Social Science Research on Recreational Use and Users of Shenandoah National Park's Rock Outcrops and Cliffs

Study Completion Report

Steve Lawson
Kerry Wood
Karen Hockett
Steve Bullock
Brett Kiser
Aurora Moldovanyi

Virginia Polytechnic Institute and State University

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Chapter 1

Introduction

Shenandoah National Park encompasses 70 miles of ridge crest along the Blue Ridge mountains of Virginia, straddling habitats of both the northern and southern Appalachians and supporting a rich assemblage of flora and fauna. Rock outcrops and cliffs punctuate the otherwise forested landscape composing approximately 2% (3920 acres) of the park's 196,000+ acre area. The cliffs of Shenandoah National Park are some of the largest in the region and serve as islands of unusual habitat and species assemblages. The relatively high elevation of many rock outcrop areas in the park means that these areas provide habitat for unique communities of boreal disjunct species. For example, the bearberry (*Arctostaphylos uva-ursi*) shrub is known from one outcrop area in the park, and is disjunct over 200 miles from its southern range limit. Previous Virginia Department of Conservation and Recreation (VADCR) survey work at a few of the park's larger rock outcrop and cliff communities has documented the occurrence of 28 rare species, including the federally endangered Shenandoah Salamander (*Plethodon shenandoah*; Ludwig et al., 1993). VADCR staff have also identified a rare plant community type, the high elevation greenstone outcrop barren, believed to be endemic to the park (Fleming et al., 2004).

The location of the world-famous park tour road, Skyline Drive, along the ridgeline provides exceptional access to many outcrops and cliffs throughout the park for a large number of the park's 1.7 million annual visitors. The popularity of the park for rock climbing and bouldering appears to have increased within the last 10 years, but that recreation use is neither monitored nor actively managed by the park (Hilke, 2002). One popular climbing guide (Watson, 1998) identifies 27 separate rock climbing areas within the park, each area described in detail with numerous climbing routes. The park has no climbing guidelines or registration procedures,

yet is a popular area for recreational climbing by park visitors, and is regularly used by nearby universities and outdoor organizations for climbing classes and activities.

Visitor use of cliff areas has led to natural resource impacts such as soil compaction, erosion, vegetation damage and loss, informal trail development, illegal or poorly located campsites, and human waste disposal issues. Known rare plant populations have exhibited marked decreases in size and vigor, and campsite and informal trail proliferation are occurring in one area occupied by the federally endangered Shenandoah Salamander. Despite the clear ecological value and imminent threats to the natural resources at cliff areas within Shenandoah National Park, the park lacks sufficient information on recreational use of these areas. The purpose of this project is to provide the National Park Service with information on recreational uses and users of two of the most heavily visited rock outcrop and cliff areas in Shenandoah National Park – the summit of Old Rag and Little Stony Man Cliffs. The information gained from this project will be utilized by managers to help inform the development of a Rock Outcrop Management Plan and a related Rock Climbing Management Plan.

The research presented in this report includes a visitor survey administered to rock climbers at Little Stony Man Cliffs and Old Rag from May to November, 2005 and direct, unobtrusive observations of visitor use on the cliff-top of Little Stony Man Cliffs conducted between May and September, 2005. This report describes the methods used to conduct the visitor survey and observation research, presents results of the survey and observation studies, and summarizes major findings designed to help inform the National Park Service's planning efforts. The report is organized as follows: Chapter 2 describes the survey instrument and sampling methods used to conduct the visitor survey at Little Stony Man and Old Rag, as well as the methods used to conduct visitor observations on Little Stony Man Cliffs; Chapter 3 presents

a summary of major findings from the visitor survey and visitor observation research conducted in this study; Chapter 4 presents, in tabular form, the quantitative results from the visitor survey at Little Stony Man Cliffs and Old Rag; and Chapter 5 presents a journal manuscript accepted for publication in the *Journal of Park and Recreation Administration* describing the methods and results of the visitor observation research conducted on Little Stony Man Cliffs, as well as management implications of integrating the visitor observation research results with resource impact assessments conducted on Little Stony Man Cliffs. Appendices in the report include copies of the visitor survey instrument and associated survey administration forms (Appendix A), as well as visitor observation forms used in the study (Appendix B). A complete list of zip codes of residences of all respondents to the visitor survey is included in Appendix C. The verbatim transcripts of responses to the open-ended question in the visitor survey administered to rock climbers at Little Stony Man Cliffs and Old Rag are included in Appendices D and E, respectively. Lastly, Appendix F contains verbatim informal observations recorded by data collectors as part of the visitor observation research conducted on the cliff-top of Little Stony Man Cliffs.

Chapter 2

Study Methods

As stated above, the research presented in this report includes a visitor survey administered to rock climbers at Little Stony Man Cliffs and Old Rag from May to November, 2005, and direct, unobtrusive observations of visitor use on the cliff-top of Little Stony Man Cliffs conducted between May and September, 2005. The visitor survey instrument administered to rock climbers at Little Stony Man Cliffs and Old Rag was reviewed and approved by the Virginia Polytechnic Institute and State University Internal Review Board and the Office of Management and Budget, and is included in this report as Appendix A.1. The following subsections of this chapter describe the methods used to administer the visitor survey and visitor observations.

Visitor Survey

A survey of a representative sample of rock climbing visitors to Little Stony Man Cliffs in Shenandoah National Park was conducted from May to November, 2005. An identical survey instrument was administered to rock climbing visitors to Old Rag during the same time period. The survey questionnaire was designed by researchers at Virginia Polytechnic Institute and State University, in consultation with researchers at North Carolina State University and the University of Cincinnati, and park staff at Shenandoah National Park. The questionnaire had six major sections. The first section of the questionnaire, entitled "Trip Description" includes questions concerning visitors' group size, group type, length of stay, sources of information about Shenandoah National Park obtained prior to their visit, the number of people rock climbing in the group on the day they were contacted for the survey, the number of leaders and

participants in organized rock climbing groups, and topics of instruction taught by leaders of organized rock climbing groups.

The second section of the questionnaire is entitled "Previous Rock Climbing Experience and Involvement" and includes questions concerning locations within Shenandoah National Park respondents have rock climbed, number of previous visits to Shenandoah National Park for rock climbing, season during which visitors climb in Shenandoah National Park most often, years of rock climbing experience, knowledge of minimum impact rock climbing techniques, level of ability for several types of rock climbing, membership in rock climbing and/or conservation organizations, dollar value of rock climbing equipment owned, and previous participation in volunteer service projects at rock climbing areas.

The third section of the questionnaire, entitled "The Rock Climbing Experience", includes questions concerning the importance of various motivations for rock climbing in Shenandoah National Park and the extent to which visitors perceive various social, resource and management issues to be a problem in Shenandoah National Park.

The fourth section of the questionnaire is entitled "Rock Climbing Management" and includes questions regarding the extent to which visitors support or oppose alternative strategies to manage resource and social impacts of rock climbing in Shenandoah National Park and the extent to which visitors felt crowded while rock climbing in the park.

The fifth section of the questionnaire is entitled "Organized Rock Climbing Groups" and contains questions concerning the extent to which visitors perceive organized rock climbing groups to be beneficial or harmful to the rock climbing experience and natural resources in Shenandoah National Park.

The final section of the questionnaire, entitled "Background Information", includes questions concerning visitors' sex, age, state or country of residence, and level of education. The last section of the questionnaire also includes an open-ended question providing respondents with an opportunity to provide any other comments they would like to make about rock climbing in Shenandoah National Park.

The visitor survey was administered at Little Stony Man Cliffs on 21 randomly selected days between May 14 and October 23, 2005, and on 25 randomly selected days between May 14 and November 6, 2005 at Old Rag as shown in Tables 2.1 and 2.2, respectively. On each sampling day, trained survey administrators approached each rock climbing group as they were completing their visit to Little Stony Man Cliffs or Old Rag and requested their participation in the survey. At Little Stony Man Cliffs, survey administrators were stationed on the Appalachian Trail, just south of the intersection of the Appalachian Trail and the spur trail to the Little Stony Man Cliffs parking lot on Skyline Drive. Survey administrators at Old Rag were stationed at "Post Office Junction" near the Berry Hollow Parking Area. Each rock climbing visitor within visitor groups who agreed to participate in the survey were given a copy of the questionnaire and asked to complete it onsite. Individuals who were unwilling or unable to participate in the survey were thanked for their consideration. In such cases, the survey administrator recorded the time of the "refusal", as well as the number of visitors in the group and the sex of each member of the group (see Appendix A.2 for the Survey Refusal Log used by survey administrators at Little Stony Man Cliffs and Old Rag). These "refusal" data were intended to be used to examine whether the survey data may be subject to non-response bias. However, response rates at both Little Stony Man Cliffs and Old Rag were relatively high (90.8% and 79.5%, respectively), thus there were too few refusals to conduct statistical tests comparing the characteristics of non-

respondents to respondents. However, the high response rates at both locations suggest that non-response bias is not likely to be an issue within the visitor survey data.

Table 2.1. Visitor survey sampling schedule – Little Stony Man Cliffs

Date	*Time*	*Number completed onsite*	*Number administered mailbacks*
May 14,2005	10 am – 8 pm	27	2
May 27, 2005	10 am – 8 pm	0	0
May 28, 2005	10 am – 8 pm	5	0
May 29, 2005	10 am – 8 pm	0	2
May 30, 2005	10 am – 8 pm	0	0
June 10, 2005	12 pm – 8 pm	0	0
June 11, 2005	12 pm – 8 pm	0	12
June 12, 2005	12 pm – 8 pm	0	0
June 13, 2005	12 pm – 8 pm	0	1
June 18, 2005	12 pm – 8 pm	0	0
June 19, 2005	12 pm – 8 pm	0	3
July 2, 2005	12 pm – 8 pm	0	0
July 3, 2005	12 pm – 8 pm	4	2
July 4, 2005	12 pm – 8 pm	2	0
July 24, 2005	12 pm – 8 pm	5	2
August 6, 2005	12 pm – 8 pm	0	0
August 7, 2005	12 pm – 8 pm	0	0
August 8, 2005	12 pm – 8 pm	4	2
Sept 10, 2005	12 pm – 8 pm	3	2
October 10, 2005	12 pm – 8 pm	2	8
October 23, 2005	12 pm – 8 pm	5	0
Shilo Quaker Camp	N/A	5	0

Table 2.2. Visitor survey sampling schedule – Old Rag			
Date	*Time*	*Number completed onsite*	*Number administered mailbacks*
May 14, 2005	10 am – 6 pm	1	0
May 16, 2005	10 am – 6 pm	0	2
May 19, 2005	10 am – 6 pm	0	1
May 26, 2005	10 am – 6 pm	0	1
May 28, 2005	10 am – 6 pm	3	1
May 29, 2005	10 am – 6 pm	0	3
June 3, 2005	10 am – 6 pm	4	0
June 11, 2005	10 am – 6 pm	4	0
June 18, 2005	10 am – 6 pm	4	0
June 19, 2005	10 am – 6 pm	5	0
June 20, 2005	10 am – 6 pm	2	0
July 2, 2005	10 am – 6 pm	5	0
July 4, 2005	10 am – 6 pm	1	0
July 17, 2005	10 am – 6 pm	0	2
July 23, 2005	10 am – 6 pm	3	0
July 24, 2005	10 am – 6 pm	4	2
September 10, 2005	10 am – 6 pm	2	1
September 11, 2005	10 am – 6 pm	0	1
September 17, 2005	10 am – 6 pm	6	1
September 18, 2005	10 am – 6 pm	0	2
October 1, 2005	10 am – 6 pm	0	7
October 15, 2005	10 am – 6 pm	3	2
October 23, 2005	10 am – 6 pm	3	3
October 30, 2005	10 am – 6 pm	0	2
November 6, 2005	10 am – 6 pm	0	2

Due to the fact that there are relatively low numbers of visitors who rock climb in Shenandoah National Park, two additions to the survey sampling procedures outlined above were included to ensure adequate sample sizes. First, questionnaires were administered to individuals who did not rock climb in the park during their visit to the park on the day they were contacted by a survey administrator, but who had rock climbed in the park on a previous visit. These individuals were instructed to complete the questionnaire based on their most recent rock climbing trip to Shenandoah National Park. Second, in cases that a rock climbing visitor was willing to fill out a questionnaire but did not have sufficient time to do so onsite, the individual

was given a questionnaire and postage paid return envelope. Individuals who were administered a mailback survey were instructed to complete the questionnaire and return it in the postage paid envelope at their earliest convenience. In addition, each mailback survey participant's contact information was recorded for the purposes of sending a follow-up reminder postcard to individuals who had not returned the questionnaire by mail within one week of the onsite contact (see Appendix A.3 for the Onsite Contact Sheet for Mailback Respondents and Appendix A.4 for the Postcard Reminder/Thank You for Mailback Respondents). A total of 89 rock climbing visitors to Little Stony Man Cliffs and 66 rock climbing visitors to Old Rag completed questionnaires.

Visitor Observation

Unobtrusive visitor use observations were conducted on 14 randomly selected days between May 27, 2005 and September 10, 2005 on top of Little Stony Man Cliffs to document and characterize the type and amount of recreational use the cliffs receive and the behaviors of recreationists that may contribute to cliff-top resource impacts. Observations were restricted to the cliff-top to investigate trampling damage to the rare plant community (High Elevation Greenstone Barren) that occurs there (Hilke, 2002). Sampling days were stratified by day of the week and time of day, with morning sampling shifts conducted from 9:00 AM to 2:00 PM and afternoon sampling shifts conducted from 2:00 PM to 7:00 PM. The sampling schedule for the visitor observation research is presented in Table 2.3.

Table 2.3 Visitor observation sampling schedule - Little Stony Man Cliffs		
	PAOT/ Behavior Observations	**Total Daily Use/ Length of Stay**
Sampling shift	*Number of days*	*Number of days*
Weekend AM	4	4
Weekend PM	4	4
Weekday AM	3	3
Weekday PM	3	3

For the purposes of conducting visitor use observations at Little Stony Man Cliffs, three observation zones were defined: the North, Cliff, and Forest Observation Zones (Figure 2.1). Data collectors were stationed in a fixed location on the cliff-top that provided a view of all three observation zones. Staff conducting the visitor use observations dressed to blend-in with visitors, concealed observation sheets, and conducted observations in a subtle manner to avoid altering visitor behavior. During the sampling period, five types of visitor use information were collected through direct observation, including the number of people at one time (PAOT) in each of the three observation zones; occurrences of soil/vegetation trampling (Behavior Observations); total daily use of the cliff-top (Total Daily Use); visitors' length of stay on the cliff-top (Length of Stay); and informal observations concerning visitor use and behavior. A detailed description of each of these five measures, as well as the methods used to record them, is presented in the journal manuscript contained in Chapter 5 of this report.

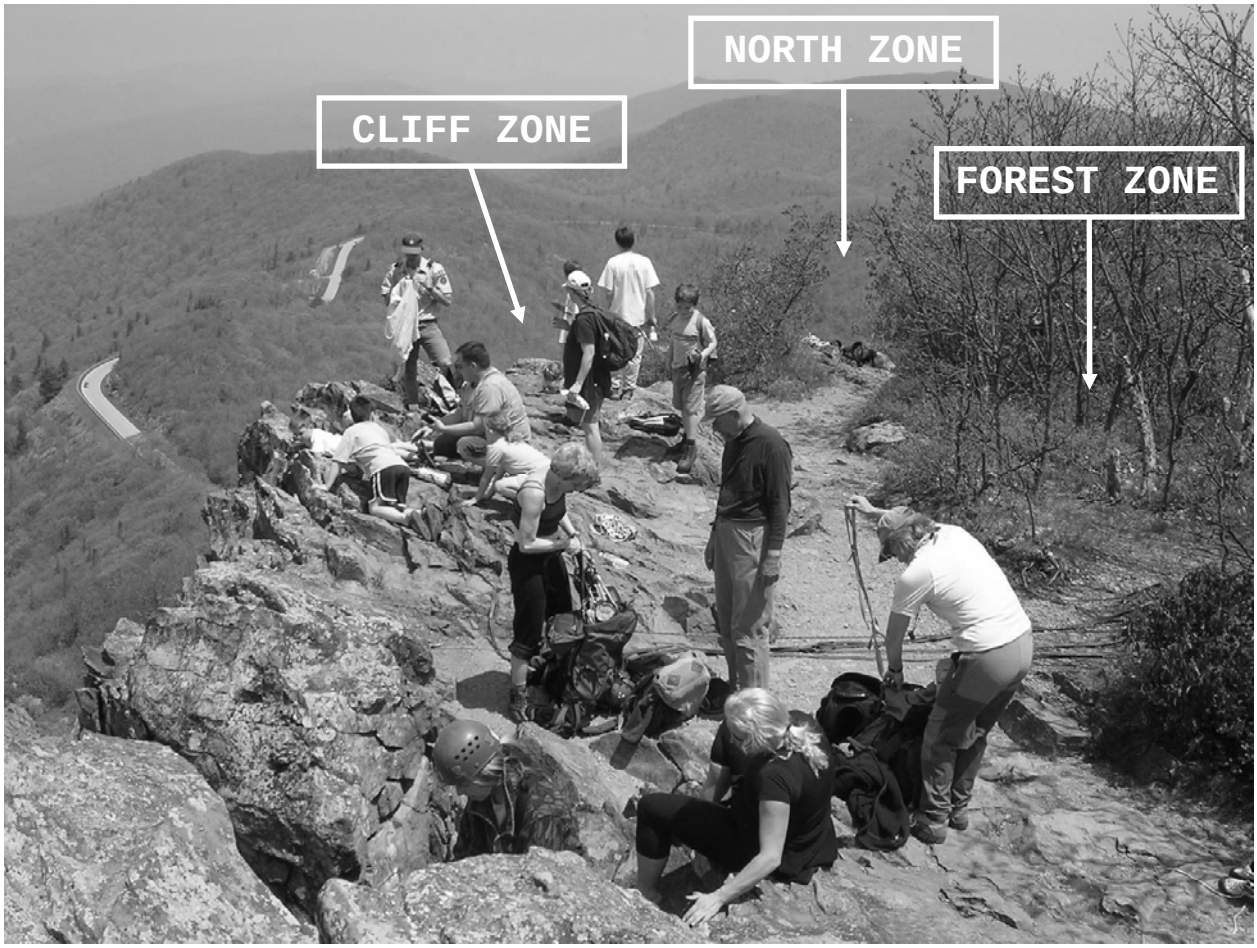

Figure 2.1. Little Stony Man Cliffs cliff-top observation zones, looking north.

