STANDARDS OF QUALITY FOR TRAFFIC CONGESTION IN PARKS: AN EMPIRICAL STUDY OF THE BLUE RIDGE PARKWARY

William Valliere
Researcher, School of Natural Resources,
University of Vermont,
Burlington, VT 05405

Robert Manning
Professor of Natural Resources,
School of Natural Resources,
University of Vermont,
Burlington, VT 05405

Steven Lawson
Post-doctoral Associate,
School of Natural Resources,
University of Vermont,
Burlington, VT 05405

James Bacon
Researcher, School of Natural Resources,
University of Vermont,
Burlington, VT 05405

Daniel Laven
Graduate Research Assistant,
School of Natural Resources,
University of Vermont,
Burlington, VT 05405

Abstract: Crowding and carrying capacity are perennial and increasingly important issues in parks and outdoor recreation. Contemporary park and outdoor recreation management frameworks, including Limits of Acceptable Change and Visitor Experience and Resource Protection, rely on indicators and standards of quality to help manage these issues. One of the ways in which crowding can be manifested in the developed portions of parks and outdoor recreation areas is traffic congestion. This issue is especially relevant at parkways, a traditional type of park unit within the National Park System. Blue Ridge Parkway is the oldest and most heavily used parkway, and traffic congestion is an issue of increasing concern to park visitors and managers. This study used photographic and survey approaches to help formulate indicators and standards of quality for traffic congestion on the Blue Ridge Parkway. Study photographs illustrated a range of numbers and types of vehicles along the Parkway, and a survey of visitors at eleven sites along the Parkway asked respondents to evaluate the acceptability of study photographs. The survey was conducted in the summer of 2002. Study data can be used to help the National Park Service formulate standards of quality for the number and type of vehicles on the Blue Ridge Parkway.

Introduction

The U.S. National Park System contains natural and cultural resources of national and, increasingly, international significance. Given the significance of this resource base, public demand to see and experience these areas is not surprising. Data on visitation to the national park system dramatically support this premise. For example, in 2002, there were over 275 million recreational visits to the national park system (National Park Service 2003). The increasing popularity of the national park system, presents substantial management challenges. Too many visitors may cause unacceptable impacts to fragile natural and cultural resources, and may also cause crowding and other social impacts that degrade the quality of the visitor experience. How many visitors can ultimately be accommodated in a park or related area? How much resource and social impact should be allowed? These and related questions are commonly referred to as carrying capacity (Manning 1999; Stankey and Manning 1986; Shelby and Herberlein 1986; Graefe et al. 1984).

The Blue Ridge Parkway is a good example of the issues noted above. The Blue Ridge Parkway is a 469 mile recreational motor road that connects Shenandoah and Great Smoky Mountains National Parks while protecting the cultural and natural features of the region. Designed as a "scenic drive" and built by the Civilian Conservation Corps in the 1930's, the Parkway provides both stunning scenery and close-up looks at the natural and cultural history of the Appalachian Mountains.

Adjacent to the park are rapidly growing towns and cities whose residents use and affect conditions on the parkway. Growing development around the park may draw larger numbers of recreational motorists, and may increase use of the parkway as part of the regional transportation system.

Figure 1. A sample of five of the 17 photographs used in the study. Photographs depict differing numbers of vehicles and different vehicle types.

Increases in these types of use could, in turn, potentially create congestion on the parkway and change the types of visitor use and the character and quality of the visitor experience. Moreover, increasing pressures to improve secondary roads that cross the parkway also threaten to change the character of the Blue Ridge Parkway. As a result, significant resource and social impacts may occur

Table 1. — Problem Issues on the Blue Ridge Parkway

		No Problem (1)	Small Problem (2)	Big Problem (3)	Don't Know	
Issue	N		Percent			Mean
A. Difficulty finding your way around the park.	910	85.5	12.1	0.7	1.8	1.1
B. Traffic congestion on the roads.	912	67.4	27.5	3.6	1.4	1.4
C. Difficulty finding parking place.	901	70.8	24.9	3.1	1.2	1.3
D. Inadequate number of visitor facilities/services.	907	68.8	22.9	3.3	5.0	1.3
E. Poor condition of visitor facilities/services.	902	81.5	12.3	1.3	4.9	1.2
F. Lack of information about what to see and do in the park.	909	75.8	17.8	3.3	3.1	1.3
G. Lack of information on park natural/cultural resources.	903	76.2	18.2	2.1	3.5	1.2
H. Lack of recreation opportunities.	899	81.9	10.9	1.4	5.8	1.1
I. Poor condition of park trails.	887	69.6	11.7	1.6	17.1	1.2
J. Unattractive views from park overlooks.	893	77.9	15.2	4.6	2.2	1.2
K. Crowding at park overlooks.	899	68.3	26.0	2.8	2.9	1.3
L. Crowding at park visitor centers.	903	70.3	20.8	3.2	5.6	1.3

as visitor use of the Parkway increases. This study, therefore, attempts to develop indicators and standards of quality for the amounts and types of visitor use that can ultimately be accommodated on the Blue Ridge Parkway.

