Design of the Blue Ridge Parkway: Environmental Masterpiece or Standard Road?

Mary Myers, Assistant Professor
Department of Landscape Architecture
College of Design
North Carolina State University
Raleigh, NC 27695

Introduction
The Blue Ridge Parkway has been touted as one of the world's most scenic and environmentally sensitive roads. (Newton, 1971) Is this really true?

The spectacular scenic qualities of the parkway, particularly its mountain vistas, are undeniable. However, it does not follow that environmental effects were insignificant. Sensitivity to view should not be equated with minimal environmental impact.

This study examines some broad impacts of the design on its immediate environment. The thesis is that the Blue Ridge Parkway is poorly located in portions of North Carolina and that this routing adversely impacted geology, soil and plant habitat. Some of the impacts were recognized and ameliorated through design. Others, such as destruction of rare plant habitat, were not correctable.

This view challenges conventional opinion that the Blue Ridge Parkway is a model of environmental road development. The paper also highlights areas of design strengths and weaknesses from which we can learn lessons.

Limitations of this study
It is beyond the scope of this paper to engage in a comprehensive assessment of parkway associated impacts. Like all roads, the parkway motor road fragments animal habitat and increases air and noise pollution. Likewise, this paper is not a quantitative assessment of environmental impacts along the lines of an Environmental Impact Statement. Instead it is confined to the *generalized* impacts and the design developed to ameliorate these impacts.

Location
The Blue Ridge Parkway, (1934-1987), is unit of the National Park Service. Unlike other units, it is a linear park, averaging 1,000' right of way, connecting two larger National Parks: Great Smokies National Park, Tennessee and North Carolina with Shenandoah National Park, Virginia.

Location, or overall route, was influenced by depression era politics with different states competing for the public works funds. Politicians and designers accepted that the parkway would pass through Virginia to access Shenandoah National Park. However, access to Great Smokies National Park could occur via Tennessee, or North Carolina and the two states competed vigorously for the $16 million in project funds.

In November 1934, after hearings and preliminary studies, Secretary of the Interior Harold Ickes decided upon a North Carolina route for the Blue Ridge Parkway, (BRP) which took it generally over the most scenic, and some would argue, the most vulnerable land in the Appalachian range. The area of greatest contention lay south of Blowing Rock, NC where the parallel ridges of the Appalachians are higher in elevation and take on a random configuration.

Potential construction and environmental problems did not go unrecognized by the landscape architects involved in early reconnaissance studies. A report on proposed locations reveals that Resident Landscape Architect, Stanley Abbott was not in favor of the crest route through North Carolina for reasons related to the monotony of scenery, dangerous driving conditions, costly construction, and perhaps most important, "scarring of the mountainsides." The report studied three potential routes for parkway: 1) the route lying wholly in Virginia and North Carolina 2) a route lying wholly in Virginia and Tennessee 3) a route lying in Virginia, North Carolina and Tennessee. Abbott's findings, based on five months of field study, recommended the third route for its "variety of scenery, reasonable construction costs and good direction." (Abbott, 1934*)*

Parkway cut through the Craggies Range

Higher ranking administrators of the National Park Service, including Arno Cammerer, Director of the National Park Service, supported Abbott's recommendation. But Ickes decided in favor of the North Carolina-Virginia location, perhaps because Tennessee already had considerable federal monies dedicated to the Tennessee Valley Authority. In any event, the 169 miles of parkway south of Blowing Rock, NC passed through the most rugged and untouched mountains of the east.

The steepest and most difficult section occurred near the southern terminus where the Plott Balsam range lay at right angles to the road. There the parkway crossed the mountain range perpendicularly. Ed Abbuehl, parkway landscape architect, described the topography as "almost impossible for parkway standards" and stated, " This road would create a scar visible for miles in the Great Smokies National Park…"(Abbuehl, 1936). Abbuehl recommended a longer, more gentle valley and foothill route but his recommendation was rejected. Instead administrators opted to achieve 'the impossible', get the parkway through the extraordinarily steep mountainous terrain between Soco and Balsam Gaps, just north of Great Smokies National Park. This location would also adversely impact rare plant habitat, (see below).

<u>Impacts of Location on Geology</u>

<u>Blasting:</u> The metamorphic and igneous origin of the Appalachians with cycles of erosion followed by a general uplift created numerous outcrops and areas where topsoil was very thin. The decision to locate in steep terrain required blasting to situate the road. In some places such as in Doughton Park, the road was literally notched into a vertical cliff. In others, it passed through subterranean passages. Blasting and excavation left strata and substrata exposed to erosion and weathering. The consequences were felt when excessive rains caused washouts and rock slides in September 1960, in Buck Creek Gap, NC.