Chapter 3

Summary of Major Findings – Visitor Survey

This chapter summarizes findings from the visitor survey administered at Little Stony Man Cliffs and Old Rag, and visitor observations conducted on the cliff-top of Little Stony Man Cliffs. Presentation of findings from the visitor survey are organized according to the sections of the visitor survey questionnaire.

Visitor Survey

Trip Description

- Visitors tend to climb in smaller groups at Old Rag than at Little Stony Man Cliffs. In particular, over two-thirds (65.4%) of rock climbers at Old Rag climb in groups of 1 or 2 people, and nearly all (96.2%) climbers at Old Rag climb in groups of 5 or fewer people. On average, visitors rock climb at Little Stony Man Cliffs in groups of 6, with about one-third (30.8%) climbing in groups of 1 or 2, a little less than half (42.3%) climbing in groups of 3 to 5 people, and just over one-quarter (26.9%) climbing in groups of 6 or more.
- The primary sources climbers at both Little Stony Man Cliffs and Old Rag rely on for information about Shenandoah National Park include previous visits to the park (80.8% and 57.1%, respectively), friends and/or relatives (76.9% and 61.5%, respectively), and guidebooks (65.4% and 73.1%, respectively). The most commonly referenced guidebooks among Little Stony Man Cliffs climbers are Watson's *Virginia Climbing Guide* (58.8%) and Horst's *Rock Climbing Virginia, West Virginia, and Maryland* (29.4%). Among Old Rag climbers, Horst's *Rock Climbing Virginia, West Virginia, and*

Maryland is by far the most commonly referenced guidebook (73.7%). About one-third (30.8%) of climbers at Little Stony Man Cliffs and nearly half of climbers at Old Rag (42.3%) rely on websites for information about Shenandoah National Park. For climbers at both areas of the park, Rockclimbing.com is the most commonly specified website used to obtain information about the park.

- While the majority of climbers at Little Stony Man Cliffs (61.5%) are day use visitors, more than one-third (38.5%) of them are overnight visitors to the park who spend an average of 2 nights in the park. Similarly, the majority of Old Rag climbers are day use visitors (73.1%), yet more than one-quarter are overnight visitors (26.9%) who spend an average of 2 nights in the park. Overnight stays among Little Stony Man Cliffs climbers are about equally split between backcountry campsites (70.0%) and car-access campgrounds, lodges, or cabins (60.0%) in the park (percentages total greater than 100% due to the fact that some respondents used more than one type of overnight accommodation during their trip). Among Old Rag climbers, overnight stays are equally split between backcountry campsites (71.4%) and car-access campgrounds (71.4%) in the park (percentages total greater than 100% due to the fact that some respondents used more than one type of overnight accommodation during their trip).
- The majority of rock climbing groups at both Little Stony Man Cliffs (76.9%) and Old Rag (84.6%) are groups of family and/or friends. However, nearly one-quarter (23.1%) of rock climbing groups at Little Stony Man Cliffs are organized groups.
- Organized rock climbing groups at Little Stony Man Cliffs have an average of 4 group leaders and 11 participants. The one organized group surveyed at Old Rag reported having 3 group leaders and 8 participants.

Previous Rock Climbing Experience and Involvement

- By far, the three most commonly used locations in Shenandoah National Park for rock climbing are Little Stony Man Cliffs, Old Rag, and Whiteoak Canyon. Fewer than 5 percent of climbers at both Little Stony Man Cliffs and Old Rag reported climbing at Blackrock/Split Rock, Mount Marshall, or Mary's Rock.
- A majority of climbers contacted at both Little Stony Man Cliffs (56.2%) and Old Rag (63.6%) reported having previously rock climbed in Shenandoah National Park. Of those Little Stony Man Cliffs climbers who have climbed in the park previously, more than half (57.1%) have visited 2-5 times previously, while nearly one-third (32.7%) have rock climbed in the park 6 to 20 times previously and about 10 percent (10.2%) have rock climbed in the park more than 20 times previously. Of those Old Rag climbers who have climbed in the park previously, more than half (59.0%) have visited 2-5 times previously and just over 10 percent (12.8%) have rock climbed in the park more than 20 times previously.
- Among Little Stony Man Cliffs climbers, Spring (34.2%) and Summer (39.5%) are the seasons during which they rock climb in the park most often. In contrast, the majority (53.1%) of Old Rag climbers report Fall as the season during which they rock climb in the park most often, while about one-quarter (28.1%) climb in the park most often during the Summer.
- Old Rag climbers tend to have more years of rock climbing experience than climbers at Little Stony Many Cliffs. In particular, just under half (47.7%) of Old Rag climbers have 6 or more years of rock climbing experience, while just under two-thirds (64.8%) of Little Stony Man Cliffs climbers have 5 or fewer years of experience.

- A majority of both Little Stony Man Cliffs (75.3%) and Old Rag (87.5%) climbers rate themselves as having intermediate or better knowledge of minimum impact rock climbing practices.
- Old Rag climbers tend to rate their abilities higher than Little Stony Man Cliffs climbers in the following rock climbing activities: bouldering, top-roping, gym climbing, and sport climbing. Furthermore, a majority of rock climbers at Little Stony Man cliffs rated themselves as novice or having no experience for all rock climbing activities considered in the study except top-roping and gym climbing. In contrast, a majority of rock climbers at Old Rag rated themselves as intermediate, advanced or expert for all rock climbing activities considered in the study except ice climbing and new route development. Climbers at both locations rated their abilities highest for top-roping, gym climbing, and bouldering.
- Nearly half of all climbers at Little Stony Man Cliffs (49.4%) and Old Rag (43.9%) consider themselves to be best described as traditional rock climbers. A little over 10 percent of Little Stony Man Cliffs and Old Rag climbers consider themselves best described as indoor/gym climbers (14.5% and 10.5%, respectively) or sport climbers (12.0% and 15.8%, respectively).
- Nearly one-third (30.7%) of rock climbers at Little Stony Man Cliffs and just over one-third (35.9%) of Old Rag climbers belong to a rock climbing or conservation organization.
- More than half (62.1%) of Old Rag climbers and just under half (42.7%) of climbers at Little Stony Man Cliffs own rock climbing equipment with a retail value of $500 or

more. Close to one-fifth (16.9%) of climbers at Little Stony Man Cliffs, however, own no rock climbing equipment.

- Nearly one-quarter of rock climbers at both Little Stony Man Cliffs (24.7%) and Old Rag (24.6%) have participated in a volunteer service project at a rock climbing area.

The Rock Climbing Experience

- On average, the experiences most important to visitors as reasons to rock climb at Little Stony Man Cliffs, in order of importance, are being with people who enjoy the same things they do, being close to nature, being challenged, and getting away from the usual demands of life. On average, the experiences most important to visitors as reasons to rock climb at Old Rag, in order of importance, are being close to nature, being with people who enjoy the same things they do, getting away from the usual demands of life, and being challenged. On average, rock climbers at both Little Stony Man Cliffs and Old Rag rank using their own equipment, teaching their rock climbing skills to others, and experiencing solitude lowest among the reasons considered for rock climbing in the park.
- Crowding-related issues are more of a problem among climbers at Little Stony Man Cliffs than at Old Rag. In particular, Little Stony Man Cliffs climbers are more likely to report crowding at climbing areas, other groups leaving ropes/equipment on routes that are not being used, too many large rock climbing groups, too many organized rock climbing groups, and long wait-times for preferred climbing routes as problems in Shenandoah National Park. However, a minority of visitors at both locations consider any of these crowding-related issues to be a moderate or big problem in the park.

- A majority (53.1%) of climbers at Old Rag consider the lack of overnight camping near the climbing areas in Shenandoah National Park to be a moderate or big problem, while less than one-quarter (22.5%) of climbers at Little Stony Man Cliffs consider this issue to be a moderate or big problem.
- A majority of climbers at both Little Stony Man Cliffs and Old Rag rate the natural and cultural resource impact issues considered in this study as little or no problem in Shenandoah National Park. The natural and cultural resource issues considered in this study include tree damage, erosion/trampling impacts, proliferation of visitor-created trails, disturbance to wildlife, and damage to archeological and/or historical sites caused by rock climbing use.

Rock Climbing Management

- The vast majority of rock climbers at both Little Stony Man Cliffs and Old Rag support having Shenandoah National Park provide more information regarding minimum impact climbing practices (76.4% and 86.2%, respectively) and climbing areas and routes in the park (76.2% and 75.0%, respectively).
- The results of the visitor survey suggest there are some areas of general agreement among climbers at both Little Stony Man Cliffs and Old Rag concerning the potentially controversial issues of using and managing fixed anchors and bolts. In particular, a majority of climbers at both Little Stony Man Cliffs and Old Rag support having the park provide fixed anchors at the top of climbs to minimize resource impacts (55.7% and 68.8%, respectively), require a permit to place bolts on climbing routes (62.9% and 55.4%, respectively), and limit the placement of bolts to specified areas (59.5% and

50.8%, respectively). Furthermore, a majority of rock climbers at both Little Stony Man Cliffs (65.2%) and Old Rag (55.4%) oppose having the National Park Service allow unregulated bolting of climbing routes in the park. While these findings suggest climbers at both Little Stony Man Cliffs and Old Rag generally support managing the use and placement of bolts on climbing routes in the park, nearly half of all climbers at Little Stony Man Cliffs (46.1%) and a majority of climbers at Old Rag (57.8%) oppose having the National Park Service prohibit the placement of bolts on climbing routes throughout the park.

- Findings from the visitor survey suggest climbers at both Little Stony Man Cliffs and Old Rag generally support management actions designed to protect park resources. In particular, a majority of rock climbers at both Little Stony Man Cliffs and Old Rag support having the National Park Service require climbers in Shenandoah National Park to use designated trails to access climbing areas (51.7% and 58.8%, respectively) and temporarily close areas to climbing use during critical wildlife seasons (57.3% and 65.6%, respectively). Furthermore, nearly half (46.0%)of all rock climbers at Little Stony Man Cliffs and a majority (50.8%) of climbers at Old Rag support closing climbing routes in areas containing sensitive rare plant species. Rock climbers in Shenandoah National Park are less supportive of closing climbing routes to protect cultural and/or archeological resources. However, more than one-third of climbers at both Little Stony Man Cliffs (38.7%) and Old Rag (39.1%) support closing climbing routes in areas where climbing use is causing impacts to cultural and/or archeological resources.
- Climbers at Old Rag are more likely than climbers at Little Stony Man Cliffs to support regulations limiting the size and number of organized groups, and requiring organized

groups to climb during designated times and in designated areas. However, none of these regulations concerning organized groups was supported by a majority of climbers at either Little Stony Man Cliffs or Old Rag.

- A majority of climbers at both Little Stony Man Cliffs (80.8%) and Old Rag (64.0%) reported encountering other rock climbers while climbing on the day they were contacted for the survey.
- As noted earlier, climbers at Little Stony Man Cliffs were more likely than climbers at Old Rag to report feeling crowded while rock climbing at Shenandoah National Park. However, a majority of climbers at both Little Stony Man Cliffs (54.0%) and Old Rag (83.4%) reported not feeling crowded at all while rock climbing on the day they were contacted for the survey.
- Climbers at Little Stony Man Cliffs generally have more favorable attitudes than climbers at Old Rag about organized rock climbing groups. In particular, climbers at Old Rag are more likely than climbers at Little Stony Man Cliffs to agree that organized rock climbing groups are a safety concern, cause conflict with other climbers, detract from their climbing experience, and cause more environmental impact than other climbers. Furthermore, Old Rag climbers are more likely than climbers at Little Stony Man Cliffs to agree that organized group use of climbing areas in Shenandoah National Park is a problem. However, the issues associated with organized rock climbing groups listed above are of concern to only a minority of Old Rag climbers. Furthermore, a majority of climbers at both Little Stony Man Cliffs and Old Rag agree that organized rock climbing groups are an effective way to introduce people to the sport of rock climbing, educate

people about rock climbing ethics, increase public support for rock climbing, and teach rock climbers safe rock climbing practices.

- The majority of rock climbers at both Little Stony Man Cliffs (73.6%) and Old Rag (67.7%) have encountered an organized rock climbing group on a rock climbing trip (this could include places other than Shenandoah National Park). However, the vast majority of climbers at both Little Stony Man Cliffs (73.1%) and Old Rag (88.6%) did not encounter an organized rock climbing group on the day they were contacted for the survey.
- Of those climbers at Little Stony Man Cliffs who encountered an organized rock climbing group on the day they were contacted for the survey, nearly one-third (31.3%) indicated that it added to the quality of their experience, while about one-fifth (18.7%) reported that it detracted from the quality of their experience. Only 4 climbers at Old Rag reported encountering an organized rock climbing group on the day they were contacted for the survey, and 2 of them indicated that it detracted from the quality of their experience, while the other 2 indicated it neither added to or detracted from the quality of their experience.

Background Information (Visitor Characteristics)

- A majority of rock climbers at both Little Stony Man Cliffs and Old Rag are male (65.2% and 77.3%, respectively), between the ages of 20 and 44 years of age (71.9% and 81.6%, respectively), and have completed some college/ business/trade school or more formal schooling (96.5% and 93.6%). Furthermore, one-third (33.3%) of rock climbers at Little

Stony Man Cliffs and nearly one-half (41.3%) of rock climbers at Old Rag have completed a master's doctoral or professional degree.

- The vast majority of rock climbers at Little Stony Man Cliffs and Old Rag have their residence in Virginia (68.5% and 61.5%, respectively), Maryland (16.9% and 23.1%, respectively) or Washington D.C. (9.0% and 9.2%, respectively).

Visitor Observation

- On average, significantly more hikers (mean = 15) and backpackers (mean = 8) visit Little Stony Man Cliffs during weekdays than rock climbers (mean < 1), while on weekends the number of day hikers who visit Little Stony Man Cliffs (mean = 49) is significantly greater than the number of backpackers (mean = 7) or rock climbers (mean = 3).
- While average daily backpacking and rock climbing use does not differ significantly between weekend days and weekdays, day hiking use of Little Stony Man Cliffs is significantly higher on weekends than during the mid-week.
- Day hiking use of Little Stony Man Cliffs is not only more concentrated on weekends than weekdays, but also more concentrated during certain hours of the day, with peaks at noon and mid-afternoon. Rock climbing use of Little Stony Man Cliffs follows a similar but less pronounced pattern across the hours of the day, whereas backpacking use tends to be relatively consistent and low throughout the day. Results of informal observations suggest that the concentrated nature of visitor use on the Little Stony Man Cliffs prompts visitors to spread laterally across the cliff-top in search of a spot from which to enjoy the view in relative privacy. Consequently, trampling impacts, particularly those associated

with day hikers, are not well spatially contained on the cliff-top of Little Stony Man Cliffs.

- Rock climbers spend significantly more time on the cliff-top of Little Stony Man Cliffs (mean = 24 minutes) than day hikers (mean = 9 minutes) or backpackers (mean = 5 minutes).
- More than one-third (39.0%) of day hikers and just over one-quarter of rock climbers (29.0%) observed during the study trampled soil or vegetation on the cliff-top of Little Stony Man Cliffs, compared with less than one-fifth (16.0%) of backpackers.
- Within each of the three observation zones on the cliff-top of Little Stony Man Cliffs, day hikers accounted for the majority of soil and vegetation trampling observed in the study. However, rock climbers accounted for about one-quarter (27%) of all observations of soil and vegetation trampling in the Forest Zone. In all three observation zones, backpackers accounted for the least amount of soil and vegetation trampling observed on the Little Stony Man Cliffs cliff-top.
- Given the size and condition of areas of disturbance and the level of visitor use on the cliff-top of Little Stony Man Cliffs, attempting to address trampling impacts through use limits would require substantial reductions in visitor use or closure to improve resource conditions. In contrast, a combination of visitor education and spatial containment strategies designed to concentrate visitor use on trampling-resistant surfaces or on core bare substrates of existing recreation sites may effectively reduce the extent of trampling impacts on the cliff-top.
- Given the relatively high levels of day hiking use on the cliff-top of Little Stony Man Cliffs, coupled with the facts that day hikers were observed trampling soil and vegetation

in all three observation zones more frequently than either rock climbers or backpackers and are more likely to disperse along the cliff edge during crowded, peak use periods potentially causing expansion of trampling disturbance areas, educational efforts designed to promote low-impact visitor behaviors to minimize soil and vegetation trampling might be most productive if they are focused particularly on day hiking visitors. Trailhead, as well as onsite locations for educational signage should be considered to implement visitor education strategies.

- The vast majority of soil and vegetation trampling by rock climbers occurs in the Forest Zone and is largely due to time spent constructing climbing anchors using trees in this area of the cliff-top of Little Stony Man Cliffs. The installation of fixed-anchors on the cliff-edge of Little Stony Man Cliffs would eliminate the need for climbers to use trees in the Forest Zone to construct anchors and could therefore substantially reduce trampling in this area of the cliff-top. In addition, installing fixed anchors on the cliff-edge of Little Stony Man Cliffs could minimize damage to cliff-top trees and cliff-edge vegetation caused by rope abrasion.
- Enforcement of and perhaps a reduction in parking capacity at the Skyline Drive parking lot for Little Stony Man Cliffs might help reduce use density during peak days and hours. These actions, combined with site management actions that concentrate use to impact-resistant surfaces and already impacted locations on the cliff-top, may reduce the lateral expansion of trampling along the cliff-top.
- Given the substantially degraded state of the "Chute Trail" and its unsustainable alignment, one possible management response would be to close the trail. However, it is likely that illegal use of the trail would occur unless an alternate but sustainable route was

constructed on the opposite end of the cliff. Installation of rock steps on the "Chute Trail" would potentially require importing rock from a distance as native rocks in the area may provide habitat for the Shenandoah Salamander. Development of a rappel station with a permanent anchor on the cliff-top of Little Stony Man Cliffs could also help to reduce "Chute Trail" trail traffic and associated resource impacts.