Study Objectives

Contemporary park and outdoor recreation management frameworks, including Limits of Acceptable Change (Stankey et al. 1985) and Visitor Experience ad Resource Protection (National Park Service 1997; Manning 2001), rely on development of indicators and standards of quality to help protect natural and cultural resources along with the quality of the visitor experience. Indicators of quality are measurable, manageable variables that reflect the essence, or quality of the visitor experience at a particular site. Standards of quality define the minimum acceptable condition of indicator variables.

This study focused on three elements of the VERP framework that benefit from empirical data: 1) collecting baseline data on visitor use and associated impacts, 2) identifying indicators and standards of quality for the visitor experience, particularly as they apply to traffic congestion, 3) identifying differences in standards of quality for different vehicle types using the Blue Ridge Parkway.

Methods

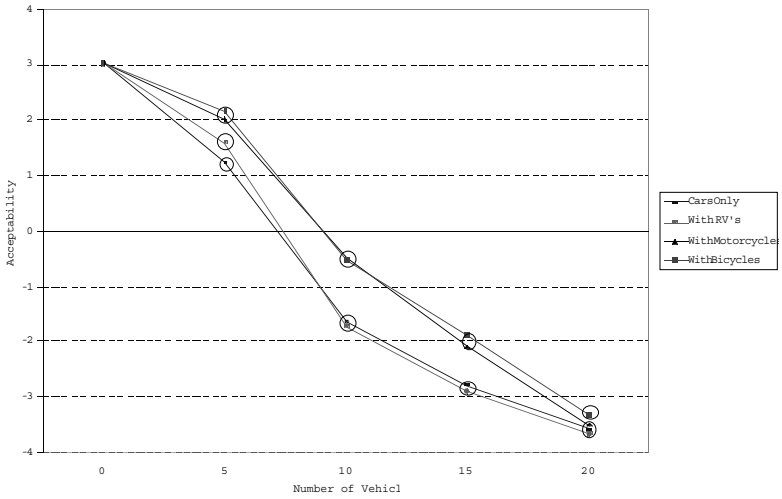
Visitor surveys were conducted at eleven locations on the parkway. Locations included visitor centers and overlooks and were selected by park staff and researchers as representative of visitor attractions and facilities along the Blue Ridge Parkway. On three randomly selected days in the summer of 2002, a trained interviewer was stationed at each of these locations between the hours of 9 a.m. and 5 p.m. At the beginning of each survey day, the first person to complete their visit at the study site was asked to participate in the survey. If the group was willing to participate, the group leader was given a copy of the study questionnaire and asked to complete the questionnaire. Photographic techniques were used to simulate increasing levels and varying types of vehicle use on the parkway (Figure 1), and these photographs accompanied the questionnaires. A total of 1,378 visitor groups were asked to participate in the study and 991 questionnaires were completed yielding a response rate of 72%. The questionnaire used in this survey focused primarily on parkway uses and users, potential indicators of the quality of the visitor experience, and standards of quality for crowding-related issues.

Results

The survey instrument was designed to gather demographic information about visitors to the Blue Ridge Parkway, as well as data that may help support the formulation of standards of quality for the visitor experience. The following section presents results on use and users and indicators and standards of quality.

Use and users

Most visitors come to the Blue Ridge Parkway in small groups of two or three with an average (mean) group size of 3.2 people and a median group size of 2 people. The majority of visitors come in groups comprised of family and/or friends (90.8%). Respondents were also asked to indicate the type of vehicle in which they visited the Blue Ridge Parkway. Results indicate that the majority



* Note: Points in this figure within the same circle are not significantly different from each other, while points in different circles are significantly different.

Figure 2. Norm Curves for Traffic

of visitors (84.5%) came in autos/SUVs/pickup trucks. However, a second tier of respondents (8.3%) visited on motorcycles. Respondents were also asked about activities participated in along the Blue Ridge Parkway, and were given a list of activities and asked to indicate which they had done or expected to do during their visit. The most popular activities reported were scenic driving/stopping at overlooks (88.1%), visiting visitor centers (60.5%), hiking (59.0%), picnicking (39%), purchasing something at visitor center stores (37.2%), and visiting historic sites (33.7%)[1].

