, nitrogen, mercury, and carbon pollution from power plants. In the absence of congressional action, states must adopt similar requirements.
- Continue the aggressive plan to combat invasive non-native species and preserve native ones. Although the new regional invasive plant management team is a good start, Congress must allocate funding sufficient to fight all invasives in the park.
- Work cooperatively with a partner to inform and educate park neighbors regarding the effects of incompatible land development on park resources and present alternatives to development, including conservation easements and land trusts.
- Conduct inventories for non-vascular plants and invertebrates; monitor wildlife species, particularly deer and bear; conduct a comprehensive soil survey; and improve methods to investigate poaching and enforce anti-poaching regulations. All of these items require additional funding and staff.

Shenandoah included, the same harmful ozone levels found in cities are present. Recent ozone measurements for Shenandoah indicate the park is comparable to Richmond, Virginia, and some northern Virginia suburbs of Washington, D.C.

Shenandoah is vulnerable to the effects of ozone pollution because of its proximity to large nitrogen oxide and volatile organic compound sources. In addition, ozone exposures are greater for forests growing on ridge tops. Three major forest types—cove hardwood, chestnut oak, and yellow poplar—cover

nearly 80 percent of the park and are particularly sensitive to ozone. Forty of the plant species in the park are sensitive to ozone, including the tulip poplar and milweed, and 25 percent of those plants are exhibiting visible foliar injury, decreased growth, and/or early leaf drop, symptoms of ozone pollution.

**Invasive non-native species.** Invasive non-native species—including plants, insects, and fungi—have had significant adverse effects on the park's native biodiversity and land and water communities, especially the American chestnut and hemlock. Currently,



MOST PEOPLE ARE SURPRISED TO LEARN THAT ON SOME DAYS, THE PARK SUFFERS FROM THE SAME HARMFUL LEVELS OF GROUND OZONE THAT ARE FOUND IN RICHMOND, VIRGINIA, AND SOME NORTHERN VIRGINIA SUBURBS OF WASHINGTON, D.C.

300 documented plant species in the park are non-natives, and many of those are considered invasive; that is, capable of successful and often rapid establishment. Some are extremely aggressive and can quickly crowd out, kill, or out-compete native species. Tree-of-heaven, for example, produces toxins that prevent the establishment of other species.

The results of successful invasions are often far-reaching and can include massive changes in natural settings and ecosystem functions. In Shenandoah and elsewhere, areas defoliated by the gypsy moth caterpillar created openings that aided in subsequent invasions by non-native species. Researchers predict the same for the hemlock stands that have fallen victim to the woolly adelgid. Other predicted effects of the hemlock loss include decreases in both native insect populations and habitat for songbirds.

Park staff face an overwhelming task in the fight against non-native species. Control now focuses on small or new invasions that pose the greatest threats to native species and their habitat. Shenandoah is part of a cooperative effort to assess and control invasive species, and for 2003, the park received funding through the regional NPS office to house a regional

#### CULTURAL RESOURCES— A WEALTH OF TREASURES IN PERIL

Shenandoah National Park received an overall rating of 56 on a scale of 0 to 100 for cultural resource conditions, including ethnography, archaeological sites, history and historic structures, cultural landscapes, and museum and archival collections. The Park Service faces many challenges in attempting to correct the deficiencies that led to the low score, particularly if funding continues to erode.

#### PEOPLES AND CULTURES—STRONG TIES BETWEEN PEOPLE AND PARK RESOURCES

##### Current Conditions - 41

For approximately ten thousand years, people have occupied the lands of Shenandoah National Park and

exotic plants "SWAT" team that will also serve ten other parks. However, overall funding and staffing to combat non-native species remain insufficient.

**Development of adjacent lands.** Expansion of towns and communities on both sides of the park is incrementally encroaching on park boundaries. Shenandoah was originally authorized to include 512,000 acres, significantly larger than its current size of 199,017 acres. As more forests and farm land are developed for commercial or residential use, the consequences for the park become more severe. As suitable wildlife habitat and, especially, migration corridors, are eliminated, the park's overall biological integrity is further threatened. In particular, as forested land around the park is developed, the resulting "edge" habitat tends to attract non-native species that often invade the park. Native species such as black bear find fewer opportunities to forage and run into problems when they seek out human-based foods. In addition, road expansion projects, such as the one proposed for widening Route 340 in the Shenandoah Valley, have the potential to attract new residential and commercial development.

used its resources for food, shelter, commerce, and pleasurable pursuits. This rich human influence is sporadically recorded through oral histories, independent academic research, and interpretation of both the park and the CCC's contributions.

But Shenandoah lacks funding and staff for a formal ethnography program—an assessment of places and natural and cultural resources that are valued in different ways by various groups affiliated with the park. This gap is especially evident in relation to the park's associations with former mountain residents and their descendants. Although pre-historic American Indian artifacts are in the park, no modern tribe claims affiliation with parklands.

Park staff collect oral histories covering the CCC period, the Skyland resort, Rapidan Camp, former park superintendents, and mountain residents. However, many of the mountain family histories, collected by an amateur reporter in the 1960s, are insufficient. With limited resources, park staff furthers the understanding of people and cultures associated with Shenandoah through archaeological studies, interpretive exhibits, films, and research.

#### FORECAST

As the assessment score of 41 indicates, Shenandoah rates low in ethnography. Park staff have not completed an Ethnographic Overview and Assessment. Such information could help mountain family descendants and park staff communicate about the sites that hold special meaning. A full-fledged ethnography program will probably not be initiated unless



Civilian Conservation Corps camp at Shenandoah

staff at NPS headquarters and in the regional offices work with park staff to assess the accomplishments and needs at the park.

#### ARCHAEOLOGICAL SITES— ABUNDANT EVIDENCE OF THE PAST

##### Current Conditions = 47

Shenandoah National Park's archaeological resources are rich and varied, from prehistoric sites to the ten camps set up as the CCC began constructing way stations and picnic grounds. Research points to seasonal camps that early hunter-gatherers established in the mountains. Surveys from the 1970s, while not up to today's standards, are still used as a basis for studying prehistoric mountain use. A few of these sites are considered highly significant, but because no systematic evaluation has been completed, the extent of the sites' archaeological value is not fully understood. Despite this, the park continues to make great strides with limited resources. For example, more than 600 sites have been recorded and evaluated in the past three years.