Chapter 4

Results – Visitor Survey

This chapter of the report presents the quantitative results of the visitor survey administered at Little Stony Man Cliffs and Old Rag. The chapter first reports information about survey response and then survey results are presented in order as they appear in the questionnaire.

Table 4.0. Visitor survey response rate, by location

	LSMC	OR
Eligible contacted	98	83
Refusals	0	0
Administered mailbacks	36	33
Completed onsite	57	54
Completed mailbacks	32	12
Total Completed Surveys	89	66
Response rate	90.8%	79.5%

Trip Description

Table 4.1. Including yourself, how many people are in your group today?				
	LSMC[a] (n=26)		**OR**[a] (n=26)	
Number of people	*Frequency*	*Percent*[b]	*Frequency*	*Percent*[b]
1 – 2 people	8	30.8	17	65.4
3 – 5 people	11	42.3	8	30.8
6 – 25 people	7	26.9	1	3.8
Mean[c]	5.5		2.6	

[a]Values computed based on *one* randomly selected respondent per group.
[b]($\chi^2 = 8.21$, $p = 0.016$)
[c]($t = 2.57$, $p = 0.016$)

Table 4.2. Including yourself, how many people in your group are rock climbing (including bouldering and/or rappelling) today?				
	LSMC[a] (n=26)		**OR**[a] (n=26)	
Number of people	*Frequency*	*Percent*[b]	*Frequency*	*Percent*[b]
0 – 2 people	10	38.5	19	73.1
3 – 5 people	9	34.6	6	23.1
6 –25 people	7	26.9	1	3.8
Mean[c]	5.1		2.2	

[a]Values computed based on *one* randomly selected respondent per group.
[b]($\chi^2 = 7.89$, $p = 0.019$)
[c]($t = 2.53$, $p = 0.018$)

Table 4.3. Prior to this trip, how did you and your group obtain information about rock climbing in Shenandoah National Park? (Check <u>all</u> that apply.)					
	LSMC[a] (n=26)		**OR**[a] (n=26)		*Chi – square, p value*
Source of information	*Frequency*	*Percent*[b]	*Frequency*	*Percent*[b]	
Received no information	1	3.8	1	3.8	N/A[c]
Previous visit(s)	21	80.8	15	57.1	$\chi^2 = 3.25$, $p = 0.07$
Friends/relatives	20	76.9	16	61.5	$\chi^2 = 1.44$, $p = 0.23$
Outfitter/guide service	3	11.5	1	3.8	N/A[c]
Website	8	30.8	11	42.3	$\chi^2 = 0.33$, $p = 0.57$
Guidebook	17	65.4	19	73.1	$\chi^2 = 0.36$, $p = 0.55$
Other	6	22.2	5	19.2	$\chi^2 = 0.07$, $p = 0.72$

[a]Values computed based on *all unique* responses per group.
[b]Percentages may total greater than 100% as respondents were asked to check all responses that apply.
[c] Chi-square analysis is not applicable as there are fewer than 5 cases in 50% or more of the cells.

Table 4.3 (outfitter/guide service). Prior to this trip, how did you and your group obtain information about rock climbing in Shenandoah National Park? (Check <u>all</u> that apply.)				
Source of information	**LSMC**[a] (n=3)		**OR**[a] (n=1)	
	Frequency	*Percent*[b]	*Frequency*	*Percent*[b]
Blue Ridge Mountain	1	33.3	0	0.0
ACAC Rock (Charlottesville)	1	33.3	0	0.0
Outdoor Adventure Social Club (Charlottesville)	1	33.3	0	0.0
Hudson Trail Outfitters	0	0.0	1	100.0
REI	0	0.0	1	100.0
Unspecified	1	33.3	0	0.0

[a]Values computed based on *all unique* responses per group.
[b]Percentages may total greater than 100% as respondents were asked to check all responses that apply.
[b]Percentages were calculated based on the number of groups who said they used an outfitter or guide service as a source of information.

Table 4.3 (website). Prior to this trip, how did you and your group obtain information about rock climbing in Shenandoah National Park? (Check <u>all</u> that apply.)				
Source of information	**LSMC**[a] (n=8)		**OR**[a] (n=11)	
	Frequency	*Percent*[b]	*Frequency*	*Percent*[b]
PATC Website	1	12.5	0	0.0
Rockclimbing.com	3	37.5	7	63.6
Shenandoah	1	12.5	0	0.0
Google/search engine	3	37.5	0	0.0
SummitPost.com	0	0.0	1	9.1
REI.com	0	0.0	1	9.1
Unspecified	3	37.5	5	45.5

[a]Values computed based on *all unique* responses per group.
[b]Percentages may total greater than 100% as respondents were asked to check all responses that apply.
[b]Percentages were calculated based on the number of groups who said they used a website as a source of information.

Table 4.3 (guidebook). Prior to this trip, how did you and your group obtain information about rock climbing in Shenandoah National Park? (Check <u>all</u> that apply.)				
	LSMC[a] (n=17)		**OR**[a] (n=19)	
Source of information	*Frequency*	*Percent*[b]	*Frequency*	*Percent*[b]
VA Climbing Guide (Watson)	10	58.8	4	21.1
Rock Climb Virginia, West Virginia, and Maryland (Horst)	5	29.4	14	73.7
Rock and Ice Magazine	0	0.0	1	5.3
Green	1	5.9	0	0
Unspecified	5	29.4	7	36.8

[a]Values computed based on *all unique* responses per group.
[b]Percentages may total greater than 100% as respondents were asked to check all responses that apply.
[b]Percentages were calculated based on the number of groups who said they used a guidebook as a source of information.

Table 4.3 (other). Prior to this trip, how did you and your group obtain information about rock climbing in Shenandoah National Park? (Check <u>all</u> that apply.)				
	LSMC[a] (n=6)		**OR**[a] (n=5)	
Source of information	*Frequency*	*Percent*[b]	*Frequency*	*Percent*[b]
Potomac ATC Club	1	16.7	0	0.0
Shenandoah National Park	2	33.3	1	20.0
Outdoor Adventure Social Club (Charlottesville)	1	16.7	0	0.0
Word of Mouth	2	33.3	1	20.0
Towson University Adventure Pursuits	1	16.7	0	0.0
College course/class	1	16.7	0	0.0
Bushwacking	0	0.0	2	40.0
Guided trips	0	0.0	1	20.0
Outdoor trip Leader Program	1	16.7	0	0.0

[a]Values computed based on *all unique* responses per group.
[b]Percentages may total greater than 100% as respondents were asked to check all responses that apply.
[b]Percentages were calculated based on the number of groups who said they used an information source other than what was listed.

Table 4.4. Which of the following best describes your visit to Shenandoah National Park on this trip? (Check <u>one</u>.)				
	LSMC[a] (n=26)		**OR**[a] (n=26)	
Type of visitor	*Frequency*	*Percent*[b]	*Frequency*	*Percent*[b]
Overnight visitor	10	38.5	7	26.9
Day use visitor	16	61.5	19	73.1

[a]Values computed based on *one* randomly selected respondent per group.
[b]($\chi^2 = 0.79$, $p = 0.38$)

Table 4.5. If you are an overnight visitor to Shenandoah National Park, how many nights are you spending in the park on this trip?				
	LSMC[a] (n=9)		**OR**[a] (n=8)	
Number of nights	*Frequency*	*Percent*	*Frequency*	*Percent*
1 night	2	22.2	4	50.0
2 nights	4	44.4	3	37.5
3 nights	2	22.2	1	12.5
4 nights	1	11.1	0	0.0
Mean[b]	2.2		1.6	

[a]Values computed based on *one* randomly selected respondent per group.
[b] ($t = 1.41$, $p = 0.18$)

Table 4.6. If you are an overnight visitor to Shenandoah National Park, which of the following overnight accommodations have you or will you use on this trip? (Check <u>all</u> that apply.)				
	LSMC[a] (n=10)		**OR**[a] (n=7)	
Type of accommodations	*Frequency*	*Percent*[b,c]	*Frequency*	*Percent*[b,c]
Car-access campground in the park	4	40.0	5	71.4
Lodge/cabin in the park	2	20.0	0	0.0
Backcountry campsite in the park	7	70.0	5	71.4
Accommodations outside the park	1	10.0	0	0.0
Other	0	0.0	0	0.0

[a]Values computed based on *all unique* responses per group.
[b]Percentages may total greater than 100% as respondents were asked to check all responses that apply.
[c]Chi-square analysis is not applicable as there are fewer than 5 cases in 50% or more of the cells.

Table 4.7. Which of the following best describes your group? (Check one.)					
	LSMC[a] (n=26)		**OR[a]** (n=26)		
Type of group	*Frequency*	*Percent*	*Frequency*	*Percent*	*Chi–square, p value*
Organized group	6	23.1	1	3.8	N/A[b]
Family	3	11.5	3	11.5	N/A[b]
Friends	10	38.5	12	46.2	$\chi^2 = 0.32$, $p = 0.58$
Family and friends	7	26.9	7	26.9	$\chi^2 = 0.00$, $p = 1.00$
Alone	0	0.0	2	7.7	N/A[b]
Other (Met partner on internet)	0	0.0	1	3.8	N/A[b]

[a]Values computed based on responses from all group members (i.e., if one member said they were with friends and another said they were a group of family and friends, the group was considered to be "family and friends."

[b] Chi-square analysis is not applicable as there are fewer than 5 cases in 50% or more of the cells.

Table 4.8. Shenandoah National Park is interested in conducting outreach with organized rock climbing groups in the future and would like to know the names and locations of organized rock climbing groups visiting the park. If you are part of an organized group, please list the names and location of origin of the group.		
	Group Size	
Name of Group, City and state of origin	**LSMC[a]**	**OR[a]**
PATC mountaineering club, Vienna, VA	20	1[b]
Boy Scout troop 1140 – Cliff Hangers, Springfield, VA	3	0
Outdoor Adventure Social Club, Charlottesville, VA	3	0
Towson University Adventure Pursuits, Towson, MD	4	0
Longwood University (multiple courses), Farmville, VA	8	0
Shiloh Quaker Camp, Standardsville, VA	5	0
Venture 180, Williamsburg, VA	0	2
American Alpine Club (Blue Ridge Section)	0	1[b]

[a] Group size. Only 1 group was contacted from each organization.

[b] One individual listed these groups, but he was not rock climbing in the park with them on the day he was contacted for the survey.

Table 4.9. If you are part of an organized group, which of the following best describes your group? (Check one.)				
	LSMC[a] (n=6)		OR[a] (n=1)	
Type of organized group	*Frequency*	*Percent*[b]	*Frequency*	*Percent*[b]
Church group	0	0.0	0	0.0
Youth camp	1	16.7	0	0.0
University climbing/outdoor club	2	33.3	0	0.0
Commercially guided group	0	0.0	0	0.0
Scouts	1	16.7	1	100.0
Other	2	33.3	0	0.0

[a]Values computed at the group level.

Table 4.9 (other). If you are part of an organized group, which of the following best describes your group? (Check one.)		
	LSMC[a]	OR[a]
Type of organized group	*Frequency*	*Frequency*
Public outdoor/trail/rock climbing club (PATC)	1	0
Public social club	1	0

[a]Values computed at the group level.

Table 4.10a. If you are a part of an organized group, please indicate how many leaders and participants are in your group today including yourself?				
	LSMC[a] (n=6)		OR[a] (n=1)	
Number of leaders	*Frequency*	*Percent*[b]	*Frequency*	*Percent*[b]
1	1	16.7	0	0.0
2	2	33.3	0	0.0
3	1	16.7	1	100.0
5	1	16.7	0	0.0
9	1	16.7	0	0.0
Mean[c]	3.5		3.0	

[a]Values computed based on the greatest reported number of leaders per group.
[b]Chi-square analysis is not applicable as there are fewer than 5 cases in 50% or more of the cells.
[c] A t-test is not applicable due to presence of only 1 Old Rag observation.

Table 4.10b. If you are a part of an organized group, please indicate how many leaders and participants are in your group today including yourself?				
	LSMC[a] (n=6)		**OR**[a] (n=1)	
Number of participants	*Frequency*	*Percent*[b]	*Frequency*	*Percent*[b]
0	1	16.7	0	0.0
4	1	16.7	0	0.0
8	1	16.7	1	100.0
12	1	16.7	0	0.0
16	1	16.7	0	0.0
25	1	16.7	0	0.0
Mean[c]	10.8		8.0	

[a]Values computed based on the greatest reported number of participants per group.
[b]Chi-square analysis is not applicable as there are fewer than 5 cases in 50% or more of the cells.
[c]A t-test is not applicable due to presence of only 1 Old Rag observation.

Table 4.11. If you are a part of an organized group, please indicate whether you are a leader or participant of this group today. (Check one.)				
	LSMC[a] (n=43)		**OR**[a] (n=2)	
Type of group member	*Frequency*	*Percent*[b]	*Frequency*	*Percent*[b]
Leader	14	32.6	2	100.0
Participant	29	67.4	0	0.0

[a]Values computed based on responses from *all* respondents.
[b]Chi-square analysis is not applicable as there are fewer than 5 cases in 50% or more of the cells.

Table 4.12. If you are a leader of an organized group, which of the following did you teach participants in your group prior to or during this visit to Shenandoah National Park? (Check all that apply.)

Instructional topics	**LSMC**[a] (n=5 groups)		**OR**[a] (n=1 group)	
	Frequency	*Percent*[b,c]	*Frequency*	*Percent*[b,c]
Minimum-impact rock climbing practices	5	100.0	1	100.0
Rock climbing etiquette	5	100.0	1	100.0
Rock climbing safety	5	100.0	1	100.0
Rock climbing skills/techniques	5	100.0	1	100.0
Other	0	0.0	1	100.0

[a]Values computed based on *all unique* responses per group.
[b]Percentages may total greater than 100% as respondents were asked to check all responses that apply.
[c]Chi-square analysis is not applicable as there are fewer than 5 cases in 50% or more of the cells.

Table 4.12 (other). If you are a leader of an organized group, which of the following did you teach participants in your group prior to or during this visit to Shenandoah National Park? (Check all that apply.)

Instructional topics	**LSMC**[a]		**OR**[a]	
	Frequency	*Percent*[b]	*Frequency*	*Percent*[b]
Backcountry etiquette for overnight camping	0	0.0	1	100.0
Rappelling	0	0.0	1	100.0

[a]Values computed based on *all unique* responses per group.
[b]Percentages may total greater than 100% as respondents were asked to check all responses that apply.

Table 4.13. At which of the following locations in Shenandoah National Park have you rock climbed today or on previous visits? (Check all that apply.)					
	LSMC[a] (n=88)		**OR**[a] (n=65-66)		*Chi–square, p value*
Location	*Frequency*	*Percent*	*Frequency*	*Percent*	
Little Stony Man	87	98.9	17	25.8	$\chi^2 = 91.93$, $p < 0.001$
White Oak Canyon	20	22.7	20	30.3	$\chi^2 = 1.13$, $p = 0.29$
Old Rag Mountain	24	27.3	58	87.9	$\chi^2 = 55.65$, $p < 0.001$
Blackrock/Split Rock	1	1.1	2	3.0	N/A[b]
Mount Marshall	1	1.1	2	3.0	N/A[b]
Mary's Rock	4	4.5	0	0.0	N/A[b]
Other	2	2.3	3	4.6	N/A[b]

[a]Values computed based on responses from *all* respondents.
[b]Chi-square analysis is not applicable as there are fewer than 5 cases in 50% or more of the cells.

Table 4.13 (other). At which of the following locations in Shenandoah National Park have you rock climbed today or on previous visits? (Check all that apply.)				
	LSMC[a] (n=2)		**OR**[a] (n=3)	
Location	*Frequency*	*Percent*	*Frequency*	*Percent*
Doyles Falls	1	50.0	0	0.0
Hawksbill	1	50.0	0	0.0
Little Devil's Stairs	0	0.0	1	33.3
Betty's Rock/Crescent Rock	0	0.0	1	33.3
Great Falls	0	0.0	1	33.3

[a]Values computed based on responses from *all* respondents.

Table 4.14. Have you ever previously visited Shenandoah National Park to rock climb? (Check one.)				
	LSMC[a] (n=89)		**OR**[a] (n=66)	
	Frequency	*Percent*[b]	*Frequency*	*Percent*[b]
Yes	50	56.2	42	63.6
No	39	43.8	24	36.4

[a]Values computed based on responses from *all* respondents.
[b]($\chi^2 = 0.87$, $p = 0.35$)

Table 4.15. If you have previously rock climbed in Shenandoah National Park, approximately how many times have you visited Shenandoah Park to rock climb including this trip?				
	LSMC[a] (n=49)		**OR**[a] (n=39)	
Number of previous visits	*Frequency*	*Percent*[b]	*Frequency*	*Percent*[b]
2-5 previous visits	28	57.1	23	59.0
6-10 previous visits	9	18.4	8	20.5
11-20 previous visits	7	14.3	3	7.7
More than 20 previous visits	5	10.2	5	12.8

[a]Values computed based on responses from *all* respondents.
[b]($\chi^2 = 1.03$, $p = 0.80$)

Table 4.16. During which season do you rock climb in Shenandoah National Park most often? (Check one.)				
	LSMC[a] (n=38)		**OR**[a] (n=32)	
Season	*Frequency*	*Percent*[b]	*Frequency*	*Percent*[b]
Fall (Oct.-Nov.)	8	21.1	17	53.1
Winter (Dec.-Feb.)	2	5.3	1	3.1
Spring(Mar.-May)	13	34.2	5	15.6
Summer (June-Sept.)	15	39.5	9	28.1

[a]Values computed based on responses from *all* respondents.
[b]($\chi^2 = 8.18$, $p = 0.04$)

Table 4.17. Approximately how many years have you been rock climbing?				
	LSMC[a] (n=88)		**OR**[a] (n=65)	
Number of years	*Frequency*	*Percent*[b]	*Frequency*	*Percent*[b]
< 1 year	5	5.7	0	0.0
1 year	23	26.1	7	10.8
2-5 years	29	33.0	27	41.5
6-10 years	13	14.8	15	23.1
11-20 years	12	13.6	13	20.0
> 21 years	6	6.8	3	4.6
Mean[c]	6.5		7.9	

[a]Values computed based on responses from *all* respondents.
[b]($\chi^2 = 11.59$, $p = 0.04$)
[c]($t = -1.12$, $p = 0.27$)

Table 4.18. How would you describe your current knowledge of minimum impact or Leave No Trace(LNT) rock climbing practices? (Check one.)				
	LSMC[a] (n=89)		**OR**[a] (n=64)	
Level of knowledge	*Frequency*	*Percent*[b]	*Frequency*	*Percent*[b]
No knowledge	5	5.6	3	4.7
Novice	17	19.1	5	7.8
Intermediate	28	31.5	19	29.7
Advanced	27	30.3	24	37.5
Expert	12	13.5	13	20.3

[a]Values computed based on responses from *all* respondents.
[b]($\chi^2 = 5.04$, $p = 0.28$)

Table 4.19. Please rate your ability for the following climbing activities? (Circle one number for each type of climbing activity.)