The number of times respondents had previously visited the Blue Ridge Parkway was also determined. Survey respondents previously visited an average of 21.2 times and a median of 5 times. Further analysis was done to explore differences in previous use of the Blue Ridge Parkway between local and non-local residents. Local residents consist of all respondents residing in Virginia and North Carolina. As one might expect, local visitors had visited significantly more often than non-local visitors (38.5% vs. 7.9%). Along with previous visitation, respondents were asked several socio-demographic questions such as their educational background and income levels. Overall, visitors to the Blue Ridge Parkway tend to be well educated with 87.3% having at least some college education or higher. In addition, visitors reported a wide and relatively even distribution of income levels. The most frequently reported income level was $40,000 to $59,999 (21.7%).

Indicators and standards of quality

To measure visitor perceptions of issues pertinent to the experience at the Blue Ridge Parkway, respondents were given a question containing a list of issues and were asked to rate each on a three point scale where 1 = “No Problem”, 2 = “Small Problem”, and 3 = “Big Problem”. Respondents were also given the opportunity to indicate that they “Don’t Know”. Results are shown in Table 1. All issues included in the question were rated by a majority of respondents as “No Problem”. The issue rated as the biggest problem was traffic congestion on roads (mean = 1.4), suggesting that the number of vehicles may be a relevant indicator of quality for the visitor experience along the Blue Ridge Parkway.

As described previously, a section of the survey questionnaire contained a series of questions and corresponding photographs that were used to measure standards of quality for crowding-related issues. The first question in this series presented respondents with a set of seventeen photographs

[1] Note that these percentages total more than 100% because most visitors participated in more than one activity during their experience on the Blue Ridge Parkway.

depicting different amounts of traffic along a 0.16 mile generic section of the parkway (Figure 1). These photographs contained varying combinations of traffic consisting of cars, recreational vehicles (RV), motorcycles, and bicycles. Respondents were initially asked to evaluate the "acceptability" of each photograph using a response scale that ranged from -4 ("Very Unacceptable") to +4 ("Very Acceptable").

Findings are shown in Figure 2 and Table 2, and these findings suggest that smaller amounts of traffic are more acceptable than larger amounts of traffic. In addition, aggregate evaluations of the photographs fall out of the acceptability range and into the unacceptable range at between approximately 7 to 10 vehicles. A multiple analysis of variance was used to determine that photographs with RVs and automobiles were, on average, less acceptable to respondents than were photographs with motorcycles and bicycles. Individual comparisons were also done, and points in Figure 2 within the same circle are not significantly different from each other, while points in different circles are significantly different. This suggests that photographs with differing numbers of autos/SUVs/pickup trucks and RVs are approximately equivalent to each other in their acceptability to respondents, while different numbers of motorcycles and bicycles are approximately equivalent to each other in terms of acceptability. In other words, visitors' evaluations of acceptable numbers of vehicles varied by type of vehicle, with visitors characterizing motorcycles and bicycles as one group, while autos/SUVs/pickup trucks and RVs constituted another group (Figure 2).

Table 2. — Summary of Acceptability Ratings for Different Types of Vehicle Use

Acceptability	Mean Number of Vehicles
Cars Only	7.0
Cars and RVs	7.4
Cars and Motorcycles	9.0
Cars and Bicycles	9.1

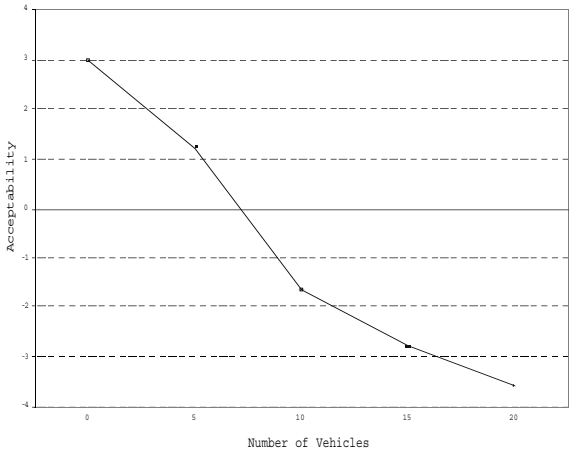


Figure 3. Norm Curves for Cars Only

Table 3. — Summary (Cars Only)