Of the estimated 1,250 to 4,800 archaeological sites in the park, more than 1,200 pertain to historic mountain residents. Included in this count are 460 known historic homestead sites, each with its own story to tell about the people who lived in these mountains before the park was established.

#### FORECAST

Shenandoah's wealth of archaeological resources is in jeopardy, as reflected in the assessment score of 47. The reasons are many, but they start with the lack of a

#### RECOMMENDED ACTIONS: PEOPLE AND CULTURES

NPCA recommends that the Park Service undertake the following actions with regard to ethnography at Shenandoah National Park:

- Meet with NPS headquarters and regional staff regularly until consensus and conclusions about the park's successes and needs are reached. It may be determined by all levels of the NPS that an Ethnographic Overview and Assessment is not necessary.
- Work with people sensitive to the local community to identify an acceptable ethnographer for the Ethnographic Overview and Assessment project if it is determined necessary by all levels of NPS.
- Continue to resolve tensions concerning access to cemeteries within the park where the descendants' family members lay at rest.

permanent staff archaeologist at the park to add an expert voice and attention to the planning and management decisions that affect archaeological resources.

The park also suffers from too little knowledge about its archaeological resources, although initial evaluations of many identified sites have been completed. An Archaeological Overview and Assessment, the baseline study for archaeological resources, was

started but has not been completed as rapidly as the park would like, in part, because the park does not have a full-time archaeologist. In addition, only ten of the park's estimated 100 nationally significant archaeological sites are listed on the National Register of Historic Places, despite repeated requests by the park for funding to update nominations. Increased funding for this project and an archaeologist will help address these needs.

The park's popularity also presents a threat to archaeological resources. Today's most visited campsites and visitor destinations were historically the destinations for early peoples and their successors. For example, all Appalachian Trail huts in the park are located on flat, level ground near water, the natural choice for past campsites. High foot traffic in these areas damages archaeological resources, often before staff can survey the sites. Damage is also caused by illegal camping in restricted areas and occasional taking of artifacts.

#### HISTORY AND HISTORIC STRUCTURES— BUILDINGS TELL A COMPELLING STORY

##### Current Conditions - 60

Park staff manage 450 extant historic structures, many of which are considered to be in good condition. One hundred and seven of the structures have been determined eligible for the National Register of Historic Places, but they are not yet included on the park's official List of Classified Structures. Of those structures, 95 are awaiting nominations to the National Register. No funding is available to support the work needed to complete the nominations.

Among the many significant historic features of the park is Skyline Drive. This magnificent stretch defines the experience of Shenandoah from the moment visitors enter the park. In addition, Massanutten Lodge, located at the former resort of Skyland, has been restored to its earlier appearance and now boasts a permanent exhibit, "The Women of Skyland," that celebrates the social and historic contributions of five women with connections to the resort.

Potomac Appalachian Trail Club manages six historic cabins in the park as rustic accommodations for guests, available on a reservation basis. Corbin Cabin—



#### RECOMMENDED ACTIONS: ARCHAEOLOGY

To alleviate deficiencies in management and protection of Shenandoah's archaeological resources, NPCA recommends the following actions:

- Congress must provide funding to hire a staff archaeologist and make the Archaeological Technician position permanent.
- Complete the Archaeological Overview and Assessment.
- Strengthen internal training of rangers and maintenance staff to promote awareness and required protection of archaeological resources.
- NPS and the Potomac Appalachian Trail Club should work together to raise awareness of archaeological resources among club members and hikers on the Appalachian Trail.

listed on the National Register of Historic Places and managed by the club—is one of the few remaining intact historic structures from the mountain families who lived in the park. In addition to the six cabins, the club manages all of the trailside huts along the Appalachian Trail. The club does an admirable job with upkeep, but having a group focused on recreation manage historic structures poses some challenges for park staff who must protect archaeological and historic remains at these popular sites.

### FORECAST

Promotion of the park's history and protection of historic structures have evolved greatly since Shenandoah was established. But as the assessment score of 60 reflects, this positive trend is dampened by funding and staffing shortfalls that hinder steps for needed improvement. While many of the historic structures in Shenandoah are in good or fair condition, the park has no formal annual monitoring program. Under the new condition assessment program, all of the structures are scheduled for inspection each year, but not necessarily by someone specifically trained in historic preservation.

Shenandoah also lacks a Historic Resource Study for the more than 100 roads that traverse the park. Aside from Skyline Drive, none of the roads has been evaluated for their significance and contributions to the historic fabric of Shenandoah.

### CULTURAL LANDSCAPES—WHERE NATURAL RESOURCES AND HISTORY MEET

#### Current Conditions - 61

Cultural landscapes represent a blending of the cultural and natural features in a park. Shenandoah has 18 identified cultural landscapes, ranging from a rustic Appalachian garden on the edge of Skyland to Rapidan Camp, President Hoover's "summer White House."

Big Meadows, where human occupation dates back thousands of years and includes the 1930s era CCC camp, is an excellent example of Shenandoah's mix of cultural and natural resources. Although not known with certainty, research indicates the meadow might have been maintained early on through intentional burning and, later, grazing of domesticated animals.

### RECOMMENDED ACTIONS: HISTORIC STRUCTURES

Park staff have worked with marked success to improve the condition of many of Shenandoah's historic structures over the past decade. The assessment found, however, that conditions are not likely to continue to improve over the next ten years unless action is taken to correct current shortcomings. In particular, lack of funding and insufficient training in the significance of historic resources and their proper preservation threaten the park's irreplaceable historic structures. NPCA recommends the following:

- Congress must provide sufficient funding to nominate the 95 remaining structures that are eligible for the National Register of Historic Places and evaluate other structures in the park for eligibility.
- Complete a Historic Resource Study for park roads to determine their historic context, keeping in mind the current wilderness character in much of the park.
- Establish a historic preservation maintenance team.
- Strengthen internal training on the significance of historic places and preservation legislation. In particular, make technical training in historic preservation mandatory for appropriate maintenance staff.
- Provide historic preservation training opportunities—and actively encourage attendance—for the Potomac Appalachian Trail Club.