Climbing activity		**LSMC[a]**		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
Bouldering	No Experience (1)	13	14.8	1	1.6	$\chi^2 = 10.16$, $p = 0.02$	
	Novice (2)	35	39.8	21	33.3		
	Intermediate (3)	32	36.4	31	49.2		
	Advanced/Expert (4)	8	9.1	10	15.9		
	Mean	2.4		2.8			$t = -3.08$ $p < 0.01$
Top-roping	No Experience (1)	5	5.6	1	1.6	$\chi^2 = 5.93$, $p = 0.12$	
	Novice (2)	14	15.7	5	8.2		
	Intermediate (3)	40	44.9	24	39.3		
	Advanced/Expert (4)	30	33.7	31	50.8		
	Mean	3.1		3.4			$t = -2.46$, $p = 0.02$
Gym climbing	No Experience (1)	9	10.1	5	8.5	$\chi^2 = 8.21$, $p = 0.04$	
	Novice (2)	21	23.6	4	6.8		
	Intermediate (3)	37	41.6	28	47.5		
	Advanced/Expert (4)	22	24.7	22	37.3		
	Mean	2.8		3.1			$t = -2.14$, $p = 0.03$

[a]Values computed based on responses from *all* respondents.

Table 4.19 (continued). Please rate your ability for the following climbing activities? (Circle <u>one</u> number for each type of climbing activity.)

Climbing activity		**LSMC[a]**		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
Traditional Climbing	No Experience (1)	24	27.3	11	18.3	$\chi^2 = 2.28$, $p = 0.52$	
	Novice (2)	23	26.1	14	23.3		
	Intermediate (3)	27	30.7	23	38.3		
	Advanced/Expert (4)	14	15.9	12	20.0		
	Mean	2.4		2.6			$t = -1.43$, $p = 0.16$
Sport climbing	No Experience (1)	36	40.9	11	18.6	$\chi^2 = 13.57$, $p < 0.01$	
	Novice (2)	22	25.0	10	16.9		
	Intermediate (3)	20	22.7	26	44.1		
	Advanced/Expert (4)	10	11.4	12	20.3		
	Mean	2.1		2.7			$t = -3.54$, $p < 0.01$
Ice climbing	No Experience (1)	64	71.9	36	60.0	$\chi^2 = 3.70$, $p = 0.30$	
	Novice (2)	11	12.4	14	23.3		
	Intermediate (3)	10	11.2	6	10.0		
	Advanced/Expert (4)	4	4.5	4	6.7		
	Mean	1.5		1.6			$t = -1.01$, $p = 0.31$

[a]Values computed based on responses from *all* respondents.

Table 4.19 (continued). Please rate your ability for the following climbing activities? (Circle <u>one</u> number for each type of climbing activity.)							
Climbing activity		**LSMC[a]**		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
New route development and/or bolting	No Experience (1)	72	81.8	45	76.3	$\chi^2 = 1.89$, $p = 0.60$	
	Novice (2)	11	12.5	8	13.6		
	Intermediate (3)	3	3.4	5	8.5		
	Advanced/Expert (4)	2	2.3	1	1.7		
	Mean	1.3		1.4			$t = -0.84$, $p = 0.40$

[a]Values computed based on responses from *all* respondents.

Table 4.20. Which of the following best describes you as a rock climber? (Check <u>one</u>.)				
	LSMC[a] (n=83)		**OR**[a] (n=57)	
Type of climber	*Frequency*	*Percent*[b]	*Frequency*	*Percent*[b]
Sport climber	10	12.0	9	15.8
Traditional rock climber	41	49.4	25	43.9
Boulderer	0	0.0	3	5.3
Indoor/gym climber	12	14.5	6	10.5
Rappeller	2	2.4	1	1.8
Don't know/not sure	9	10.8	4	7.0
Other	9	10.8	9	15.8

[a]Values computed based on responses from *all* respondents.
[b]($\chi^2 = 6.59$, $p = 0.36$)

Table 4.20 (other). Which of the following best describes you as a rock climber? (Check <u>one</u>.)				
	LSMC[a] (n=9)		**OR**[a] (n=9)	
Type of climber	*Frequency*	*Percent*	*Frequency*	*Percent*
Top roper	3	33.3	5	55.6
Mountaineer	0	0.0	0	0.0
Hybrid (Sport/traditional)	1	11.1	4	44.4
All Around	3	33.3	0	0.0
Occasional Climber (traditional or indoor)	1	11.1	0	0.0
Camp Counselor	1	11.1	0	0.0

[a]Values computed based on responses from *all* respondents who marked "other".

Table 4.21. Do you belong to any rock climbing or conservation organizations (e.g. Access Fund, Sierra Club, Appalachian Trail Conservancy)?				
	LSMC[a] (n=88)		**OR**[a] (n=64)	
	Frequency	*Percent*[b]	*Frequency*	*Percent*[b]
Yes	27	30.7	23	35.9
No	61	69.3	41	64.1

[a]Values computed based on responses from *all* respondents.
[b]($\chi^2 = 0.46$, $p = 0.50$)

Table 4.22. What is the approximate retail value of all the rock climbing equipment you have ever purchased? (Only include equipment you use solely for rock climbing purposes.)				
	LSMC[a] (n=89)		**OR**[a] (n=66)	
Retail value	*Frequency*	*Percent*[b]	*Frequency*	*Percent*[b]
I do not own any rock climbing equipment	15	16.9	2	3.0
Less than $100	7	7.9	2	3.0
$100 to $249	16	18.0	9	13.6
$250 to $499	13	14.6	12	18.2
$500 to $1,000	20	22.5	15	22.7
More than $1,000	18	20.2	26	39.4

[a]Values computed based on responses from *all* respondents.
[b]($\chi^2 = 13.78$, $p = 0.02$)

Table 4.23. Have you ever participated in a volunteer service project at a rock climbing area?				
	LSMC[a] (n=89)		**OR**[a] (n=65)	
	Frequency	*Percent*[b]	*Frequency*	*Percent*[b]
Yes	22	24.7	16	24.6
No	67	75.3	49	75.4

[a]Values computed based on responses from *all* respondents.
[b]($\chi^2 = 0.00$, $p = 0.99$)

Table 4.24a. If you have ever participated in a volunteer service project at a rock climbing area, please specify the name of the climbing area and the year of the most recent service project you participated in.				
	LSMC[a] (n=19)		**OR[a]** (n=15)	
Name of rock climbing area	*Frequency*	*Percent*	*Frequency*	*Percent*
Carder Rock	2	10.5	1	6.7
Seneca Rocks	1	5.3	0	0.0
Great Falls	6	31.6	7	46.7
Franklin	1	5.3	0	0.0
Sugarloaf Mountain	1	5.3	0	0.0
Love Gap	1	5.3	0	0.0
Stony Man	1	5.3	0	0.0
New River Gorge	1	5.3	4	26.7
Manchester Wall	0	0.0	1	6.7
Little Stony Man Cliffs	2	10.5	0	0.0
Enchanted Rocks Natural Area, TX	1	5.3	0	0.0
James River Park	1	5.3	0	0.0
Coopers Rock, WV	1	5.3	0	0.0
Quincy Quarries, MA	0	0.0	1	6.7
Red Rocks ,NV	0	0.0	1	6.7
San Juan, CO	0	0.0	1	6.7

[a]Values computed based on responses from *all* respondents who answered "yes" to Question 23.

Table 4.24b. If you have ever participated in a volunteer service project at a rock climbing area, please specify the name of the climbing are and the year of the most recent service project you participated in.				
	LSMC[a] (n=19)		**OR[a]** (n=15)	
Year of most recent project	*Frequency*	*Percent[b]*	*Frequency*	*Percent[b]*
2005	2	10.5	4	26.7
2003 – 2004	11	57.9	7	46.7
2000 – 2002	3	15.8	2	13.3
1989 – 1999	3	15.8	2	13.3

[a]Values computed based on responses from *all* respondents.
[b] Chi-square analysis is not applicable as there are fewer than 5 cases in 50% or more of the cells.

Table 4.25. People have many potential reasons for rock climbing. We would like to know what motivated you to rock climb at Shenandoah National Park today. Please indicate how important each of the experiences listed below was to you as a reason to rock climb today. (Circle one number for each item.)

Reasons to visit		**LSMC[a]**		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
To view the scenery	Not at all important (1)	1	1.1	1	1.5	$\chi^2 = 5.41$, $p = 0.25$	
	(2)	4	4.5	0	0.0		
	Somewhat important (3)	24	27.0	14	21.5		
	(4)	31	34.8	20	30.8		
	Extremely important (5)	29	32.6	30	46.2		
	Mean	3.9		4.2			$t = -1.79$, $p = 0.08$
To use my equipment	Not at all important (1)	22	25.3	13	20.6	$\chi^2 = 3.73$, $p = 0.44$	
	(2)	17	19.5	18	28.6		
	Somewhat important (3)	21	24.1	19	30.2		
	(4)	17	19.5	9	14.3		
	Extremely important (5)	10	11.5	4	6.3		
	Mean	2.7		2.6			$t = 0.73$, $p = 0.47$

[a]Values computed based on responses from *all* respondents.

Table 4.25 (continued). People have many potential reasons for rock climbing. We would like to know what motivated you to rock climb at Shenandoah National Park today. Please indicate how important each of the experiences listed below was to you as a reason to rock climb today. (Circle one number for each item.)							
Reasons to visit		**LSMC[a]**		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
To learn new skills	Not at all important (1)	7	7.9	3	4.8	$\chi^2 = 1.95$, $p = 0.75$	
	(2)	8	9.0	7	11.1		
	Somewhat important (3)	27	30.3	16	25.4		
	(4)	25	28.1	23	36.5		
	Extremely important (5)	22	24.7	14	22.2		
	Mean	3.5		3.6			$t = -0.40$, $p = 0.69$
To be with people who enjoy the same things I do	Not at all important (1)	0	0.0	0	0.0	$\chi^2 = 3.03$, $p = 0.39$	
	(2)	1	1.1	0	0.0		
	Somewhat important (3)	20	22.7	9	14.3		
	(4)	23	26.1	22	34.9		
	Extremely important (5)	44	50.0	32	50.8		
	Mean	4.3		4.4			$t = -0.87$, $p = 0.38$

[a]Values computed based on responses from *all* respondents.

Table 4.25 (continued). People have many potential reasons for rock climbing. We would like to know what motivated you to rock climb at Shenandoah National Park today. Please indicate how important each of the experiences listed below was to you as a reason to rock climb today. (Circle one number for each item.)

Reasons to visit		LSMC[a]		OR[a]		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
To get exercise	Not at all important (1)	3	3.4	0	0.0	$\chi^2 = 7.82$, $p = 0.10$	
	(2)	4	4.5	2	3.1		
	Somewhat important (3)	21	23.6	7	10.8		
	(4)	29	32.6	23	35.4		
	Extremely important (5)	32	36.0	33	50.8		
	Mean	3.9		4.3			$t = -2.63$, $p < 0.01$
To experience solitude	Not at all important (1)	25	28.4	3	4.6	$\chi^2 = 14.39$, $p < 0.01$	
	(2)	16	18.2	15	23.1		
	Somewhat important (3)	20	22.7	19	29.2		
	(4)	14	15.9	13	20.0		
	Extremely important (5)	13	14.8	15	23.1		
	Mean	2.7		3.3			$t = -2.92$, $p < 0.01$

[a]Values computed based on responses from *all* respondents.

Table 4.25 (continued). People have many potential reasons for rock climbing. We would like to know what motivated you to rock climb at Shenandoah National Park today. Please indicate how important each of the experiences listed below was to you as a reason to rock climb today. (Circle one number for each item.)

Reasons to visit		**LSMC[a]**		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
To teach my rock climbing skills to others	Not at all important (1)	23	26.4	18	28.6	$\chi^2 = 2.04$, $p = 0.73$	
	(2)	22	25.3	15	23.8		
	Somewhat important (3)	19	21.8	17	27.0		
	(4)	10	11.5	8	12.7		
	Extremely important (5)	13	14.9	5	7.9		
	Mean	2.6		2.5			$t = 0.71$, $p = 0.48$
To test my abilities	Not at all important (1)	5	5.6	3	4.6	$\chi^2 = 2.11$, $p = 0.72$	
	(2)	5	5.6	2	3.1		
	Somewhat important (3)	18	20.2	13	20.0		
	(4)	33	37.1	20	30.8		
	Extremely important (5)	28	31.5	27	41.5		
	Mean	3.8		4.0			$t = -1.03$, $p = 0.31$

[a]Values computed based on responses from *all* respondents.

Table 4.25 (continued). People have many potential reasons for rock climbing. We would like to know what motivated you to rock climb at Shenandoah National Park today. Please indicate how important each of the experiences listed below was to you as a reason to rock climb today. (Circle one number for each item.)

Reasons to visit		**LSMC[a]**		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
To get away from the usual demands of life	Not at all important (1)	5	5.6	1	1.6	$\chi^2 = 5.49$, $p = 0.24$	
	(2)	6	6.7	1	1.6		
	Somewhat important (3)	15	16.9	8	12.5		
	(4)	22	24.7	16	25.0		
	Extremely important (5)	41	46.1	38	59.4		
	Mean	4.0		4.4			$t = -2.39$, $p = 0.02$
To be close to nature	Not at all important (1)	0	0.0	0	0.0	$\chi^2 = 4.20$, $p = 0.24$	
	(2)	3	3.4	0	0.0		
	Somewhat important (3)	15	16.9	6	9.4		
	(4)	25	28.1	20	31.3		
	Extremely important (5)	46	51.7	38	59.4		
	Mean	4.3		4.5			$t = -1.77$, $p = 0.08$

[a]Values computed based on responses from *all* respondents.

Table 4.25 (continued). People have many potential reasons for rock climbing. We would like to know what motivated you to rock climb at Shenandoah National Park today. Please indicate how important each of the experiences listed below was to you as a reason to rock climb today. (Circle one number for each item.)

Reasons to visit		**LSMC[a]**		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
To be challenged	Not at all important (1)	1	1.1	0	0.0	$\chi^2 = 1.85$, $p = 0.76$	
	(2)	4	4.5	3	4.6		
	Somewhat important (3)	15	16.9	10	15.4		
	(4)	26	29.2	15	23.1		
	Extremely important (5)	43	48.3	37	56.9		
	Mean	4.2		4.3			$t = -0.87$, $p = 0.39$

[a]Values computed based on responses from *all* respondents.

Table 4.26. How much of a problem do you think the following issues are at Shenandoah National Park? (Circle one number for each item.)

Management issues		LSMC[a]		OR[a]		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
Large numbers of bolts on climbing routes	Not a problem (1)	50	56.2	33	50.8	$\chi^2 = 1.70$, $p = 0.64$	
	(2)	17	19.1	10	15.4		
	Moderate problem (3)	8	9.0	7	10.8		
	(4)	0	0.0	0	0.0		
	Big problem (5)	0	0.0	0	0.0		
	Don't know	14	15.7	15	23.1		
	Mean	1.4		1.5			$t = -0.31$, $p = 0.76$
Tree damage caused by climbers using trees as anchors	Not a problem (1)	31	34.8	29	45.3	$\chi^2 = 4.73$, $p = 0.45$	
	(2)	34	38.2	15	23.4		
	Moderate problem (3)	9	10.1	8	12.5		
	(4)	4	4.5	3	4.7		
	Big problem (5)	1	1.1	0	0.0		
	Don't know	10	11.2	9	14.1		
	Mean	1.9		1.7			$t = 0.84$, $p = 0.40$

[a]Values computed based on responses from *all* respondents.

Table 4.26 (continued). How much of a problem do you think the following issues are at Shenandoah National Park? (Circle one number for each item.)							
Management issues		**LSMC[a]**		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
Erosion/trampling impacts caused by rock climbing use	Not a problem (1)	22	24.7	22	34.4	$\chi^2 = 6.82$, $p = 0.24$	
	(2)	32	36.0	14	21.9		
	Moderate problem (3)	19	21.3	14	21.9		
	(4)	5	5.6	1	1.6		
	Big problem (5)	2	2.2	3	4.7		
	Don't Know	9	10.1	10	15.6		
	Mean	2.2		2.1			$t = 0.58$, $p = 0.56$
Too many visitor-created trails to climbing area	Not a problem (1)	25	28.1	26	40.0	$\chi^2 = 7.93$, $p = 0.16$	
	(2)	26	29.2	12	18.5		
	Moderate problem (3)	22	24.7	10	15.4		
	(4)	6	6.7	3	4.6		
	Big problem (5)	2	2.2	2	3.1		
	Don't know	8	9.0	12	18.5		
	Mean	2.2		1.9			$t = 0.72$, $p = 0.47$

[a]Values computed based on responses from *all* respondents.

Table 4.26 (continued). How much of a problem do you think the following issues are at Shenandoah National Park? (Circle one number for each item.)