<u>Role of Gradient</u>: Vertical gradient is related to location. BRP gradient had a significant role in environmental impacts. The designers followed established parkway precedent in insisting on gentle vertical grades conducive to a pleasant, safe and easy driving experience. A gradient of 3 - 6% became the BRP standard, with an absolute maximum of 8% for distances of ¼ mile or less. (Lord, 1954)

Achieving moderate gradient in naturally steep areas required drastic earth moving. Cut and fill would normally be balanced at a local level because cut could not be disposed of and fill could not be obtained other than through the road routing. Local balancing increased volumes of earthwork in steep sections where the route encountered both ascent and descent. There was a 1,370' ascent and a 2,340' descent in the 12.5 miles from Soco to Balsam Gap. The massive excavation and blasting required to achieve gradient was understood by Abbuehl who questioned the purpose:"…the only accomplishment is to get from Balsam Gap to Soco Gap, which is a rather arbitrary control." (Abbuehl, 1936) Adherence to the gradient resulted in many tunnels. 24 tunnels had to be excavated in North Carolina south of Blowing Rock.

Steep Road Banks A problem in achieving moderate gradient in extreme topography is merging with existing grade. Cuts on the uphill side of the road and fill on the down hill side had to meet existing grade within the parkway right-of-way. This often resulted in extremely steep, unsightly and erosive banks, some in excess of 2:1 ratio. Parkway landscape architects struggled to try to blur the edge between road embankment and natural setting through planting but were not always immediately successful.

Impacts of location on erosion and watershed

The soils around the parkway were generally considered "immature" in profile. Slopes were acknowledged to be vulnerable to erosion, particularly where vegetative cover was weak. (BRP Master Plan, 1952)

For about a decade, until 1945, the parkway accepted erosion onto adjacent lands as a consequence of construction. A failure to reduce and disperse motor road stormwater caused serious erosion problems on private land holdings. Complaints were filed by adjacent landowners and supported by memoranda issued by the Soil Conservation Service. In 1944 it was estimated that half the drains along the parkway were causing "appreciable damage" to adjacent properties and that "no effort was being made to stabilize the gullies caused by parkway culverts, some as large as 10' deep and active." (Taylor, 1944) Drainage culverts had been located at regular intervals of 300 or 400 feet, regardless of the actual location of small streams and drainage ways. (Hooper, 2001). Inadequate for the velocity and volume of storm water the culverts directed all of the water from the road and the land above onto the low side of the road. After heavy rains water was ejected with such force that it gullied the land below, carrying away topsoil which filled nearby creeks and reservoirs. Parkway landscape architects, earlier critical of the impoverished and eroded mountain farm landscapes nearby, found themselves in a position of defending erosion!

Impacts of location on plant habitat

In the highest elevations, the parkway impacted a rare and sensitive plant habitat, the Spruce and Balsam Fir association found north and south of Asheville in the Craggies and Balsams. Much of this association was what the parkway administrators termed 'primeval' or virgin forest. Aside from the paucity of virgin forest anywhere in the east, the Spruce-Balsam Fir association was particularly unusual. It is indigenous to Canada and unknown in the southern U.S. except at elevations over 4,500. Road cuts impacted trees outside, as well as, inside of the motor road zone because of their shallow rooting structure, (due to thin topsoil). When the roots were cut the Spruce and Balsam Fir became vulnerable to blow downs and to disease. A warning against disturbing this habitat was issued in 1934 by Robert Marshall, wilderness advocate and friend of Ickes. Marshall visited the proposed parkway location and responded with a spirited memorandum to "Save the Primitive". He cautioned against building the road through the Pisgah, Balsam and Plott Balsam ranges of North Carolina due to the susceptibility of the trees to windfall after construction. (Marshall, 1934)

In 1938, the Acting Head of the U.S. Forest Service issued another warning against construction in the Spruce - Balsam Fir habitat. This time with specific data to confirm his recommendation:
"…severe damage to adjacent spruce and balsam fir stands inevitably follows right-of-way clearing. Recent studies made along the Newfound Gap-Clingman Dome's highway within the park showed

that more than 1200 trees bordering the right of way died or were blown down in a period of 21 months and a distance of 5 miles. In addition, a road cut through a dark coniferous forest is not healed for many years." (Forsling, 1938)

The advice, which referred to the Soco Gap-Balsam Gap section, was again unheeded. The motor road cut through stretches of Spruce – Balsam Fir habitat in the Plott Balsams and through the Craggies above Asheville. At least one major blow down occurred in the Asheville Watershed District during the 1940's. (Pease, 2001)

Design approaches to ameliorate geological impacts

Their location recommendations were ignored but BRP landscape architects could and did develop design approaches to reduce impact of the road. Moreover, the five decades of design and construction permitted time to observe, and in some cases, correct problems.

Single motor road of limited width:
The most important decision related to minimizing environmental disturbance was the single motor road with two lanes. Most parkways had divided motor roads with two lanes in each direction to facilitate a safer, more relaxing driving experience. Destruction caused by two motor roads in the steep North Carolina section would have doubled that of one.

20' wide parkway motor road with sloping rock adjacent to shoulder

The width of the motor road is narrower than most residential streets: 20 ' of paved surface with 5' grass shoulders on each side. The decision to maintain a narrow width reduced blasting and earthwork operations.