This allowed several unique plant communities to take root. The open character of Big Meadows attracts populations of birds found nowhere else in Shenandoah.

This area also illustrates the complexity of managing cultural landscapes. In keeping with the original philosophy of returning parkland to a natural state, Big Meadows was not actively maintained. Encroaching forest and scrub reduced the meadow to 150 of its original 700 acres. Park staff now manage the open landscape by mowing down encroaching saplings and using prescribed burns.

Lewis Mountain, another of the park's cultural landscapes, relates a tale of race relations in the

## RESTORATION OF A PRESIDENTIAL RETREAT

Rapidan Camp, formerly known as Camp Hoover, is of exceptional significance within the many historically important structures at Shenandoah. A National Historic Landmark located at the headwaters of the Rapidan River, this site was President Herbert Hoover's summer retreat from 1929 to 1933. Shadowed by arching hemlocks, Rapidan Camp became known as the "summer White House." It included the President's Cabin, Prime Minister's Cabin, a Marine camp, and several other structures.

Time and neglect led to the loss of several of the camp's structures, and others were modified from their appearance in the 1930s. The wooly adelgid infestation threatens to kill most of the hemlocks that gave Rapidan Camp's landscape its distinctive character. And ice storms in 1998 caused significant damage to the historic landscape and structures of the camp.

The Park Service is restoring Rapidan Camp and its remaining structures to their 1931 appearance, using historic photos and records that provide clues to the original look and layout. Restoration of the historic structures is nearly complete, and the President's Cabin will become a permanent museum. Despite this significant progress, funding to fully interpret and maintain the site remains uncertain.



United States during the time of segregation. This landscape, in the process of being nominated for the National Register of Historic Places, was initially opened in 1939 to serve only African-American visitors to Shenandoah. Harold Ickes, Secretary of the Department of the Interior under President Franklin Roosevelt, ordered the park to integrate the park's Pinnacles Picnic Grounds, but the leading park concessionaire at the time fought integration in the park. It was not until 1950 that visitor facilities at

Shenandoah were fully integrated, more than a decade before other public facilities in the Commonwealth of Virginia.



### FORECAST

The balance between cultural and natural values in cultural landscapes is well illustrated at Shenandoah National Park, where staff have done a credible job maintaining the landscapes. But much remains to be done to protect these landscapes into the future, as reflected in the assessment score of 61.

According to park staff, the condition of cultural landscapes at Shenandoah remains largely unknown; and therefore, is presumed to be deteriorating. The park has had some successes, including stabilization of Judd Gardens and the borders of Big Meadows. But overall, cultural landscape preservation at Shenandoah is inadequately funded and understaffed.

As one result, only a few sites have been documented and subsequently nominated to the National Register of Historic Places as cultural landscapes. Most of Shenandoah's documentation work required for the National Park Service's Cultural Landscape Inventory is done out of the Park Service's Philadelphia Support Office, which carries a huge responsibility for the entire Northeast Region. Noting that a new General Management Plan for Shenandoah has not been completed, the Philadelphia office has not made the park's cultural landscape research a priority. This means that the park will probably not meet its goal of entering research for 12 cultural landscapes into the Cultural Landscape Inventory by 2005.

It also means that staff will not have access to the baseline data needed to make decisions and carry out plans to preserve cultural landscapes. They also will lack resources to initiate training about how to care for cultural landscapes and how to help prevent possible future damage from maintenance workers and visitors who are unaware of their importance.

### MUSEUM COLLECTIONS AND ARCHIVES— CURATORIAL STAFFING SHORTAGE

#### Current Conditions = 79

The museum collection and archives at Shenandoah

earned the highest score, 79, of all cultural resources categories. A new state-of-the-art storage facility allowed staff to move collections and archives out of basements and attics, and most of these items are in good or fair condition. Staff have also reduced the backlog of uncataloged items so that only 24 percent of the collection remains to be cataloged, considerably less than the National Park System average.

The park's collection and archives are extensive. As of May 2002, records indicate the park maintains 468,712 museum holdings. The varied collection ranges from archaeological items to historical objects and extensive archival material.

The bulk of the history collection includes objects such as clothing, furniture, and tools that are related to the exploration of Shenandoah, the CCC, and Skyland. The large archival collection contains documents associated with establishing the park, including resource management records dating back to the 1920s. Of special significance are the personal papers of L. Ferdinand Zerkel, a Virginia businessman who was instrumental in the park's formation.



The assessment forecasted that the condition of Shenandoah's museum collection and archival material will be consistent in the coming years; only curatorial assistance and more storage space will improve the situation. The park's collection has grown in recent years through increased archaeological excavations and purchases for the CCC museum at Panorama near the Thornton Gap Entrance Station. Park staff have requested funding for a small addition to house the archaeological artifacts. Compressed storage units were installed in December 2002, and a new collection management plan that will include a storage management plan is scheduled for completion in 2003.

Not having enough money to hire the staff needed to keep up with the growing collection and exhibits is the single greatest threat to continued improvements. Staff may be forced to close the new exhibit at Massanutten Lodge in 2003 if money for a ranger cannot be found. In addition, too few employees are available to handle the backlog of uncataloged

materials, catalog new items, respond to requests for information from visitors and the broader public, and staff anticipated new exhibitions.

#### RECOMMENDED ACTIONS: CULTURAL LANDSCAPES

It is clear that additional funding, for research, training, and support from the regional office are needed to help ensure the continued integrity and protection of Shenandoah's cultural landscapes. NPCA recommends that park staff take the following steps:

- Renew communications with the Philadelphia office regarding the timeline for completing the research needed for the Cultural Landscape Inventory. Congress should appropriate the funds necessary to complete this much needed work.
- Train park staff in site significance/awareness and horticultural issues and procedures.
- Look into partnerships with neighboring parks or protected areas to share training and resources.
- Reach out to the Potomac Appalachian Trail Club through workshops and training to increase the group's awareness of cultural landscapes.