Management issues		**LSMC[a]**		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
Other groups leaving ropes/equipment on routes that are not being used	Not a problem (1)	47	53.4	38	58.5	$\chi^2 = 8.97$, $p = 0.06$	
	(2)	30	34.1	14	21.5		
	Moderate problem (3)	3	3.4	2	3.1		
	(4)	3	3.4	0	0.0		
	Big problem (5)	0	0.0	0	0.0		
	Don't know	5	5.7	11	16.9		
	Mean	1.5		1.3			$t = 1.78$, $p = 0.08$
Crowding at climbing areas	Not a problem (1)	28	31.5	36	55.4	$\chi^2 = 18.62$, $p < 0.01$	
	(2)	24	27.0	12	18.5		
	Moderate problem (3)	27	30.3	7	10.8		
	(4)	4	4.5	0	0.0		
	Big problem (5)	1	1.1	1	1.5		
	Don't know	5	5.6	9	13.8		
	Mean	2.1		1.5			$t = 3.65$, $p < 0.01$

[a]Values computed based on responses from *all* respondents.

Table 4.26 (continued). How much of a problem do you think the following issues are at Shenandoah National Park? (Circle one number for each item.)

Management issues		**LSMC[a]**		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
Too many large rock climbing groups	Not a problem (1)	31	34.8	33	50.8	$\chi^2 = 17.15$, $p < 0.01$	
	(2)	38	42.7	12	18.5		
	Moderate problem (3)	11	12.4	7	10.8		
	(4)	3	3.4	0	0.0		
	Big problem (5)	0	0.0	1	1.5		
	Don't know	6	6.7	12	18.5		
	Mean	1.8		1.6			$t = 1.83$, $p = 0.07$
Too many organized rock climbing groups	Not a problem (1)	34	38.2	35	53.8	$\chi^2 = 9.51$, $p = 0.09$	
	(2)	34	38.2	13	20.0		
	Moderate problem (3)	10	11.2	4	6.2		
	(4)	1	1.1	1	1.5		
	Big problem (5)	0	0.0	1	1.5		
	Don't know	10	11.2	11	16.9		
	Mean	1.7		1.5			$t = 1.46$, $p = 0.15$

[a]Values computed based on responses from *all* respondents.

Table 4.26 (continued). How much of a problem do you think the following issues are at Shenandoah National Park? (Circle one number for each item.)							
Management issues		**LSMC[a]**		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
Long wait-time for preferred climbing routes	Not a problem (1)	43	48.3	35	53.8	$\chi^2 = 12.98$, $p = 0.01$	
	(2)	32	36.0	14	21.5		
	Moderate problem (3)	7	7.9	2	3.1		
	(4)	3	3.4	1	1.5		
	Big problem (5)	0	0.0	0	0.0		
	Don't know	4	4.5	13	20.0		
	Mean	1.6		1.4			$t = 1.87$, $p = 0.06$
Disturbance to wildlife caused by rock climbing use	Not a problem (1)	35	39.3	28	43.1	$\chi^2 = 2.79$, $p = 0.73$	
	(2)	27	30.3	18	27.7		
	Moderate problem (3)	10	11.2	4	6.2		
	(4)	4	4.5	3	4.6		
	Big problem (5)	0	0.0	1	1.5		
	Don't know	13	14.6	11	16.9		
	Mean	1.8		1.7			$t = 0.33$, $p = 0.74$

[a]Values computed based on responses from *all* respondents.

Table 4.26 (continued). How much of a problem do you think the following issues are at Shenandoah National Park? (Circle one number for each item.)							
Management issues		**LSMC[a]**		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
Damage to archeological and/or historical sites caused by rock climbing use	Not a problem (1)	43	48.3	37	56.9	$\chi^2 = 6.68$, $p = 0.25$	
	(2)	18	20.2	8	12.3		
	Moderate problem (3)	5	5.6	2	3.1		
	(4)	2	2.2	0	0.0		
	Big problem (5)	0	0.0	2	3.1		
	Don't know	21	23.6	16	24.6		
	Mean	1.5		1.4			$t = 0.59$, $p = 0.56$
Lack of overnight camping near the climbing areas	Not a problem (1)	33	37.1	16	25.0	$\chi^2 = 19.37$, $p < 0.01$	
	(2)	25	28.1	6	9.4		
	Moderate problem (3)	9	10.1	18	28.1		
	(4)	7	7.9	7	10.9		
	Big problem (5)	4	4.5	9	14.1		
	Don't know	11	12.4	8	12.5		
	Mean	2.0		2.8			$t = -3.31$, $p < 0.01$

[a]Values computed based on responses from *all* respondents.

Table 4.27. Please indicate the extent to which you would support or oppose each of the following potential rock climbing management actions at Shenandoah National Park. (Please circle one number for each item.)

Management actions		LSMC[a]		OR[a]		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
Provide more information regarding minimum impact climbing practices	Strongly oppose (1)	1	1.1	1	1.5	$\chi^2 = 5.67$, $p = 0.34$	
	(2)	0	0.0	1	1.5		
	Neither oppose nor support (3)	17	19.1	6	9.2		
	(4)	19	21.3	20	30.8		
	Strong support (5)	49	55.1	36	55.4		
	Don't know	3	3.4	1	1.5		
	Mean	4.3		4.4			$t = -0.38$, $p = 0.71$
Provide more information on climbing areas and routes	Strongly oppose (1)	4	4.5	2	3.1	$\chi^2 = 3.04$, $p = 0.69$	
	(2)	1	1.1	3	4.7		
	Neither oppose nor support (3)	15	17.0	10	15.6		
	(4)	24	27.3	13	20.3		
	Strong support (5)	43	48.9	35	54.7		
	Don't know	1	1.1	1	1.6		
	Mean	4.2		4.2			$t = -0.26$, $p = 0.80$

[a]Values computed based on responses from *all* respondents.

Table 4.27 (continued). Please indicate the extent to which you would support or oppose each of the following potential rock climbing management actions at Shenandoah National Park. (Please circle <u>one</u> number for each item.)

Management actions		**LSMC[a]**		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
Provide fixed anchors at the top of climbs to minimize resource impacts	Strongly oppose (1)	8	9.1	4	6.3	$\chi^2 = 6.33$, $p = 0.28$	
	(2)	2	2.3	3	4.7		
	Neither oppose nor support (3)	21	23.9	11	17.2		
	(4)	25	28.4	17	26.6		
	Strong support (5)	24	27.3	27	42.2		
	Don't know	8	9.1	2	3.1		
	Mean	3.7		4.0			$t = -1.38$, $p = 0.17$
Require climbers to use designated trails to access climbing areas	Strongly oppose (1)	5	5.7	8	12.7	$\chi^2 = 10.25$, $p = 0.07$	
	(2)	8	9.2	7	11.1		
	Neither oppose nor support (3)	28	32.2	8	12.7		
	(4)	21	24.1	19	30.2		
	Strong support (5)	24	27.6	18	28.6		
	Don't know	1	1.1	3	4.8		
	Mean	3.6		3.5			$t = 0.28$, $p = 0.78$

[a]Values computed based on responses from *all* respondents.

Table 4.27 (continued). Please indicate the extent to which you would support or oppose each of the following potential rock climbing management actions at Shenandoah National Park. (Please circle one number for each item.)							
Management actions		**LSMC[a]**		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
Limit the size of rock climbing groups	Strongly oppose (1)	20	22.5	11	16.9	$\chi^2 = 7.24$, $p = 0.20$	
	(2)	19	21.3	12	18.5		
	Neither oppose nor support (3)	30	33.7	15	23.1		
	(4)	10	11.2	12	18.5		
	Strong support (5)	9	10.1	12	18.5		
	Don't know	1	1.1	3	4.6		
	Mean	2.6		3.0			$t = -1.78$, $p = 0.08$
Require leaders of organized groups to attend a program in the park on minimum impact climbing as part of the permit process	Strongly oppose (1)	18	20.2	12	18.5	$\chi^2 = 1.78$, $p = 0.88$	
	(2)	18	20.2	9	13.8		
	Neither oppose nor support (3)	22	24.7	19	29.2		
	(4)	20	22.5	14	21.5		
	Strong support (5)	10	11.2	10	15.4		
	Don't know	1	1.1	1	1.5		
	Mean	2.8		3.0			$t = -0.81$, $p = 0.42$

[a]Values computed based on responses from *all* respondents.

Table 4.27 (continued). Please indicate the extent to which you would support or oppose each of the following potential rock climbing management actions at Shenandoah National Park. (Please circle <u>one</u> number for each item.)

Management actions		**LSMC[a]**		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
Limit the number of permits issued to organized groups	Strongly oppose (1)	22	24.7	11	16.9	$\chi^2 = 8.72$, $p = 0.12$	
	(2)	22	24.7	13	20.0		
	Neither oppose nor support (3)	30	33.7	23	35.4		
	(4)	11	12.4	7	10.8		
	Strong support (5)	2	2.2	9	13.8		
	Don't know	2	2.2	2	3.1		
	Mean	2.4		2.8			$t = -2.24$, $p = 0.03$
Require organized groups to climb only during specially designated dates and times	Strongly oppose (1)	42	47.2	19	29.2	$\chi^2 = 9.15$, $p = 0.10$	
	(2)	19	21.3	13	20.0		
	Neither oppose nor support (3)	21	23.6	26	40.0		
	(4)	4	4.5	3	4.6		
	Strong support (5)	3	3.4	2	3.1		
	Don't know	0	0.0	2	3.1		
	Mean	2.0		2.3			$t = -1.95$, $p = 0.05$

[a]Values computed based on responses from *all* respondents.

Table 4.27 (continued). Please indicate the extent to which you would support or oppose each of the following potential rock climbing management actions at Shenandoah National Park. (Please circle one number for each item.)							
Management actions		**LSMC[a]**		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
Require organized groups to climb in specially designated climbing areas	Strongly oppose (1)	40	45.5	14	21.5	$\chi^2 = 10.94$, $p = 0.05$	
	(2)	16	18.2	20	30.8		
	Neither oppose nor support (3)	25	28.4	22	33.8		
	(4)	5	5.7	5	7.7		
	Strong support (5)	1	1.1	3	4.6		
	Don't know	1	1.1	1	1.5		
	Mean	2.0		2.4			$t = -2.56$, $p = 0.01$
Allow unregulated bolting of climbing routes	Strongly oppose (1)	41	46.1	25	38.5	$\chi^2 = 8.31$, $p = 0.14$	
	(2)	17	19.1	11	16.9		
	Neither oppose nor support (3)	21	23.6	11	16.9		
	(4)	3	3.4	8	12.3		
	Strong support (5)	2	2.2	5	7.7		
	Don't know	5	5.6	5	7.7		
	Mean	1.9		2.3			$t = -1.81$, $p = 0.07$

[a]Values computed based on responses from *all* respondents.

Table 4.27 (continued). Please indicate the extent to which you would support or oppose each of the following potential rock climbing management actions at Shenandoah National Park. (Please circle <u>one</u> number for each item.)

Management actions		**LSMC[a]**		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
Require a permit to place bolts on climbing routes	Strongly oppose (1)	6	6.7	6	9.2	$\chi^2 = 2.46$, $p = 0.78$	
	(2)	9	10.1	9	13.8		
	Neither oppose nor support (3)	14	15.7	12	18.5		
	(4)	22	24.7	18	27.7		
	Strong support (5)	34	38.2	18	27.7		
	Don't know	4	4.5	2	3.1		
	Mean	3.8		3.5			$t = 1.35$, $p = 0.18$
Limit the placement of bolts to specified areas	Strongly oppose (1)	7	7.9	5	7.7	$\chi^2 = 2.41$, $p = 0.79$	
	(2)	6	6.7	8	12.3		
	Neither oppose nor support (3)	19	21.3	17	26.2		
	(4)	26	29.2	17	26.2		
	Strong support (5)	27	30.3	16	24.6		
	Don't know	4	4.5	2	3.1		
	Mean	3.7		3.5			$t = 1.05$, $p = 0.30$

[a]Values computed based on responses from *all* respondents.

Table 4.27 (continued). Please indicate the extent to which you would support or oppose each of the following potential rock climbing management actions at Shenandoah National Park. (Please circle one number for each item.)							
Management actions		**LSMC[a]**		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
Prohibit the placement of bolts on climbing routes throughout the park	Strongly oppose (1)	29	32.6	26	40.6	$\chi^2 = 3.13$, $p = 0.68$	
	(2)	12	13.5	11	17.2		
	Neither oppose nor support (3)	22	24.7	14	21.9		
	(4)	8	9.0	6	9.4		
	Strong support (5)	11	12.4	4	6.3		
	Don't know	7	7.9	3	4.7		
	Mean	2.5		2.2			$t = 1.38$, $p = 0.17$
Close climbing routes in areas where climbing use is causing impacts to cultural/archeological resources	Strongly oppose (1)	10	11.4	5	7.8	$\chi^2 = 2.25$, $p = 0.81$	
	(2)	12	13.6	11	17.2		
	Neither oppose nor support (3)	27	30.7	19	29.7		
	(4)	24	27.3	21	32.8		
	Strong support (5)	10	11.4	4	6.3		
	Don't know	5	5.7	4	6.3		
	Mean	3.1		3.1			$t = 0.06$, $p = 0.95$

[a]Values computed based on responses from *all* respondents.

Table 4.27 (continued). Please indicate the extent to which you would support or oppose each of the following potential rock climbing management actions at Shenandoah National Park. (Please circle one number for each item.)							
Management actions		**LSMC[a]**		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
Close climbing routes in areas containing sensitive rare plant species	Strongly oppose (1)	5	5.7	6	9.2	$\chi^2 = 10.29$, $p = 0.07$	
	(2)	13	14.9	7	10.8		
	Neither oppose nor support (3)	28	32.2	14	21.5		
	(4)	22	25.3	25	38.5		
	Strong support (5)	18	20.7	8	12.3		
	Don't know	1	1.1	5	7.7		
	Mean	3.4		3.4			$t = 0.21$, $p = 0.84$
Temporarily close areas to climbing use during critical wildlife seasons (e.g., nesting, breeding)	Strongly oppose (1)	5	5.6	2	3.1	$\chi^2 = 2.67$, $p = 0.75$	
	(2)	13	14.6	6	9.4		
	Neither oppose nor support (3)	19	21.3	12	18.8		
	(4)	27	30.3	23	35.9		
	Strong support (5)	24	27.0	19	29.7		
	Don't know	1	1.1	2	3.1		
	Mean	3.6		3.8			$t = -1.21$, $p = 0.23$

[a]Values computed based on responses from *all* respondents.

Table 4.28. Did you encounter any other rock climbers at the base or top of climbs during your visit to Shenandoah National Park today?				
	LSMC[a] (n=26)		**OR[a]** (n=25)	
	Frequency	*Percent*[b]	*Frequency*	*Percent*[b]
Yes	21	80.8	16	64.0
No	5	19.2	9	36.0

[a]Groups were coded as having met another rock climber if at least one group member responded "Yes".
[b]($\chi^2 = 1.80$, $p = 0.18$)

Table 4.29. How crowded did you feel while rock climbing in Shenandoah National Park today? (Circle one number.)										
		Not at all Crowded		**Somewhat crowded**			**Moderately crowded**		**Extremely crowded**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
LSMC[a] (Mean = 3.0)[b]	*Frequency*	27	20	13	5	9	6	6	1	0
	Percent	31.0	23.0	14.9	5.7	10.3	6.9	6.9	1.1	0.0
OR[a] (Mean = 1.8)[b]	*Frequency*	34	16	4	2	2	1	1	0	0
	Percent	56.7	26.7	6.7	3.3	3.3	1.7	1.7	0.0	0.0

[a]Values computed based on responses from *all* respondents.
[b] ($t = 4.15$, $p < 0.01$)

Table 4.29. How crowded did you feel while rock climbing in Shenandoah National Park today? (Circle one number.)					
		Not at all crowded	**Somewhat crowded**		**Moderately/ Extremely crowded**
		1-2	**3-4**	**5**	**6-9**
LSMC[a] (n=87)	*Frequency*	47	18	9	13
	Percent[b]	54.0	20.7	10.3	14.9
OR[a] (n=60)	*Frequency*	50	6	2	2
	Percent[b]	83.3	10.0	3.3	3.3

[a]Values computed based on responses from *all* respondents. Response categories were combined as indicated in order to perform a chi-square test.
[b] ($\chi^2 = 14.13$, $p = 0.003$)

Table 4.30. Please indicate the extent to which you agree or disagree with each of the following statements about organized rock climbing groups. (Circle one number for each item.)							
		LSMC[a]		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
Organized groups are an effective way to introduce people to the sport of rock climbing	Strongly disagree (1)	0	0.0	2	3.1	$\chi^2 = 7.59$, $p = 0.18$	
	(2)	1	1.1	2	3.1		
	Neutral (3)	12	13.5	16	25.0		
	(4)	39	43.8	22	34.4		
	Strong agree (5)	35	39.3	21	32.8		
	Don't know	2	2.2	1	1.6		
	Mean	4.2		3.9			$t = 2.15$, $p = 0.03$
Organized groups are a safety concern	Strongly disagree (1)	13	14.6	4	6.3	$\chi^2 = 8.89$, $p = 0.11$	
	(2)	29	32.6	13	20.3		
	Neutral (3)	31	34.8	25	39.1		
	(4)	9	10.1	14	21.9		
	Strong agree (5)	4	4.5	4	6.3		
	Don't know	3	3.4	4	6.3		
	Mean	2.6		3.0			$t = -2.69$, $p < 0.01$

[a]Values computed based on responses from *all* respondents.