Measure	Mean Number of Cars
Acceptability	7.0
Preference	3.4
Management Action	12.1
Tolerance/Displacement	16.2
Typically Seen	5.1
Expectation	6.6

Using the five of seventeen photographs containing only cars, respondents were asked to indicate the photograph that 1) shows the number of cars preferred (referred to as "preference"), 2) shows the number of cars that would be so unacceptable that respondents would no longer visit the area (referred to as "tolerance/displacement"), 3) shows the highest number of cars the National Park Service should allow before visitor use is restricted (referred to as "management action"), 4) shows the number of cars typically seen by respondents on the day of the study (referred to as "typically seen"), and 5) shows the number of cars expected to be seen (referred to as "expectation"). Where appropriate, respondents were allowed options to indicate that none of the photographs represented the conditions asked or that the National Park Service should not restrict visitor use. Findings for these questions are summarized in Figure 3 and Table 3. Respondents reported that 1) an average of 7.0 cars was the highest level of use acceptable, 2) they prefer to see an average of 3.4 cars, 3) they would be displaced by an average of 16.2 cars, 4) that the National Park Service should allow no more than an average of 12.1 cars, 5) that they typically saw an average of 5.1 cars, and 6) that they expected to

Table 4. — Summary Cars per Mile

Measure	Number of Cars per Mile
Acceptability	56
Preference	21
Management Action	75
Tolerance/Displacement	101
Typically Seen	31
Expectation	41

see an average of 6.6 cars. The displacement and management action values are slightly underestimated as some respondents reported that either none of the photographs represented the condition asked or that the National Park Service should not restrict visitor use.

Table 4 presents an extension of study data from the 0.16 mile section of road shown in the photographs to cars per mile. When converted to cars per mile, results from this study indicate that, 1) an average of 56 cars per mile is the maximum acceptable condition, 2) visitors prefer to see an average of 21 cars per mile, 3) visitors would be displaced by an average of 101 cars per mile, 4) the National Park Service should allow no more than an average of 75 cars per mile, 5) visitors typically saw an average of 31 cars per mile, and 6) visitors expected to see an average of 41 cars per mile.

In addition, results from an analysis of variance indicate there is no statistically significant difference in standards of quality across the 11 study sites on the Blue Ridge Parkway.

Management Implications

This study has at least two potential contributions to the management of parks and related protected areas. First, results from this study suggest that traffic congestion on the Blue Ridge Parkway is a moderately salient indicator of quality for the visitor experience. In addition, visitors to the Blue Ridge Parkway appear to be able to express meaningful normative standards of quality about acceptable levels of traffic congestion. These results may be important because traffic congestion is predicted to increase on the Blue Ridge Parkway. Moreover, while perhaps expected, study findings such as these help to expand the applicability of indicator-based planning and management frameworks from backcountry or wilderness settings to front country and urban-proximate contexts (Manning et al. 1999; Budruk and Manning, In Press). As management agencies create new types of protected area designations (e.g., National Heritage Areas (Hamin 2001)) and use of indicator-based planning and management frameworks increases (Stokes 1990), development of contextually relevant indicators and standards of quality becomes an important research priority.

Second, this study begins to address how visitors evaluate different types of vehicle use on the Blue Ridge Parkway. For example, results from this study suggest that larger vehicles impact the visitor experience to a greater degree than smaller vehicles. This information may be useful to managers because increased traffic congestion may lead to conflict among different user groups. Although previous research has explored conflict among participants in alternative recreation activities (e.g., Lucas 1964; Brewer and Fulton 1973; McAvoy et al. 1986; Williams 1993; Hendricks 1995; Watson 1995; Jacobi et al. 1996; Manning 1999, Chapter 9), little of this work has been directly applied to traffic congestion in parks and protected areas.

Study Limitations and Future Research

As previously discussed, this study begins to explore how visitors evaluate alternative types of vehicle use on the Blue Ridge Parkway. However, the vast majority of respondents (84.5%) visited the park in a car, SUV, or pickup truck. In contrast, only 8.3% percent of respondents drove motorcycles, 1.7% drove RVs, and 1.5% used bicycles. However, previous research suggests that visitors participating in different types of recreational activities may evaluate uses differentially. For example, canoeists in the Boundary Waters Canoe Area Wilderness, MN perceived themselves as very different from motor-boat users, and these differences in perceptions may contribute to, or result in, conflict between motorboat users and canoeists (Adelman et al. 1982; Lucas 1964; Manning 1999). Similar differences may also be present among visitors to the Blue Ridge Parkway, and future research might integrate a combination of targeted sampling and qualitative methods in an effort to identify and articulate these differences.

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