#### RECOMMENDED ACTIONS: MUSEUM COLLECTIONS

The relatively high score for this category is a testament to the park staff's commitment to stewardship in the face of limited personnel and funding. NPCA recommends that the following steps be taken to ensure adequate funding for work needed in the future:

- Congress needs to allocate funding to hire a curatorial technician to manage and maintain the expanding number of park exhibits.
- Analyze projected growth of collections, researcher needs, and exhibit expansions and then use the results to seek funding to add needed curatorial expertise to the permanent staff.
- Ensure that the upcoming storage management plan accurately reflects the anticipated growth in collections over the long term, not merely for the near future.
- Continue work on reducing the catalog backlog even as collection acquisitions increase.

## STEWARDSHIP CAPACITY— CHALLENGES AND POTENTIAL

The third and final step in the resource assessment process examines stewardship capacity—how well positioned the Park Service is to protect Shenandoah's natural and cultural resources. Four categories were considered: funding and staffing, park plans, interpretation, and external support.

Overall, the park's stewardship capacity rated 63. As discussed throughout this report, Shenandoah faces many serious threats that originate outside its boundaries, and the Park Service can not reasonably be expected to address their full scope. Nevertheless, NPCA believes that adequate funding and sufficient personnel can be strategically used to reduce the effects these threats have on the park's outstanding natural and cultural resources.

OVER THE PAST TWO DECADES AS  
THE COST OF MEETING RECURRING  
PARK NEEDS ROSE,  
PURCHASING POWER ERODED.



FUNDING AND STAFFING—SHORTFALLS  
RESULT IN LESS PROTECTION FOR  
RESOURCES AND FEWER SERVICES FOR  
VISITORS

Rating: 61



At Shenandoah, as at many other national parks, funding is the most significant factor in the staff's capacity to protect park resources. For most national parks, the largest share of budgets is composed of operating funds made available by Congress for recurring needs—basic day-to-day functions such as resource protection, law enforcement, interpretation, management, administration, and routine maintenance. The park's Business Plan, an analysis of operating funds from fiscal years 1980 through 2000, shows that in inflation-adjusted dollars, the park received increases of about 1.2 percent per year, about 24 percent in total. Costs rose about 31 percent over the same time period. Some of this increase includes the cost to meet the requirements of the Clean Air and Clean Water acts, regulations regarding hazardous materials, and other public safety measures.

In other words, over the past two decades as the cost of meeting recurring park needs rose, purchasing power eroded. A serious budget shortfall has resulted, and park officials are increasingly challenged to carry out even basic responsibilities. Other funding sources, such as 80 percent of revenues from fees collected in the park, are targeted for specific projects and cannot be transferred to help cover the budget shortfall for recurring needs.

Current unfunded annual operating needs totaled about \$5 million in fiscal year 2000, rising to \$6.7 million in fiscal year 2002. Nearly half of this funding deficit occurred in the Resource Protection budget, which was short \$2.2 million and 29 full-time equivalents. The Natural Resource management program operated with a funding deficit of nearly \$1.4 million annually. Other funding needs include activities such as improved dissemination of cultural resource knowledge and information (\$265,000), year-round operation of the new visitor/education facility (\$458,000), improved protection of designated wilderness (\$259,000), improved law enforce-

ment response and employee safety (\$614,000), establishment of a historic structures preservation maintenance team (\$490,000), improved emergency medical response time (\$221,000), improved structural fire prevention and response time (\$275,000), and improved maintenance of all facilities (\$771,000) (dollars adjusted to the year 2000).

The funding shortfall has led to serious understaffing at the park. In 2000, Shenandoah reported 219 full-time equivalent employees, 84 fewer than are needed to protect park resources and maintain quality visitor services under existing plans. Lack of adequate funding is also taking a toll on public information, emergency, and protection services provided by park rangers. Without additional funding, park officials cannot ensure basic safety and emergency response for park visitors.

#### RECOMMENDED ACTIONS: FUNDING AND STAFFING

In 2000 the park's business plan identified substantial funding and staffing shortfalls that have been exacerbated by budget erosion over recent years. Congress must act to increase base funding and staffing levels to ensure full resource protection and a quality experience for visitors.

#### PARK PLANS—OUTDATED GENERAL MANAGEMENT PLAN

**Rating: 46**



A number of significant park plans are outdated or absent in Shenandoah National Park, including an important guiding document—the General Management Plan (GMP). Shenandoah's existing plan dates back 20 years and is no longer relevant. A new plan may soon be in the works because the Park Service has placed Shenandoah on its priority list.

Shenandoah's Resource Management Plan (RMP), the vision for resource management, was last updated

#### SWAT TEAM TO ADDRESS REGION'S PLANT INVASIONS SHENANDOAH MAY LOSE A POSITION TO STAFF IT

A new non-native plant management team will be located at Shenandoah, where controlling invasive, non-native species is one of the park's greatest challenges. The team will serve 11 parks in the region, including Shenandoah. Unfortunately for the park, staffing the SWAT team comes at the expense of another vital position that will not be refilled because of a lack of funds. The new supervisor for the team is currently employed at the park in insect pest management control and environmental assessment and compliance. His current position will go unfilled.



in 1998, the same year that NPS decided to put RMPs on hold system wide.

Other significant omissions in park planning documents, discussed in the cultural resource section of this report, are the Archaeological Overview and Assessment (currently under way but delayed because of funding and staffing shortages), an overall Historic Resource Study, and a Historic Resource Study for the park's roads.

This category received a low score because of the large number of outdated or non-existent plans.

**RECOMMENDED ACTIONS: PARK PLANS**

- Begin revisions of the General Management and Resource Management plans as soon as possible.
- Congress should provide funding to complete a Historic Resource Study for the park as a whole, including the park's roads, as also recommended in the cultural resources section of this report.
- Initiate—with the appropriate regional and National Park Service offices—an internal partnership to further the park's ethnography studies and efforts.
- Congress should provide funding to complete much needed natural resource management plans, such as an exotic species management plan and deer and bear management plans.