Table 4.30 (continued). Please indicate the extent to which you agree or disagree with each of the following statements about organized rock climbing groups. (Circle one number for each item.)							
		LSMC[a]		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
Organized groups are an effective way to educate rock climbers about rock climbing ethics	Strongly disagree (1)	1	1.1	1	1.6	$\chi^2 = 3.58$, $p = 0.61$	
	(2)	1	1.1	3	4.7		
	Neutral (3)	16	18.0	11	17.2		
	(4)	35	39.3	30	46.9		
	Strong agree (5)	34	38.2	18	28.1		
	Don't know	2	2.2	1	1.6		
	Mean	4.1		4.0			$t = 1.27$, $p = 0.21$
Organized groups cause conflict with other climbers	Strongly disagree (1)	11	12.5	2	3.1	$\chi^2 = 13.50$, $p = 0.02$	
	(2)	19	21.6	11	17.2		
	Neutral (3)	33	37.5	21	32.8		
	(4)	13	14.8	23	35.9		
	Strongly agree (5)	3	3.4	4	6.3		
	Don't know	9	10.2	3	4.7		
	Mean	2.7		3.3			$t = -3.20$, $p < 0.01$
Organized groups are an effective way to increase public support for rock climbing	Strongly disagree (1)	0	0.0	0	0.0	$\chi^2 = 6.54$, $p = 0.16$	
	(2)	3	3.4	5	7.8		
	Neutral (3)	28	31.5	24	37.5		
	(4)	31	34.8	22	34.4		
	Strong agree (5)	26	29.2	10	15.6		
	Don't know	1	1.1	3	4.7		
	Mean	3.9		3.6			$t = 2.10$, $p = 0.04$

[a]Values computed based on responses from *all* respondents.

Table 4.30 (continued). Please indicate the extent to which you agree or disagree with each of the following statements about organized rock climbing groups. (Circle one number for each item.)							
		LSMC[a]		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
The presence of organized groups detracts from my climbing experience	Strongly disagree (1)	15	16.9	5	7.8	$\chi^2 = 7.92$, $p = 0.16$	
	(2)	17	19.1	8	12.5		
	Neutral (3)	31	34.8	28	43.8		
	(4)	18	20.2	16	25.0		
	Strong agree (5)	2	2.2	5	7.8		
	Don't know	6	6.7	2	3.1		
	Mean	2.7		3.1			$t = -2.44$, $p = 0.02$
Organized groups are an effective way to teach rock climbers safe rock climbing practices	Strongly disagree (1)	0	0.0	0	0.0	$\chi^2 = 2.42$, $p = 0.66$	
	(2)	2	2.3	3	4.7		
	Neutral (3)	14	15.9	14	21.9		
	(4)	34	38.6	25	39.1		
	Strong agree (5)	36	40.9	20	31.3		
	Don't know	2	2.3	2	3.1		
	Mean	4.2		4.0			$t = 1.52$, $p = 0.13$
Organized groups cause no more environmental impact than other climbers	Strongly disagree (1)	5	5.7	6	9.4	$\chi^2 = 9.21$, $p = 0.10$	
	(2)	14	15.9	18	28.1		
	Neutral (3)	25	28.4	22	34.4		
	(4)	18	20.5	9	14.1		
	Strong agree (5)	19	21.6	5	7.8		
	Don't know	7	8.0	4	6.3		
	Mean	3.4		2.8			$t = 2.95$, $p < 0.01$

[a]Values computed based on responses from *all* respondents.

Table 4.30 (continued). Please indicate the extent to which you agree or disagree with each of the following statements about organized rock climbing groups. (Circle one number for each item.)							
		LSMC[a]		**OR[a]**		*Chi-square, p-value*	*t-statistic, p-value*
		Frequency	*Percent*	*Frequency*	*Percent*		
Organized group use of climbing areas at Shenandoah National Park is a problem	Strongly disagree (1)	25	28.4	10	15.6	$\chi^2 = 4.49$, $p = 0.34$	
	(2)	18	20.5	12	18.8		
	Neutral (3)	28	31.8	26	40.6		
	(4)	1	1.1	2	3.1		
	Strong agree (5)	0	0.0	0	0.0		
	Don't know	16	18.2	14	21.9		
	Mean	2.1		2.4			$t = -2.04$, $p = 0.04$

[a]Values computed based on responses from *all* respondents.

Table 4.31. Have you ever encountered an organized rock climbing group on any rock climbing trip (including places other than Shenandoah National Park)?

	LSMC[a] (n=87)		OR[a] (n=65)	
	Frequency	*Percent*[b]	*Frequency*	*Percent*[b]
Yes	64	73.6	44	67.7
No	23	26.4	21	32.3

[a]Values computed based on responses from *all* respondents.
[b]($\chi^2 = 0.62$, $p = 0.43$)

Table 4.32. Did you encounter any organized rock climbing groups during your visit to Shenandoah National Park today?

	LSMC[a] (n=26)		OR[a] (n=35)	
	Frequency	*Percent*[b]	*Frequency*	*Percent*[b]
Yes	7	26.9	4	11.4
No	19	73.1	31	88.6

[a] Groups were coded as having met an organized rock climbing group if at least one group member responded "Yes".
[b]($\chi^2 = 2.42$, $p = 0.12$)

Table 4.33. Which of the following best describes your encounter with an organized rock climbing group or groups today?

	LSMC[a] (n=16)		OR[a] (n=4)	
	Frequency	*Percent*[b]	*Frequency*	*Percent*[b]
My encounter with an organized rock climbing group or groups today added to the quality of my experience	5	31.3	0	0.0
My encounter with an organized group or groups today neither added to nor detracted from the quality of my experience	8	50.0	2	50.0
My encounter with an organized rock climbing group or groups today detracted from the quality of my experience today	3	18.7	2	50.0

[a]Values computed based on responses from *all* respondents.
[b]Chi-square analysis is not applicable as there are fewer than 5 cases in 50% or more of the cells.

Table 4.34. If your encounter with an organized rock climbing group or groups today detracted from the quality of your experience, please indicate which of the following issues you thought were a problem. (Check all that apply.)

	LSMC[a] (n=4)		OR[a] (n=2)	
	Frequency	*Percent*[b,c]	*Frequency*	*Percent*[b,c]
An organized group or groups caused crowding in the area where I was climbing	3	75.0	1	50.0
An organized group or groups left ropes on climbing routes they were not using	0	0.0	1	50.0
An organized group or groups practiced unsafe climbing techniques in the area where I was climbing	0	0.0	1	50.0
An organized group or groups failed to use minimum impact climbing practices	0	0.0	0	0.0
Other	2	50.0	0	0.0

[a]Values computed based on responses from *all* respondents.
[b]Percentages may total greater than 100% as respondents were asked to check all responses that apply.
[c]Chi-square analysis is not applicable as there are fewer than 5 cases in 50% or more of the cells.

Table 4.34 (other). If your encounter with an organized rock climbing group or groups today detracted from the quality of your experience, please indicate which of the following issues you thought were a problem. (Check all that apply.)

	LSMC[a] (n=2)		OR[a] (n=0)	
	Frequency	*Percent*	*Frequency*	*Percent*
Just wanting to be alone	1	50.0	0	0.0
Noise	1	50.0	0	0.0

[a]Values computed based on responses from *all* respondents.

Table 4.35. If your encounter with an organized rock climbing group or groups today added to the quality of your experience, please indicate which of the following factors added to your experience. (Check all that apply.)				
	LSMC[a] (n=6)		**OR**[a] (n=1)	
	Frequency	*Percent*[b,c]	*Frequency*	*Percent*[b,c]
An organized group or groups provided useful information to me about rock climbing in Shenandoah National Park	4	66.7	0	0.0
I was pleased to observe leaders of the organized group or groups I encountered instructing participants in minimum impact climbing practices	4	66.7	0	0.0
The members of the organized group of groups provided me with first aid supplies/help	3	50.0	0	0.0
An organized group or groups provided me with first aid supplies/help	0	0.0	0	0.0
I was pleased to observe leaders of the organized group or groups I encountered instructing participants in safe climbing practices	5	83.3	0	0.0
I was please to observe members of an organized group or groups being introduced to the sport of rock climbing	3	50.0	0	0.0
Other	1	16.7	0	0.0

[a]Values computed based on responses from *all* respondents.
[b]Percentages may total greater than 100% as respondents were asked to check all responses that apply.
[c]Chi-square analysis is not applicable as there are fewer than 5 cases in 50% or more of the cells.

Table 4.35 (other). If your encounter with an organized rock climbing group or groups today added to the quality of your experience, please indicate which of the following factors added to your experience. (Check all that apply.)				
	LSMC[a] (n=1)		**OR**[a] (n=0)	
	Frequency	*Percent*	*Frequency*	*Percent*
They were friendly	1	100.0	0	0.0

[a]Values computed based on responses from *all* respondents.

Table 4.36. What is you sex? (Check one.)				
	LSMC[a] (n=89)		**OR**[a] (n=66)	
Sex	*Frequency*	*Percent*[b]	*Frequency*	*Percent*[b]
Male	58	65.2	51	77.3
Female	31	34.8	15	22.7

[a]Values computed based on responses from *all* respondents.
[b]($\chi^2 = 2.66$, $p = 0.10$)

Table 4.37. In what year were you born?				
	LSMC[a] (n=89)		**OR**[a] (n=65)	
Age[b]	*Frequency*	*Percent*[c]	*Frequency*	*Percent*[c]
14 – 19 years of age	6	6.7	2	3.1
20 – 24 years of age	21	23.6	13	20.0
25 – 34 years of age	23	25.8	25	38.5
35 – 44 years of age	20	22.5	15	23.1
45 – 54 years of age	14	15.7	9	13.8
55 years of age or older	5	5.6	1	1.5
Mean[d]	33.8		33.1	
Range	14-66		20-61	

[a]Values computed based on responses from *all* respondents.
[b]Responses were used to calculate age in years and were categorized to match age categories used in 2000 U.S. Census.
[c]($\chi^2 = 8.54$, $p = 0.13$)
[d]($t = 0.37$, $p = 0.71$)

Table 4.38 (state). If you live in the United States, what is your state and zip code of residence?				
	LSMC[a] (n=89)		**OR**[a] (n=65)	
State of residence	*Frequency*	*Percent*	*Frequency*	*Percent*
Virginia	61	68.5	40	61.5
Maryland	15	16.9	15	23.1
Washington, DC	8	9.0	6	9.2
Pennsylvania	2	2.2	0	0.0
North Carolina	2	2.2	0	0.0
Oregon	0	0.0	2	3.1
Illinois	1	1.1	0	0.0
New York	0	0.0	1	1.5
Missouri	0	0.0	1	1.5

[a]Values computed based on responses from *all* respondents.

Table 4.38 (zip code). If you live in the United States, what is your state and zip code of residence?				
	LSMC[a] (n=88)		**OR**[a] (n=65)	
Zip code of residence[b]	*Frequency*	*Percent*	*Frequency*	*Percent*
Charlottesville, VA (22901, 22903)	7	8.0	4	6.2
Vienna, VA (22180, 22182)	3	3.4	5	7.7
Sterling, VA (20164)	0	0.0	4	6.2
Springfield, VA (22152)	2	2.3	2	3.1
Alexandria, VA (22301)	1	1.1	2	3.1
Manassas, VA (20112)	2	2.3	1	1.5
Arlington, VA (22202)	3	3.4	0	0.0
Fredericksburg, VA (22401)	3	3.4	0	0.0
Hyattsville, MD (20783)	2	2.3	1	1.5

[a]Values computed based on responses from *all* respondents

[b]Table contains top 11 most frequently reported zip codes. See Appendix C for full list of respondent zip codes.

Table 4.40. What is the highest level of formal schooling you have completed? (Check one.)				
	LSMC[a] (n=87)		**OR**[a] (n=63)	
Level of education	*Frequency*	*Percent*[b]	*Frequency*	*Percent*[b]
Some high school, high school graduate, or GED	3	3.4	4	6.3
Some college, business or trade school	22	25.3	7	11.1
College, business or trade school graduate	24	27.6	22	34.9
Some graduate school	9	10.3	4	6.3
Master's, doctoral or professional degree	29	33.3	26	41.3

[a]Values computed based on responses from *all* respondents.
[b]($\chi^2 = 6.40$, $p = 0.17$)

See Appendices D (Little Stony Man Cliffs) and E (Old Rag) for verbatim responses to Question 41 "Are there any other comments you would like to make regarding rock climbing or your rock climbing trip to Shenandoah National Park today?".

Chapter 5

Results – Visitor Observation at Little Stony Man Cliffs

This chapter includes a manuscript that has been accepted for publication in the *Journal of Park and Recreation Administration* describing the methods, results, and management implications of visitor observation research conducted at Little Stony Man Cliffs between May and September, 2005. The manuscript is expected to appear in issue number four of the *Journal of Park and Recreation Administration* in 2006.

(Running Head: Assessing Recreation Impacts to Cliffs)

Assessing Recreation Impacts to Cliffs In Shenandoah National Park: Integrating Visitor Observation with Trail and Recreation Site Measurements

Kerry T. Wood
Appalachian Trail Conservancy

Steven R. Lawson
Department of Forestry
Virginia Polytechnic Institute and State University

Jeffrey L. Marion
Virginia Tech Field Unit
United States Geological Survey
Patuxent Wildlife Research Center

Address correspondence to Steven R. Lawson, Department of Forestry, Virginia Polytechnic Institute and State University, 307A Cheatham Hall (0324), Blacksburg, VA, 24061, Tel: (540) 231-8303, Fax: (540) 231-3698, email: lawsons@vt.edu

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Executive Summary

The rock outcrops and cliffs of Shenandoah National Park provide habitat for several rare and endangered plant and animal species, including the federally endangered Shenandoah Salamander (*Plethodon shenandoah*; Ludwig et al., 1993). The location of the well-known park tour road, Skyline Drive, along the ridgeline provides exceptional access to many outcrops and cliffs throughout the park for a large number of the park's 1.2 million annual visitors. Consequently, visitor use of cliff areas has led to natural resource impacts, including marked decreases in size and vigor of known rare plant populations. Despite the clear ecological value and potential threats to the natural resources at cliff areas, managers possess little information on visitor use of cliff sites and presently have no formal planning document to guide management. Thus, a park wide study of cliff sites was initiated during the 2005 visitor use season. As part of this research effort, our study used an integrative approach to study recreational use and visitor-caused resource impacts at one of the more heavily visited cliff sites in the park: Little Stony Man Cliffs (LSMC). In particular, this study integrated data from resource impact measurements and visitor use observation to help assess the effects of recreational use on the natural resources of LSMC.

Procedures derived from campsite and trail impact studies were used to measure and characterize the amount of visitor-caused resource impacts on LSMC (Marion & Leung, 2001; Marion, 1995). Visitor use observations were conducted on top of LSMC to document and characterize the type and amount of recreational use the cliffs receive and the behaviors of recreationists that may contribute to cliff-top resource impacts.

Resource impact measurement data show trampling disturbance present at LSMC, characterized by vegetation loss, exposed soil, and root exposure. Documentation of informal trails, soil erosion, tree damage, and tree stumps provide further indicators of resource damage at LSMC. Results of visitor use observation offer several insights into contributory factors of cliff-top resource damage by showing differences in use and behavior between visitor types. The findings from this study suggest that a management approach characterized by visitor education, some site hardening, and concentration of visitor use on durable surfaces, along with the installation of fixed anchors at the top of popular climbing routes is likely to have the greatest success at balancing visitor enjoyment with resource protection at LSMC.

Keywords: Shenandoah National Park, rock climbing, cliff and rock outcrops, resource impact measurements, visitor use observation

Introduction

Shenandoah National Park (SNP) encompasses 70 miles of ridge crest along the Blue Ridge Mountains of Virginia. Rock outcrops and cliffs punctuate the otherwise forested landscape, composing approximately 2% (3920 acres) of the park's 197,000 acres. Previous Virginia Department of Conservation and Recreation (VADCR) survey work at a few of the park's larger rock outcrops documented the occurrence of 28 rare species, including the federally endangered Shenandoah Salamander (*Plethodon Shenandoah*; Ludwig et al., 1993). Furthermore, previous research identified a rare plant community type, the High Elevation Greenstone Outcrop Barren, believed to be endemic to the park (Hilke, 2002).

The location of the world-famous ridgeline parkway, Skyline Drive, makes many outcrops and cliffs within the park readily accessible to the park's 1.2 million annual visitors. Rock outcrops provide vistas for day hikers and backpackers along the park's 500 miles of trails, including the Appalachian National Scenic Trail, which parallels Skyline Drive for the length of the park. Additionally, in the last several years, some cliff areas in the park have become increasingly popular for rock climbing. Consequently, visitor use of cliff areas within the park has led to natural resource impacts such as vegetation damage and loss, soil exposure, compaction and erosion, proliferation of informal (visitor-created) trails, and illegal or poorly located campsites (Hilke, 2002).

Despite the clear ecological value and potential threats to the natural resources at SNP cliff areas, managers possess little information on visitor use of cliff sites and presently have no formal planning document to guide visitor management of the park's cliff resources. Concern over the effects of visitor-caused impacts to cliff areas has prompted

the park to initiate a study of cliff sites and to formulate a Cliff Resource Management Plan. As part of this research effort, the study presented in this paper used an approach that integrates social science and ecological data to help assess the effects of recreational use on the vegetation and soils at one of the most heavily visited cliff sites in the park, Little Stony Man Cliffs (LSMC). In particular, this study integrates data from measurements of resource conditions on cliff-associated trails, recreation sites, and campsites with information collected through direct observations of the amount and type of recreational use, and the behaviors of visitors that might contribute to resource impacts at LSMC. The information from this study will assist the park in managing visitor use and developing a plan that protects the park's cliff resources while providing sustainable opportunities for visitor enjoyment.

Related Literature

Cliff Resource Impacts

Cliffs often support distinctly different plant communities than surrounding environments, largely due to the limited moisture availability, high winds, and limited supply of nutrients characteristic of cliff environments. These unique environmental attributes provide habitat for a relatively narrow range of species adapted to extreme environments (Farris, 1998; Nuzzo, 1996). While adapted to harsh cliff environments, cliff plant species' resistance to other forms of disturbance (e.g., trampling) may be limited (Farris, 1998). Until recently, the inaccessibility and potential danger of most cliffs has provided a protective barrier between plant communities and potentially damaging human activities (Camp & Knight, 1998; Kelly & Larson, 1997; Krajick,

1999). However, the growing popularity of rock climbing means that more people are accessing and using cliff sites, which may negatively affect cliff site plant communities (Camp & Knight, 1998; Farris, 1998, McMillan et al., 2003).