Detailing of Rock Cuts:
Rock cuts at the edges of the motorway were designed to try to relate to the natural slope of the mountain. Instead of the straight slice common to highways of the 1930's and 40's, the stone was cut to fold back into the mountainside. This would reduce slides and random stone fall. The stone walls were left quite close to the motorway sometimes as close as 5 feet from the edge of the road, a distance considered unsafe in standard highway situations. The decision to retain a limited shoulder zone reduced the amount of excavation. Often that which was left was imposing and added to the feeling of "naturalness" of the parkway. The presence of huge, battered, irregular stone walls within close proximity to the car may serve a safety function by inhibiting speed.

Use of advanced technology:
The final parkway section of the Blue Ridge Parkway was not completed until the mid 1980's. This section around Grandfather Mountain, el. 5637', was treacherous. Parkway landscape architects and engineers mulled over the problem for years, proposing different routes and road elevations. All involved what was by then considered to be an unacceptable level of environmental impact: blasting, filling, tunnel and retaining wall construction. Eventually, it was proposed that the road should follow the middle line of Pilot Ridge and straddle large rock formations. In one place, Linn Cove, the road became a completely elevated viaduct minimizing destruction of geology and vegetation. The type of post stressed, segmental, precast construction used for the viaduct was a technological innovation unavailable in the earlier years of parkway construction.

Design Approaches to ameliorate soil impacts

In late 1944, early 1945, BRP designers began to address areas of washout and gullying of adjacent lands resulting from improper dispersal of storm water. Field observation by teams of landscape architects and engineers resulted in adjustment for pre-existing drainage ways. Problem areas were studied and additional culverts were installed, along with flumes, check dams and drainage ditches. In all areas, landscape architects directed engineers to keep water in its natural course, not to divert it. (Pease, 2001).

One of the most successful techniques for checking erosion over the long term was revegetating eroded areas. Experimentation with plants that could become established quickly, such as quick growing grasses and fescues, showed the designers that low growing species were often as useful in checking erosion as the taller ones preferred at the time. (Hooper, 2001)

Design approaches to ameliorate impact of plant habitat

Nothing could be done to correct the damage done to the old growth Spruce-Fir Balsam habitat. Parkway maintenance personnel utilized the downed wood for construction purposes. However, the serious impact to a very rare virgin forest type had been done.

Conclusion

What is to be learned from this analysis? First, that location is the foremost consideration of road design. The southernmost section of the Blue Ridge Parkway was located in an environment which probably ought to have been protected from *any* road development. Impacts to soils and watersheds were serious, the damage to plant habitat was irreversible.
Second, it is possible to ameliorate some road impacts over time. Observation, experimentation and adjustment of details are key to amelioration.
Third, design decisions, such as width of road, storm water accommodations and detailing of rock cuts can reduce environmental impact.

In the case of the Blue Ridge Parkway the corrective measures have been so cleverly accomplished and that the parkway is now considered to be a road without impacts.

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Recognition:
After this conference was completed, the ARCC board members in attendance voted two awards be made.

Shahin Vassigh, Assistant Professor, School of Architecture and Planning, at the State University of New York at Buffalo was given the "Best Presentation" award for her paper and demonstration of "Teaching Statics and Strengths of Materials using Digital Technology"

Jody Rosenblatt Naderi, Assistant Professor, Department of Landscape Architecture and Urban Planning, College of Architecture, at Texas A&M University was given the "Best Paper" award for her paper titled " Transportation + Street Trees: Effect of the Urban Design Industry's Roadside Landscape Improvement Standards on Driver and Pedestrian Performance.

Thanks:
It is important to recognize the people who contributed their time and insight to the success of this conference.

Professor Paul Knox, Dean of the College of Architecture and Urban Studies for his introductory remarks, and for hosting the welcoming reception.

Professor Frank Weiner, Head, Department of Architecture, College of Architecture and Urban Studies for his advice, and thoughtful introduction of Dr. Mayo.

Professor Walter Grondzik, ARCC Past President, from the School of Architecture at Florida A & M University, for chairing the peer review process for paper submissions.

Professor James Jones, Co-Chair for the Spring Conference at Virginia Tech.

Opening Speakers, Professor Volker Hartkopf, Director, Center for Building Performance and Diagnostics, Carnegie Mellon University and Professor Deborah Mayo, Department of Philosophy, Virginia Tech and discussion leader, Thomas Barrie, Professor, Department of Architecture, Lawrence Technological Institute.

Contributing Speakers, Matthew Nowakowski, Coordinator, Initiative for Architectural Research, Professor Dennis Jones and Mehdi Setareh, Department of Architecture, Virginia Tech and Professor Yvan Beliveau, Head, Department of Building Construction at Virginia Tech.

Professor Lucie Fontein, Carleton University, Conference chair for the upcoming 2002 ARCC conference May 22 - 25 at McGill University, Montreal.

I especially appreciate the following ARCC Board Members Participation in this conference.

Professor Mary Kihl, Editor ARCC Newsletter, from The Herberger Center for Design Excellence, College of Architecture and Environmental Design, Arizona State University

Professor James West, ARCC Secretary, School of Architecture, Mississippi State University

Professor Fatih Rifki ARCC Board Member, School of Design, North Carolina State University

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Most sincerely,

Michael O'Brien, President ARCC
Conference Chair.