**INTERPRETATION—WELL-ROUNDED  
EFFORTS PRODUCE RESULTS****Rating: 83**

Public understanding of Shenandoah's resources is an important stewardship tool. In a popular park like Shenandoah, which is close to large urban areas and averages 1.5 million visits a year, an effective education program is one of the best ways to reach the public.

The park's interpretive services are in great demand. In 2002, Shenandoah's 14 full-time and eight seasonal interpretive employees contacted 439,000 people through visitor centers, informal and formal interpretation, and the junior ranger and other education programs. Through non-personal services such as publications and audio/visual media, staff made more than 540,000 contacts. Outreach services, which includes giving presentations and loaning materials, accounted for an additional 2,000 contacts. The park's web site registered approximately 1.5 million hits.

The Business Plan estimates that to accomplish the goals and objectives of the Interpretation and Education Division, an additional eight full-time equivalents are necessary. In 2000, \$1.1 million was spent on visitor interpretive services, about \$354,000 less than what was needed, and funding for this activ-

ity has decreased since then. Staff shortages mean the park is not able to offer visitor services, including education programs, to 50,000 wintertime visitors. The park's Loft Mountain Information Center is closed two days a week during the peak park visitation season and closed from fall through spring. Visitor services have been lost each year because of persistent staffing shortfalls, and the park may have to close a visitor center permanently in the coming year because of budget and staffing erosion. The park will take possession of the Panorama building at Thornton Gap in 2004, but will not receive funding to transform it into a year-round visitor center and CCC museum until 2006.

**RECOMMENDED ACTIONS:  
INTERPRETATION**

- Congress must help to eliminate the \$350,000 shortfall in interpretive funding. The erosion of the interpretation budget has serious implications for the park's ability to meet visitor demands.
- Congress must provide funding for eight full-time equivalent interpretive staff positions needed to carry out work under existing plans.
- Congress must provide funding beginning in 2004 to renovate the Panorama building.

**EXTERNAL SUPPORT—VOLUNTEERS AND  
PARTNERSHIPS MAKE VALUABLE  
CONTRIBUTIONS****Rating: 62**

Across the country, volunteers and national park partners make valuable contributions to the protection of park resources. At Shenandoah, volunteerism averages a remarkable 40,000 hours a year, and in years when the park is damaged by events such as hurricanes, volunteerism rises. In 2002, 518 volunteers—300 of them from the Potomac Appalachian Trail

Club—donated 41,735 hours of their time to the park, equating roughly to \$668,000 of service.

Volunteer activities range from interpretation, youth conservation, and trail maintenance to resource management and administrative duties. While the number of volunteers at Shenandoah is fewer than in some other national parks assessed by the State of the Parks® program, their productivity tends to be higher, averaging 80 hours per volunteer.

In addition to volunteers, Shenandoah maintains multiple long-term partnerships with many other organizations and at least six universities. The partnerships focus on key issues and park needs such as falcon reintroduction and gypsy moth research, fish and wildlife monitoring, air quality, archaeological work, trail and hut maintenance, educational materials development and watershed acidification research.

Community outreach is a key component of building support for the park and to recruit volunteers and forming partnerships. Shenandoah staff work with park neighbors on several fronts. Senior managers routinely attend meetings of the Blue Ridge Committee, a group that consists of representatives from all the counties that surround the park, to work on issues such as park access and local tourism. The park employs teenagers through the Youth Conservation Corps during the summer and maintains a community service program for legal offenders.

Although members of Congress and other decision makers have supported specific pro-park initiatives, Shenandoah lacks the consistent, assertive champions needed to resolve the threats facing the park. Because of uncertain congressional support and the lack of a full-time volunteer program coordinator, the assessment rated external support at 62.

#### **RECOMMENDED ACTIONS: EXTERNAL SUPPORT**

- Congress must provide funding for a full-time volunteer coordinator to increase the effectiveness of park volunteers. Park advocacy groups and key decision makers at local, state, and federal levels must work together particularly on issues relating to air pollution, funding, and non-native species, and on other issues necessary to protect, restore, and enhance the park.
- Examine the possibility of working through partnerships and conservation easements on private lands to create ecological corridors linking Shenandoah National Park with neighboring protected areas.
- Continue community outreach activities, especially regarding issues of local planning and zoning.

## APPENDIX:



# STATE OF THE PARKS® ASSESSMENT PROCESS

To determine the condition of known natural and cultural resources at Shenandoah and other national parks, the National Parks Conservation Association developed a resource assessment and ratings process. It examines current resource conditions, evaluates the park staff's capacity to fully care for the resources, and forecasts likely conditions over the next ten years.

Researchers gather available information from a variety of sources in a number of critical categories. The Natural Resources rating reflects assessment of more than 120 discrete metrics associated with environmental quality, biotic health, and ecosystem integrity. Environmental quality and biotic health metrics (EBS) address air, water, soils, and climatic change conditions as well as their influences and human-related influences on plants and animals. Ecosystems measures (ESM) address the extent, species composition, and interrelationships of organisms with each other and the physical environment for indicator, representative or all terrestrial and freshwater communities. Each of the metrics is assigned a score of 1-3 based on the interpretation of extent, severity, and duration of impacting influences as regards the element. The total element scores for each category are divided by the total score possible and the percentage calculated becomes the rating. Element category scores are then rolled-up to produce the EBS, ESM, and Overall scores. In addition to producing a 0-100 scale score for each element category and roll-up categories of Environmental and Biotic Measures, Ecosystems Measures, and Overall, the assessment ratings also provide a "basis" for interpreting the adequacy of information upon which the element category or roll-up scores are based. This basis is also

reported on a 0-100 scale and reflects the extent to which information requirements for the assessment are met. The scores for cultural resources are determined based on the results of indicator questions that reflect the National Park Service's own Cultural Resource Management Guidelines and other Park Service resource management standards.