Despite the fact that over 9 million individuals are estimated to participate in rock climbing annually, rock climbing's effects on cliff site environments have received limited attention in the scientific literature (Cordell, 2004; Farris, 1998; McMillan & Larson, 2002). The Access Fund (2001) describes six zones that have the potential to be impacted by rock climbing activities: the approach (access trail), staging area (cliff-bottom), climb (cliff-face), summit (cliff-top), descent (descent trail or rappel route), and campsite. Existing cliff research has generally focused on studying rock climbing-related impacts in the cliff-top, cliff-bottom, and cliff-face zones. Results of these studies have documented negative effects of rock climbing on vascular plant density and/or species richness on cliff-faces (Camp & Knight, 1998; Kelly & Larson, 1997; McMillan & Larson, 1999; Nuzzo, 1995;), on cliff-tops (Kelly & Larson, 1997; McMillan & Larson, 2002) and cliff-bottoms (Camp & Knight, 1998). Additionally, Nuzzo (1996) found lichen cover and frequency to decrease on climbed cliff-faces.

Whereas cliff-face impacts are associated with rock climbers due to technical skill and equipment requirements, the remaining zones are subject to impact by other recreationists such as hikers and backpackers. However, few studies have examined the relative effect of alternative types of recreational use on cliff resources (Parikesit et al., 1995). Rather, it is often inferred, without empirical evidence, that cliff-top and cliff-bottom trampling impacts are caused primarily by rock climbers (Camp & Knight, 1998; Kelly & Larson, 1997; McMillan & Larson, 2002). For example, a letter from Virginia's

Division of Natural Heritage describing the trampling and loss of globally significant cliff-top plant communities at SNP largely attributed the worst damage to "increased heavy use … by large rock-climbing groups" at LSMC, a conclusion reached through intuition rather than empirical evidence. This letter prompted the park to initiate the study presented in this paper.

While the authors of this paper are aware of only one study examining the trampling effects of non-rock climbing recreational activities on cliff resources (Parikesit et al., 1995), a number of studies have been conducted to investigate soil and vegetation trampling impacts to trails and campsites (Cole, 1995; Leung & Marion, 2000; Marion & Cole, 1996). These studies reveal that most vegetation is lost on sites receiving even low levels of visitation, particularly in forested habitats. Procedures used to measure trampling disturbance on trails (Farrell & Marion, 2002; Marion & Leung, 2001) and campsites (Leung & Marion, 2000; Marion, 1995) are reasonably well-developed and are adaptable for measuring cliff-top, cliff-bottom, and descent trail impacts. Thus, procedures designed to measure the total area of trampling disturbance, vegetation loss, and soil exposure on campsites or day-use recreation sites are likely adaptable to measure these and other indicators on cliff-top and cliff-bottom recreation sites. Thus, despite an apparent lack of previous studies evaluating the effects of alternative recreation types on cliff sites, present study methodology and findings from both rock climbing cliff impact studies and trampling literature reviewed above may provide adequate tools for evaluation and documentation of cliff site impacts. This study is designed to adapt and apply these methods and knowledge to assess the extent of resource impacts at LSMC associated with all types of recreational uses, including, but not limited to, rock climbing.

Visitor Observation

As noted, previous studies of recreation-related cliff resource impacts lack a social science component. Thus, it is difficult to draw conclusions from these studies about the relative effect of varying amounts and types of recreational use on cliff resources. Furthermore, it is difficult to assess the extent to which cliff resource impacts might be explained by visitor behaviors. In this study, visitor observations were used to document the amount and type of recreational use of LSMC, and the frequency with which visitors engaged in behaviors that directly impact cliff resources (i.e., trampling soil and vegetation). While the authors know of no published applications of visitor observation methods to studies of cliff resource use in general and rock climbing in particular, a number of studies have documented direct observation procedures and methods designed to collect information about visitor use (e.g., amount, time, location of use, etc.) and visitor characteristics (e.g., type of use, group size, activities, etc.; Hendricks et al., 2001; Keirle, 2002; Muhar et al., 2002; Watson, 2000). Direct visitor observation methods have also been used to study visitors' behavior, including depreciative behavior (Gramann & Vander Stoep, 1986; Hockett, 2000) and visitor etiquette (Hendricks et al., 2001). Furthermore, direct observation methods have been used to study the extent to which visitors engage in behaviors that cause environmental impacts. For example, Johnson and Swearingen (1992) used unobtrusive observation methods to examine the extent to which visitors at Mt. Rainer National Park hiked off-trail, causing the formation of informal trails. Hendricks et al. (2001) conducted unobtrusive observations of mountain bikers on Mt. Tamalpais in Marin County, California to investigate stream protection behavior at a stream crossing. In particular, observers were stationed at the

stream crossing and recorded for each passing mountain biker whether they rode through the stream or crossed the bridge spanning the stream.

The authors are aware of no other studies that have used unobtrusive observation methods in tandem with resource impact measurements to examine how information about visitor use and behavior might be used to explain the extent and character of resource impacts at recreational sites. Thus, the objectives of this study, which are applied and methodological in nature, are designed to address this gap in the literature. From a methodological perspective, the objective of this study is to build on the literature reviewed above by demonstrating a set of procedures to not only document the extent of recreation-related resource impacts associated with cliff recreation, but develop an understanding of visitor use and behavior that helps to explain the occurrence, extent, and location of resource impacts. From an applied perspective, the objective of this study is to integrate measures of resource impacts with information about visitor use and behavior obtained through direct observation to provide park managers with a more informed basis for developing resource protection strategies for LSMC than resource impact measurements or visitor observation behavior would provide alone.

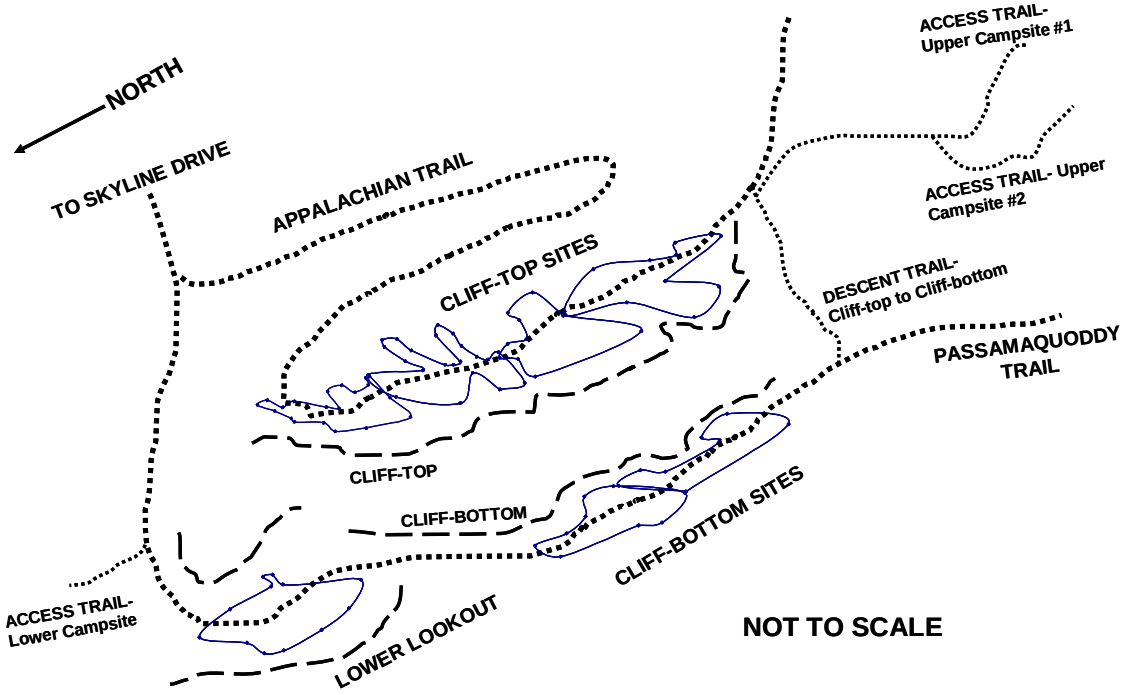
Methods

Study Area

The Little Stony Man Cliffs are one of many greenstone (metamorphosed basalt) cliff formations located within SNP. At an elevation of 3560 feet, these cliffs rise approximately 100 feet, providing visitors with a spectacular view of the Shenandoah Valley to the west and, on clear days, West Virginia. The cliffs are popular among day

hikers and backpackers for the views they afford and among rock climbers, including organized groups, for the easily accessed beginner to intermediate climbing routes (Hilke, 2002). Most visitors access LSMC by taking a short hike on the Appalachian Trail from the Little Stony Man Cliffs trailhead on Skyline Drive (Figure 5.1). During the summer and fall of the 2002 visitor use season, trailhead registers were used to monitor the amount of use of LSMC. The trailhead register data suggested that an average of 49 people visit LSMC per day during the summer and fall seasons (Hilke, 2002). However, observation data collected during eight randomly selected days when trailhead registers were in place suggest that only about 59% of visitors signed in at the register. Thus, after adjusting for non-compliance with the trailhead register, it was estimated that approximately 84 people visit LSMC per day during the summer and fall seasons. While seasonal differences in visitor use levels may occur at LSMC, they were not reported in the study (Hilke, 2002).

Figure 5.1
Little Stony Man Cliffs - Recreation Sites and Trails



The majority of the LSMC cliff-top is characterized by solid rock rising toward the cliff edge at varying heights with a few interspersed patches of vegetation and bare soil. Several day-use recreation sites located along and east of the rocky cliff edge are present on the cliff-top, characterized by a mix of bare soil and trampled vegetation. The Appalachian Trail runs the length of the cliff-top, bisecting the recreation sites which extend west to the cliff edge and east into the forest, and further south to the cliff descent trail and upper campsite access trails (Figure 5.1). The polygons in Figure 5.1 represent the recreation sites that were measured for recreation impacts as part of this study.

The lower portion of LSMC is comprised of two separate areas, both accessed by the Passamaquoddy Trail - a lower lookout perched on top of a small cliff and the cliff-

bottom (Figure 5.1). The lower lookout shares similar characteristics with the cliff-top - a large recreation site perched on top of a cliff. Few patches of vegetation are found at this site and it lacks a forest canopy. The main cliff-bottom is characterized by two recreation sites containing a mix of bare soil and trampled vegetation along with multiple informal trails diverging from the Passamaquoddy Trail to the cliff base.

Three visitor-created campsites are located close to LSMC, accessible by informal (visitor-created) trails connected to the Appalachian or Passamaquoddy Trails (Figure 5.1). Two of the campsites are located south of the cliff-top while the remaining campsite is located to the north of the lower lookout. Each campsite contains at least one core area of disturbance characterized by a combination of bare soil, organic litter and trampled vegetation.

In addition to informal trails associated with recreation sites, one informal descent trail located south and adjacent to LSMC provides quick access between cliff-top and cliff-bottom (Figure 5.1). This badly eroded trail follows a steep drainage ravine consisting of loose soil, rock, and other debris. The soil and rock eroded from this trail have accumulated in a large mound found at the base of the trail where it joins the Passamaquoddy Trail.

Several rare and endangered animal species and plant species and communities are found throughout the LSMC area. The highest occurrence of rare plant species and communities are on the cliff-top and surrounding upper ledges as most species are particularly adapted to the microclimate characteristic of these locations (Hilke, 2002; Nuzzo, 1995). Less frequent concentrations of rare plants are present on the lower lookout and along the cliff-top directly south of LSMC, along the edge of the two upper

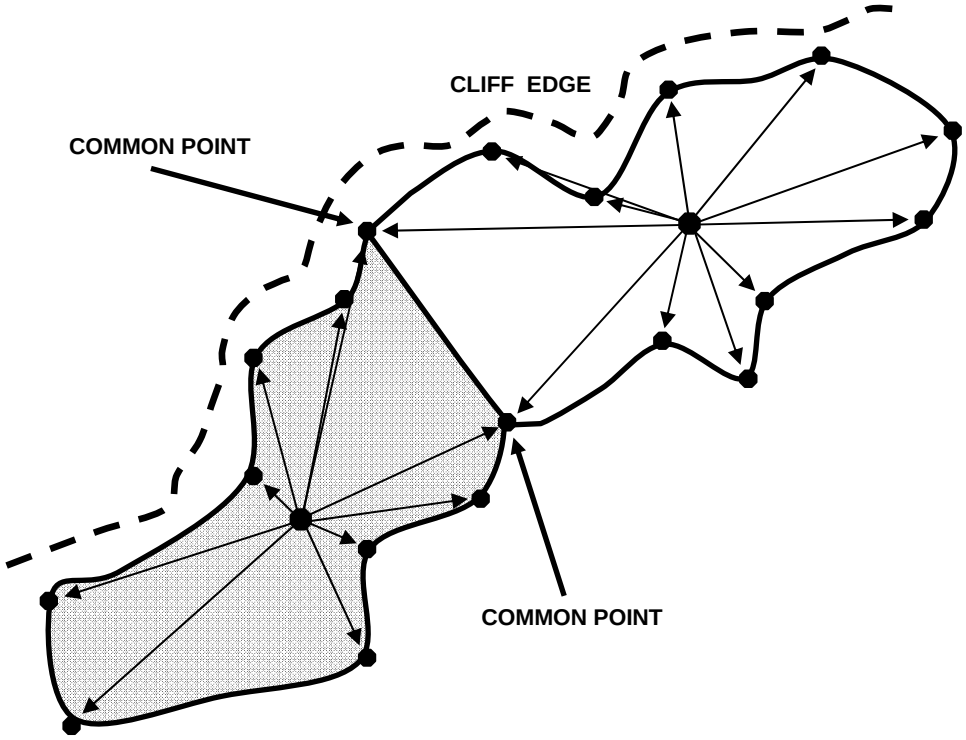
campsites (Figure 5.1). Furthermore, habitat for the globally rare Shenandoah Salamander is believed to be located within proximity of the descent trail to the south of LSMC (Hilke, 2002; Ludwig et al., 1993).

Resource Impact Measurement

In the study presented in this paper, procedures from campsite and trail impact studies were adapted to measure and characterize the extent of resource impacts associated with all types of LSMC recreational uses. Impact indicators assessed at cliff-top and cliff-bottom recreation sites and campsites included area of disturbance, vegetation loss, exposed soil, tree damage, tree stumps, root exposure, number of informal (visitor-created) trails, and expansion potential. Trail condition assessments were also performed on visitor-created trails at LSMC exceeding 10 feet in length (a decision rule to conserve assessment time).

Recreation site and campsite sizes were measured using a variable radial transect method based on measurements of transect lengths and compass bearings radiating from a reference point to site boundaries defined by trampling disturbance (Marion, 1995). Reference points were permanently marked and located using Global Positioning System (GPS) devices. Multiple radial transects that shared common points were used to accurately measure area of disturbance for long linear recreation sites present on both the cliff-top and cliff-bottom (Figure 5.2). Area of disturbance for each radial transect was calculated arithmetically from transect data using Excel spreadsheet formulas.

Figure 5.2
Modified Radial Transect Method Used to Measure Recreation Sites at Little Stony Man Cliffs



Ground vegetation on recreation sites and campsites and in environmentally similar but undisturbed control sites, was assessed using six cover classes (Marion & Cole, 1996). Vegetation loss was calculated by subtracting the onsite coverage class midpoint value from its paired control site coverage class midpoint value, resulting in a percentage of vegetation loss. This percentage value was multiplied by the corresponding area of disturbance to obtain an estimate of the area over which vegetation cover has been lost. The area of exposed soil was also assessed by multiplying the onsite coverage class midpoint value for exposed soil by the corresponding area of disturbance.

Tree damage and root exposure were recorded by category (none/slight, moderate, and severe) for each onsite tree and tree stumps were counted (Marion & Cole, 1996). These indicators were assessed to evaluate potential damage to trees from climbing ropes being tied around them and from intensive foot traffic and associated soil loss. Informal trails that connected with each radial transect were counted, regardless of length. Site expansion potential was assessed for each site based on the extent to which expansion appeared to be inhibited by topography, rockiness, or dense woody vegetation. Impact indicator values reported for LSMC reflect summed totals and mean percentages for all sites according to their location at LSMC (cliff-top, cliff-bottom, campsites, and lower lookout).

The condition of informal trails was assessed using point sampling procedures outlined in Farrell and Marion (2001) and Marion (2006), and included measurement of trail length, width, mean depth, and when depth exceeded one inch, assessments of soil loss since trail creation using a cross sectional area (CSA) procedure. These measurements were taken at transects spaced at fixed intervals along each trail following a randomized start. The number of transects for each trail was proportional to the trail's length. GPS devices were also used to document each trail's location. Trail condition measures were calculated for each trail and for all trails combined, including mean CSA, trail width, and trail depth. Trail length was multiplied by mean trail width to produce estimates of the land area intensively disturbed by trail traffic. CSA soil loss measures at each transect were also extrapolated to provide aggregate estimates of soil loss (ft^3) for each trail.