Indicators of stress and threats to resources are applied across each natural and cultural resource category to determine what their impacts will likely be over the next ten years. A checklist is used to derive a score based on the percentage of positive responses to questions posed about threats to existing resources. This enables a risk analysis to indicate whether resource conditions are likely to decline, remain the same, or improve. The impacts of threats to the park are also used to evaluate how resource conditions may change as a result of threats that are outside the control of park staff.

Sewardship capacity refers to the Park Service's ability to protect park resources. Information is collected and circulated to park staff and peer reviewers for analysis and to assign ratings. An overall average based on a 100-point scale is used to determine the ratings. An overall score is obtained by weighting the funding and staffing component at 40 percent, recognizing its critical importance, and the remaining three elements at 20 percent each.

For this report, researchers collected data and prepared a paper that summarized the results. The draft underwent peer review and was also reviewed by staff at Shenandoah National Park.\*

NPCA's State of the Parks Program represents the first time that such assessments have been undertaken for units of the National Park System. Comments on the program's methods are welcome.

\* This report does not address all of the information gleaned from the assessment process. Rather, it highlights current natural and cultural resource conditions in Shenandoah National Park and the threats that the National Park Service can most likely address to improve resource conditions into the future. For a copy of the full report, please visit [www.npca.org/stateoftheparks/](http://www.npca.org/stateoftheparks/). For more information about the ratings in this report, contact National Parks Conservation Association, State of the Parks® Program, P.O. Box 737, Fort Collins, CO 80522 (Phone: 970-493-2545; Fax: 970-493-9164; E-mail: [stateoftheparks@npca.org](mailto:stateoftheparks@npca.org)).

### DATA SOURCES FOR THIS REPORT\*

#### Commonwealth of Virginia

- Department of Natural Heritage
- Department of Conservation and Recreation
- Department of Environmental Quality
- Department of Forestry

#### U.S. Government

- Bureau of the Census
- Environmental Protection Agency
- National Oceanic and Atmospheric Administration
- National Atmospheric Deposition Program/National Trends Network
- U.S. Geological Survey

- U.S. National Park Service and Park Service staff at Shenandoah National Park

#### Other

- The National Trust for Historic Preservation
- Colonial Williamsburg Foundation
- University of Virginia
- Virginia Polytechnic Institute and State University
- James Madison University

\* Data from these sources were collected during visits to the park and from park publications, personal interviews, Internet resources, and literature reviews.



**D R A F T**  
**OCTOBER 1990**

# New Source Review Workshop Manual

Prevention of Significant Deterioration  
and  
Nonattainment Area  
Permitting

**CHAPTER B**  
**BEST AVAILABLE CONTROL TECHNOLOGY**

**I. INTRODUCTION**

Any major stationary source or major modification subject to PSD must conduct an analysis to ensure the application of best available control technology (BACT). The requirement to conduct a BACT analysis and determination is set forth in section 165(a)(4) of the Clean Air Act (Act), in federal regulations at 40 CFR 52.21(j), in regulations setting forth the requirements for State implementation plan approval of a State PSD program at 40 CFR 51.166(j), and in the SIP's of the various States at 40 CFR Part 52, Subpart A - Subpart FFF. The BACT requirement is defined as:

"an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Clean Air Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results."

During each BACT analysis, which is done on a case-by-case basis, the reviewing authority evaluates the energy, environmental, economic and other

costs associated with each alternative technology, and the benefit of reduced emissions that the technology would bring. The reviewing authority then specifies an emissions limitation for the source that reflects the maximum degree of reduction achievable for each pollutant regulated under the Act. In no event can a technology be recommended which would not meet any applicable standard of performance under 40 CFR Parts 60 (New Source Performance Standards) and 61 (National Emission Standards for Hazardous Air Pollutants).

In addition, if the reviewing authority determines that there is no economically reasonable or technologically feasible way to accurately measure the emissions, and hence to impose an enforceable emissions standard, it may require the source to use design, alternative equipment, work practices or operational standards to reduce emissions of the pollutant to the maximum extent.

On December 1, 1987, the EPA Assistant Administrator for Air and Radiation issued a memorandum that implemented certain program initiatives designed to improve the effectiveness of the NSR programs within the confines of existing regulations and state implementation plans. Among these was the "top-down" method for determining best available control technology (BACT).

In brief, the top-down process provides that all available control technologies be ranked in descending order of control effectiveness. The PSD applicant first examines the most stringent--or "top"--alternative. That alternative is established as BACT unless the applicant demonstrates, and the permitting authority in its informed judgment agrees, that technical considerations, or energy, environmental, or economic impacts justify a conclusion that the most stringent technology is not "achievable" in that case. If the most stringent technology is eliminated in this fashion, then the next most stringent alternative is considered, and so on.

The purpose of this chapter is to provide a detailed description of the top-down method in order to assist permitting authorities and PSD applicants in conducting BACT analyses.

## **II. BACT APPLICABILITY**

The BACT requirement applies to each individual new or modified affected emissions unit and pollutant emitting activity at which a net emissions increase would occur. Individual BACT determinations are performed for each pollutant subject to a PSD review emitted from the same emission unit. Consequently, the BACT determination must separately address, for each regulated pollutant with a significant emissions increase at the source, air pollution controls for each emissions unit or pollutant emitting activity subject to review.

### **III. A STEP BY STEP SUMMARY OF THE TOP-DOWN PROCESS**

Table B-1 shows the five basic steps of the top-down procedure, including some of the key elements associated with each of the individual steps. A brief description of each step follows.

#### **III. A. STEP 1-- IDENTIFY ALL CONTROL TECHNOLOGIES**

The first step in a "top-down" analysis is to identify, for the emissions unit in question (the term "emissions unit" should be read to mean emissions unit, process or activity), all "available" control options. Available control options are those air pollution control technologies or techniques with a practical potential for application to the emissions unit and the regulated pollutant under evaluation. Air pollution control technologies and techniques include the application of production process or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of the affected pollutant. This includes technologies employed outside of the United States. As discussed later, in some circumstances inherently lower-polluting processes are appropriate for consideration as available control alternatives. The control alternatives should include not only existing controls for the source category in question, but also (through technology transfer) controls applied to similar source categories and gas streams, and innovative control technologies. Technologies required under lowest achievable emission rate (LAER) determinations are available for BACT purposes and must also be included as control alternatives and usually represent the top alternative.

In the course of the BACT analysis, one or more of the options may be eliminated from consideration because they are demonstrated to be technically infeasible or have unacceptable energy, economic, and environmental impacts on a case-by-case (or site-specific) basis. However, at the outset, applicants

**TABLE B-1. - KEY STEPS IN THE "TOP-DOWN" BACT PROCESS**

**STEP 1: IDENTIFY ALL CONTROL TECHNOLOGIES.**

- LIST is comprehensive (LAER included).

**STEP 2: ELIMINATE TECHNICALLY INFEASIBLE OPTIONS.**

- A demonstration of technical infeasibility should be clearly documented and should show, based on physical, chemical, and engineering principles, that technical difficulties would preclude the successful use of the control option on the emissions unit under review.

**STEP 3: RANK REMAINING CONTROL TECHNOLOGIES BY CONTROL EFFECTIVENESS.**

Should include:

- control effectiveness (percent pollutant removed);
- expected emission rate (tons per year);
- expected emission reduction (tons per year);
- energy impacts (BTU, kWh);
- environmental impacts (other media and the emissions of toxic and hazardous air emissions); and
- economic impacts (total cost effectiveness, incremental cost effectiveness).

**STEP 4: EVALUATE MOST EFFECTIVE CONTROLS AND DOCUMENT RESULTS.**

- Case-by-case consideration of energy, environmental, and economic impacts.
- If top option is not selected as BACT, evaluate next most effective control option.

**STEP 5: SELECT BACT**

- Most effective option not rejected is BACT.

should initially identify all control options with potential application to the emissions unit under review.

### **III. B. STEP 2--ELIMINATE TECHNICALLY INFEASIBLE OPTIONS**

In the second step, the technical feasibility of the control options identified in step one is evaluated with respect to the source-specific (or emissions unit-specific) factors. A demonstration of technical infeasibility should be clearly documented and should show, based on physical, chemical, and engineering principles, that technical difficulties would preclude the successful use of the control option on the emissions unit under review. Technically infeasible control options are then eliminated from further consideration in the BACT analysis.

For example, in cases where the level of control in a permit is not expected to be achieved in practice (e.g., a source has received a permit but the project was cancelled, or every operating source at that permitted level has been physically unable to achieve compliance with the limit), and supporting documentation showing why such limits are not technically feasible is provided, the level of control (but not necessarily the technology) may be eliminated from further consideration. However, a permit requiring the application of a certain technology or emission limit to be achieved for such technology usually is sufficient justification to assume the technical feasibility of that technology or emission limit.

### **III. C. STEP 3--RANK REMAINING CONTROL TECHNOLOGIES BY CONTROL EFFECTIVENESS**

In step 3, all remaining control alternatives not eliminated in step 2 are ranked and then listed in order of overall control effectiveness for the pollutant under review, with the most effective control alternative at the top. A list should be prepared for each pollutant and for each emissions unit (or grouping of similar units) subject to a BACT analysis. The list should present the array of control technology alternatives and should include the following types of information:

- ! control efficiencies (percent pollutant removed);
- ! expected emission rate (tons per year, pounds per hour);
- ! expected emissions reduction (tons per year);
- ! economic impacts (cost effectiveness);
- ! environmental impacts (includes any significant or unusual other media impacts (e.g., water or solid waste), and, at a minimum, the impact of each control alternative on emissions of toxic or hazardous air contaminants);
- ! energy impacts.

However, an applicant proposing the top control alternative need not provide cost and other detailed information in regard to other control options. In such cases the applicant should document that the control option chosen is, indeed, the top, and review for collateral environmental impacts.

#### **III. D. STEP 4 - EVALUATE MOST EFFECTIVE CONTROLS AND DOCUMENT RESULTS**

After the identification of available and technically feasible control technology options, the energy, environmental, and economic impacts are considered to arrive at the final level of control. At this point the analysis presents the associated impacts of the control option in the listing. For each option the applicant is responsible for presenting an objective evaluation of each impact. Both beneficial and adverse impacts should be discussed and, where possible, quantified. In general, the BACT analysis should focus on the direct impact of the control alternative.

If the applicant accepts the top alternative in the listing as BACT, the applicant proceeds to consider whether impacts of unregulated air pollutants or impacts in other media would justify selection of an alternative control option. If there are no outstanding issues regarding collateral environmental impacts, the analysis is ended and the results proposed as BACT. In the event that the top candidate is shown to be inappropriate, due to energy, environmental, or economic impacts, the rationale for this finding should be

documented for the public record. Then the next most stringent alternative in the listing becomes the new control candidate and is similarly evaluated. This process continues until the technology under consideration cannot be eliminated by any source-specific environmental, energy, or economic impacts which demonstrate that alternative to be inappropriate as BACT.

**III. E. STEP 5 - - SELECT BACT**

The most effective control option not eliminated in step 4 is proposed as BACT for the pollutant and emission unit under review.

# ***Department of Environmental Quality***

**Air Program Regulatory Update  
Environment Virginia  
April 7, 2010  
Michael G. Dowd**

# **New 8 Hr Ozone Standard – Impact on Virginia**

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- Will put many Virginia areas into nonattainment
- EPA not considering another “early action” program
- More regional/national controls will be needed in areas like No. Va.

# Virginia Design Values 2007-2009

## STANDARD AT 70 PPB

Loudoun	77	Shenandoah	73	Wythe	67
Prince William	71	Stafford	72	Rockbridge	64
Arlington	79	Caroline	74	Page	66
Alexandria	75	Frederick	69	Fauquier	66
Fairfax-Lee Park	80	Roanoke	70	Rockingham	67
Fairfax-McLean	77	Chesterfield	74	Albemarle*	69
Fairfax-Mt. Vernon	80	Henrico	78	Newport News*	66
Fairfax-Chantilly	73	Hanover	75	Suffolk-TCC	72
Fairfax-Annandale	78	Charles City	77	Suffolk-Holland	73

*\*Less than 3 years of data*

# Virginia Design Values 2007-2009

## STANDARD AT 65 PPB

Loudoun	77	Shenandoah	73	Wythe	67
Prince William	71	Stafford	72	Rockbridge	64
Arlington	79	Caroline	74	Page	66
Alexandria	75	Frederick	69	Fauquier	66
Fairfax-Lee Park	80	Roanoke	70	Rockingham	67
Fairfax-McLean	77	Chesterfield	74	Albemarle*	69
Fairfax-Mt. Vernon	80	Henrico	78	Newport News*	66
Fairfax-Chantilly	73	Hanover	75	Suffolk-TCC	72
Fairfax-Annandale	78	Charles City	77	Suffolk-Holland	73

\*Less than 3 years of data

# Virginia Design Values 2007-2009

## STANDARD AT 60 PPB

Loudoun	77	Shenandoah	73	Wythe	67
Prince William	71	Stafford	72	Rockbridge	64
Arlington	79	Caroline	74	Page	66
Alexandria	75	Frederick	69	Fauquier	66
Fairfax-Lee Park	80	Roanoke	70	Rockingham	67
Fairfax-McLean	77	Chesterfield	74	Albemarle*	69
Fairfax-Mt. Vernon	80	Henrico	78	Newport News*	66
Fairfax-Chantilly	73	Hanover	75	Suffolk-TCC	72
Fairfax-Annandale	78	Charles City	77	Suffolk-Holland	73

*\*Less than 3 years of data*

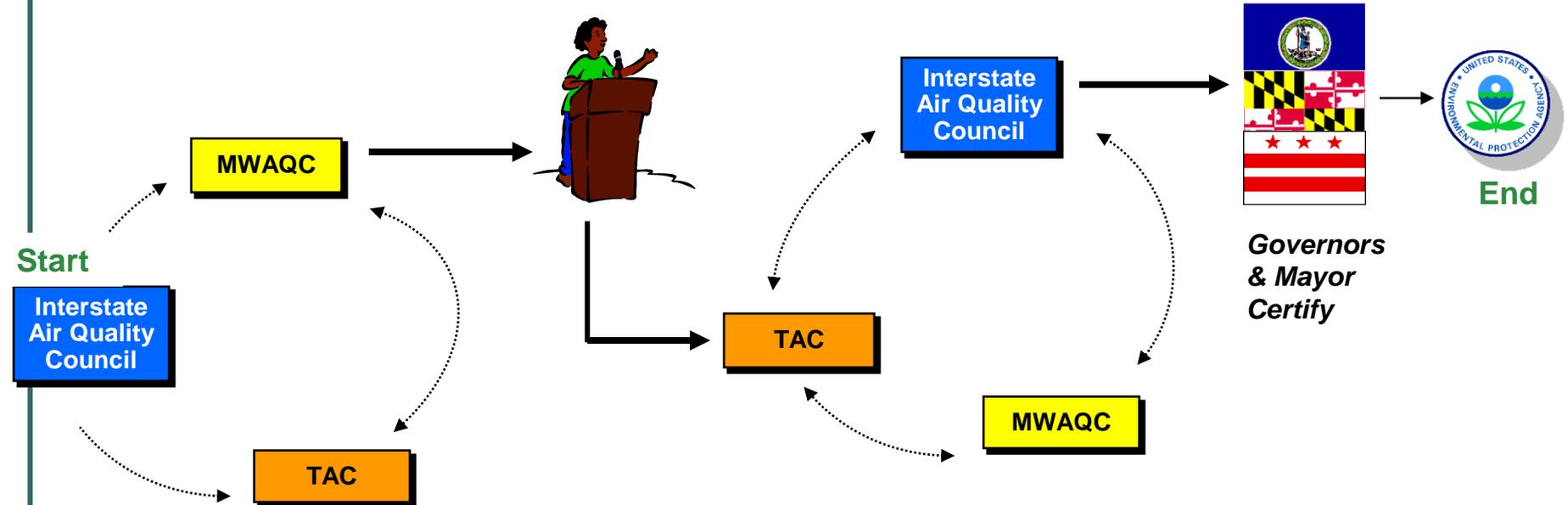
# Regional Air Quality Plan Development

Prepare Draft

Public Comment

Revise Draft

Final Submittal



# The Future of Ozone Standards

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- EPA will propose another new ozone standard in May 2013 as required by CAA 5 yr review schedule
  - More science, no safe threshold
  - Costs can't be considered
- Biogenic background levels at 30-45 ppb
  - So. Cal. claims 48 ppb background
- “Combustion out” control strategy?

# Future Air Quality Standards – Shift in Regulatory Approach?

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- Current “single-pollutant” based approach
  - Reducing mass emissions of a single pollutant is key
  - Embodied in CAA (NAAQS)
- New “source-exposure” based approach
  - Suggested by “cutting-edge” air pollution health science
  - Reducing exposure is key
  - Wrung all we can out of current approach
  - Much scientific uncertainty; *very* complex & expensive

# Shifting to Source-Exposure Based Regulatory Approach

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- EPA moving from ambient to source-specific monitoring
  - Pb “source-oriented” monitoring
  - NO2 “near-road” monitoring and “focus on vulnerable and susceptible groups”
- Communities demanding individual control strategies for local “hot-spots”
  - Rhoda
  - Hopewell
- Resources lagging behind

# Climate Change/ Green House Gases

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- EPA will require GHG permitting in 2011
- GHG permitting threshold to be set @ 50,000-100,000 tpy of CO<sub>2</sub>e
- However, under current regulations GHG permitting threshold in Va. would be 100-250 tpy of CO<sub>2</sub>e per language of CAA
- Expeditious promulgation of Va. Tailoring Rule modeled on EPA's rule:
  - Raise GHG permitting threshold to federal levels
  - Administrative necessity
  - Level regulatory playing field for Va. regulated entities