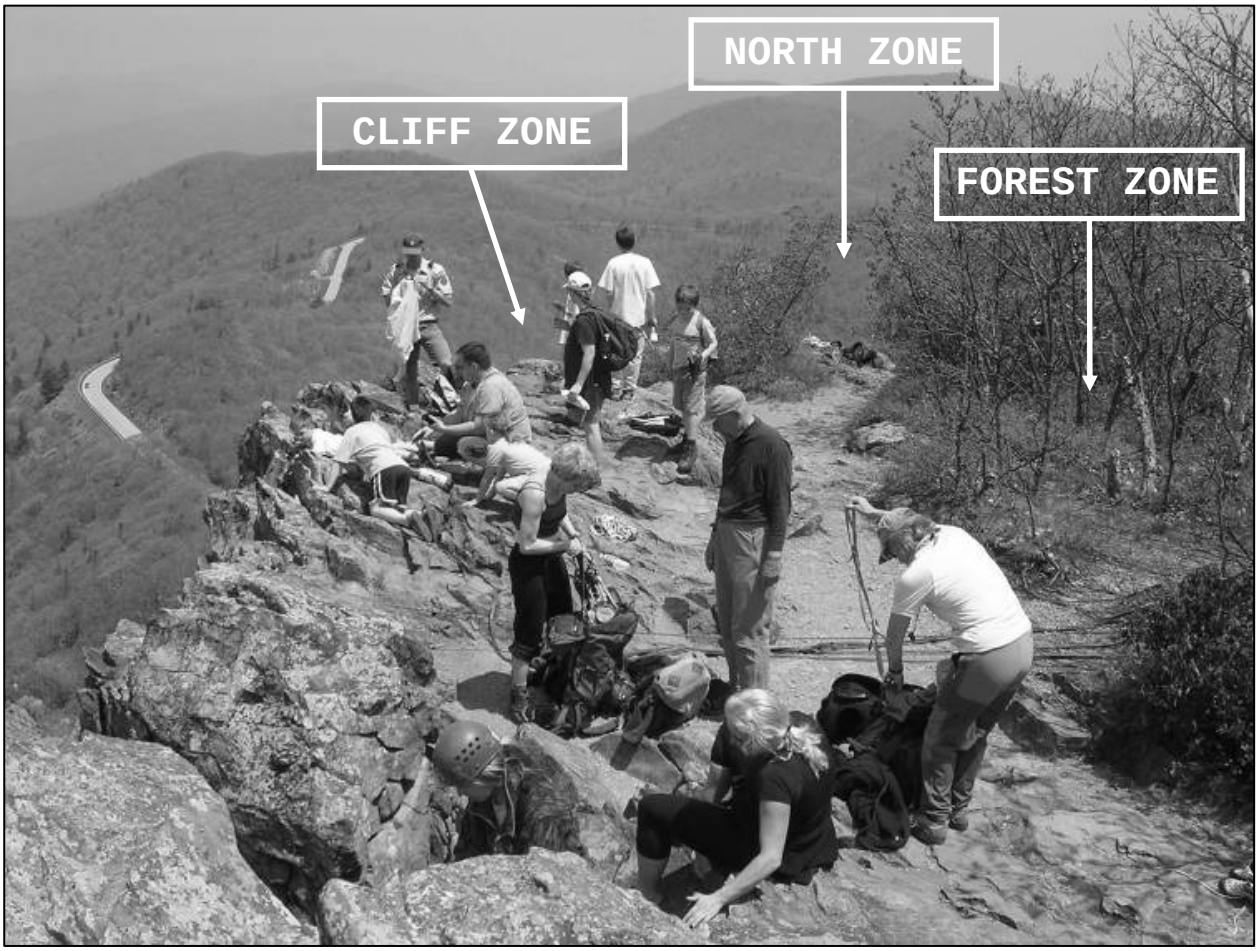
Visitor Observation

Unobtrusive visitor use observations were conducted on 14 randomly selected days between May 27, 2005 and September 10, 2005 on top of LSMC to document and characterize the type and amount of recreational use the cliffs receive and the behaviors of recreationists that may contribute to cliff-top resource impacts. Sampling days were stratified by day of the week and time of day, with morning sampling shifts conducted from 9:00 AM to 2:00 PM and afternoon sampling shifts conducted from 2:00 PM to 7:00 PM. For the purposes of conducting visitor use observations at LSMC, three observation zones were defined: the North, Cliff, and Forest Zones (Figure 5.3). Data collectors were stationed in a fixed location on the cliff-top that provided a view of all three observation zones. Staff conducting the visitor use observations dressed to blend-in with visitors, concealed observation sheets, and conducted observations in a subtle manner to avoid altering visitor behavior.

During the sampling period, five types of visitor use information were collected through direct observation, including the number of people at one time (PAOT) in each of the three observation zones; occurrences of soil/vegetation trampling (Behavior Observations); total daily use of the cliff-top (Total Daily Use); visitors' length of stay on the cliff-top (Length of Stay); and supplemental observations concerning visitor use and behavior.

PAOT and Behavior Observations data were collected concurrently by a single data collector. At the start of each sampling day that PAOT counts and Behavior Observations were collected, the data collector conducted an instantaneous PAOT count and recorded the number and type (i.e., rock climber, day hiker, backpacker) of visitors in

Figure 5.3
Little Stony Man Cliffs Cliff-top Observation Zones, Looking North.



each observation zone. Immediately following the first PAOT count, the data collector randomly selected one individual from among the visitors in the three observation zones. The data collector observed the behavior of the selected participant for five minutes or until he/she was no longer in any of the three observation zones. For the duration of the observation, the data collector recorded whether the individual being observed trampled soil/vegetation, and the location of each "trampling event" observed. At the conclusion of the Behavior Observation, the data collector recorded the type of visitor observed (i.e., rock climber, day hiker, backpacker) and the length of time of the observation. At five

minutes after the first PAOT count, the data collector conducted a second PAOT count and then randomly selected the next subject for Behavior Observation. The data collector continued making PAOT counts every five minutes throughout the sampling day and Behavior Observations during the five minute intervals between PAOT counts.

Length of Stay observations were conducted in tandem with Total Daily Use observations by a single data collector. On each day that Length of Stay and Total Daily Use observations were conducted, the total number and type of visitors entering the study area were tallied and recorded. Visitors who left the observation area and returned at a later time were counted each time they entered the observation area unless the data collector recognized the visitor as having been counted earlier in the sampling shift. In addition, at the start of each sampling day that Length of Stay and Total Daily Use observations were conducted, the data collector selected the first visitor to enter any of the three observation zones. The data collector recorded the type of visitor selected and his/her point and time of entry into the study area. The data collector also recorded the visitor as part of the Total Daily Use count being conducted concurrently with Length of Stay observations, along with all subsequent visitors that entered any of the three study zones while Length of Stay observations were conducted. The data collector observed the selected visitor until he/she left the study area, at which time the data collector recorded the subject's exit point and time, and the total time the visitor was observed in the study area. The data collector then selected the next visitor to enter any of the three observation zones as the subject of the next Length of Stay observation. The process described above was repeated throughout the entire sampling period.

Data collectors recorded supplemental observations concerning visitor use and behavior at the end of each sampling period. Supplemental observations were made on the initial sampling day and on each subsequent sampling day in which previously unrecorded activities and/or behaviors were observed. Data collected as a result of supplemental observations included possible motivations for visitors trampling soil or vegetation. For example, non-rock climbing visitors were observed trampling soil or vegetation in the Forest Zone in an effort to seek shade from the sun and others were observed trampling soil or vegetation in the Cliff Zone to get a closer look at rock climbing activity. Supplemental observations also included notes describing behavioral responses of non-rock climbing visitors to the presence of rock climbing ropes and webbing placed across the Appalachian Trail on the cliff-top. For example, observations of visitors stepping off of the Appalachian Trail into the Forest Zone in order to avoid having to step over the climbing ropes crossing the trail were noted. Data collectors also documented popular climbing routes at LSMC and the location of trees and boulders most often used to construct anchors for each climbing route.

During the first two days of visitor use observations, data were collected by pairs of observers in order to assess the reliability of observation data (excluding supplemental observations) and to make adjustments to data collection procedures as needed to increase the reliability of the observation data. In particular, results of observations from the paired observers were compared to determine whether they were the same or similar. Comparisons of the paired observers' results suggested that all of the measures were being recorded precisely the same by both observers, except measures of soil and vegetation trampling. Specifically, the procedures were originally designed to have

observers record a soil trampling event or a vegetation trampling event when visitors stepped off the trail or bedrock, depending on whether they stepped onto soil or onto vegetation. This procedure was adjusted based on the results of the reliability assessments, which suggested that while it was not difficult for observers to determine when visitors stepped off the trail or bedrock surfaces, it was difficult to distinguish whether they had stepped onto soil or onto vegetation. Consequently, the procedures were revised to have observers record a soil/vegetation trampling event when visitors had stepped off the trail, but not to try to distinguish whether it was soil or vegetation that they had stepped onto. Comparisons of paired observations of the revised soil/vegetation trampling measure suggested that the measure was being recorded precisely the same by both observers.

Results

Resource Impact Measurement

The area of disturbance for LSMC recreation sites and campsites, characterized by bare soil and vegetation loss, total 12817 ft^2 (Table 5.1). The highest percentage (42%) of trampling disturbance was found to occur on the cliff-top while the lower lookout accounted for the lowest percentage (15%). Conversely, percentage of exposed bare soil and vegetation loss estimates were lowest on the cliff-top while the lower lookout was the most heavily impacted site, containing roughly 63% bare soil and accounting for an 83% reduction in ground cover compared to the offsite control. The combined area of disturbance for campsites accounted for nearly 25% of trampling disturbance at LSMC, while percentages of both vegetation loss and bare soil were similar to the cliff-top.

Table 5.1
Impact Indicator Data for LSMC Recreation Sites

Impact Indicator	Cliff-top	Cliff-bottom	Campsites	Lower Lookout	Total
Area of Disturbance (ft^2) [a]	5338	2481	3139	1859	12817
Vegetation Loss (%) [b]	35	46	35	83	
Vegetation Loss (ft^2) [a]	1529	1367	962	1543	5401
Exposed Soil (%) [b]	16	16	21	63	
Exposed Soil (ft^2) [a]	827	943	538	1171	3479
Tree Damage (#)					
Slight	27	9	9	0	45
Moderate	2	6	5	0	13
Severe	0	3	0	0	3
Tree Root Exposure (#)					
Slight	28	14	10	0	52
Moderate	0	1	3	0	4
Severe	0	1	1	0	2
Tree Stumps (#)	4	1	1	0	6
Informal Trails (#)	2	0	4	0	6

[a] Values reported are sums
[b] Values reported are means

All sites where resource impacts were measured contained trees, except the lower lookout site. Within cliff sites where trees are present, most observed tree damage was categorized as none/slight. However, some moderate tree damage was found in all three sites that contained trees, while severe tree damage was observed only at the cliff-bottom. While tree stumps were also observed in all three sites that contained trees, the cliff-top contained the greatest number of stumps and only one stump was observed in each of the other sites. Root exposure was observed within all three sites, but only the cliff-bottom and campsites contained areas with moderate or severe root exposure.

Informal trails were found only on the cliff-top and at the three campsites. The two informal trails on the cliff-top and one informal trail at an upper campsite were less than

10 feet in length, thus condition assessments were not performed on them. However, condition assessments were performed for two informal trails observed at the upper campsites, one for the lower campsite, and the descent trail (Figure 5.1). The condition assessments found that informal trails used to access campsites at LSMC range from 98-169 feet in length, 34-37 inches in width, and have mean trail depths ranging between 1.4-3.2 inches (Table 5.2). Measurements of the descent trail indicate that the trail is 204 feet in length, has a mean width of 115 inches, and a mean trail depth of 16.8 inches. The total surface area of disturbance associated with informal trails is one-quarter (3243 ft^2) the size of the total area of disturbance (12817 ft^2) from recreation sites and campsites. Soil loss on the campsite trails was relatively low, as indicated by mean CSA, ranging from 49 in^2 for the lower campsite trail and 38 in^2 and 144 in^2 for the upper campsite trails, #1 and #2 respectively. Soil loss on the cliff descent trail was much more pronounced, with a mean CSA of 1747 in^2. Additionally, the descent trail made up roughly 82% (2288 ft^3) of the total cumulative soil loss (2803 ft^3) from all informal trails.

Table 5.2
Impact Indicator Data for LSMC Informal Trails

Impact Indicator	Cliff Descent Trail	Lower Campsite Trail	Upper Campsite Trail #1	Upper Campsite Trail #2	Totals
Trail Length (ft)	204	169	141	98	612
Trail Width (in)[a]	115	37	34	45	
Area of Disturbance (ft^2)[b]	1955	521	400	368	3243
Trail Depth (in)[a]	16.8	2	1.4	3.2	
Cross Sectional Area (CSA)					
(in^2)[a]	1747	49	38	144	
(ft^3)[b]	2288	440	21	54	2803

[a]Values reported are means

[b]Values reported are sums

Visitor Observation

Results of pairwise comparisons of average daily use by type of visitor suggest that significantly more hikers ($t=5.43$; $p<0.01$) and backpackers ($t=3.96$; $p<0.01$) visit LSMC during weekdays than rock climbers (Table 5.3). On weekend days, the number of day hikers who visit LSMC is significantly greater than the number of backpackers ($t=-8.60$, $p<0.01$) and rock climbers ($t=10.87$, $p<0.01$) who do so. Furthermore, while average daily backpacking and rock climbing use did not differ significantly between weekend days and weekdays, day hiking use of LSMC was found to be significantly higher on weekends than during the mid-week ($t=-5.41$, $p<0.01$).

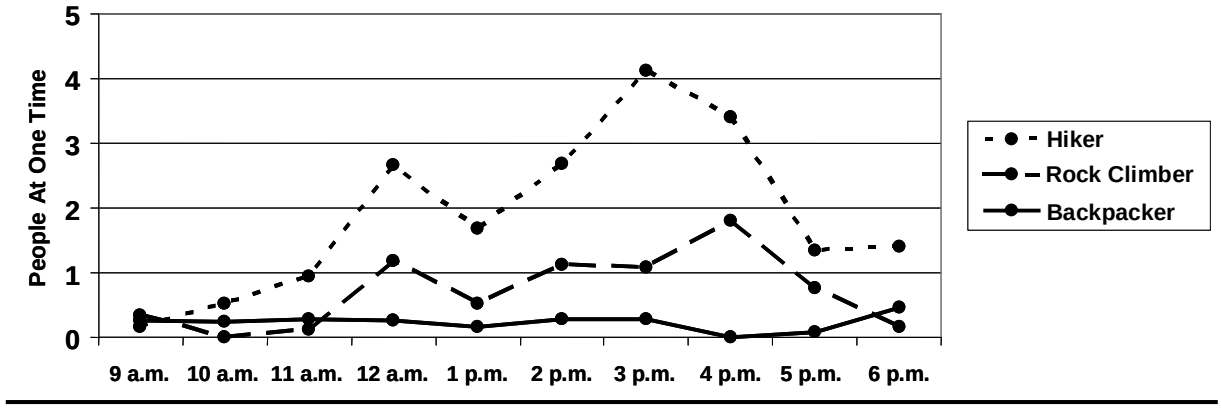
Table 5.3
Mean Total Daily Use on LSMC Cliff-top, by Day of Week and Type of Visitor

	Weekday	Weekend	Pairwise t - tests of weekday vs. weekend daily use
Rock Climber	0.3^{a}	2.7^{a}	$t=-1.64$; $p=0.58$
Hiker	14.5^{b}	48.8^{b}	$t=-5.41$; $p<0.01$
Backpacker	8.0^{b}	7.2^{a}	$t=0.67$; $p=0.98$

Note: Within each column, means with different superscripts are significantly different at $\alpha=0.05$.

Day hiking use of LSMC was found to not only be concentrated more on weekends than weekdays, but also to be unevenly distributed across the hours of the day (Figure 5.4). In particular, day hiking use tends to be bi-modally distributed, with peaks at noon and mid-afternoon. Rock climbing use was observed to follow a similar but less pronounced trend across the hours of the day, whereas backpacking use of LSMC stayed relatively consistent and low throughout the day.

Figure 5.4
Mean Number of People At One Time (PAOT) on Little Stony Man Cliffs Cliff-Top, by Type of Visitor and Time of Day



Results of a one-way ANOVA comparing day hikers, rock climbers and backpackers with respect to mean length of stay indicate that the amount of time visitors spend on the cliff-top varies significantly by type of use ((F=10.62; p<.01). Post hoc tests (Tukey's HSD) suggest that rock climbers, with an average length of stay of 24 minutes, spend significantly more time on the cliff-top than day hikers, who average 9 minutes on the cliff-top, or backpackers, who spend an average of 5 minutes on the cliff-top. Day hikers and backpackers were not found to differ significantly with respect to the amount of time they spend on the cliff-top.

The likelihood of visitors to trample soil and vegetation on the LSMC cliff-top was found to differ by type of visitor (χ^2=10.68; p<0.01; Table 5.4). In particular, 39% of day hikers observed during the study stepped on soil or vegetation, compared with 29% of rock

climbers and 16% of backpackers.

Table 5.4
Percent of Observed Visitors Seen Trampling Soil/Vegetation, by Type of Visitor

Rock Climber (n=62)		Hiker (n=224)		Backpacker (n=51)	
Trampling	No Trampling	Trampling	No Trampling	Trampling	No Trampling
29%	71%	39%	61%	16%	84%

χ^2=10.68; p<0.01

Within each of the three observation zones, day hikers accounted for the majority of soil and vegetation trampling observed, however, rock climbers accounted for about one-quarter of all observations of soil and vegetation trampling in the Forest Zone (Table 5.5). In all three observation zones, backpackers accounted for the least amount of soil and vegetation trampling observed.

Table 5.5
Percent of Observations of Soil/Vegetation Trampling, by Observation Zone and Type of Visitor

Cliff Zone (n=28)			Forest Zone (n=64)			North Zone (n=30)		
RC	H	BP	RC	H	BP	RC	H	BP
7%	89%	4%	27%	67%	6%	0%	90%	10%
χ^2=7.19; p=0.03			χ^2=6.99; p=0.03			χ^2=9.38; p=0.01		

Note: RC=Rock Climber; H=Hiker; BP=Backpacker

Discussion and Management Implications

Resource impact measurement data show trampling disturbance present at all four LSMC sites (i.e., cliff-top, cliff-bottom, lower lookout, and campsites), characterized by vegetation loss, exposed soil, and root exposure. Documentation of informal trails, soil erosion, tree damage, and tree stumps provide further indicators of resource damage at

LSMC. Of most concern are areas of disturbance at the cliff-top, the lower lookout, and the upper two campsites due to the substantial vegetation loss (including rare plants) and degradation/loss of habitat for the rare Shenandoah Salamander (Hilke, 2002; Smith, 2002). The presence of rare plants was noted near the boundaries of each site surveyed and some were located at protected locations within site boundaries. Earlier rare plant surveys had noted substantial expansion of the campsites and vista viewing areas over time and park managers are concerned about continued expansion into known endangered species habitat.

Findings from the visitor use observation work provide insights into factors that may be driving visitor-caused impacts at LSMC and, coupled with the resource impact measurement data, are suggestive of potential management solutions. Roughly one-third of all day hikers and rock climbers observed on the cliff-top of LSMC were seen trampling soil or vegetation. Consequently, as the resource data in this study show, large areas of bare soil and solid rock are already characteristic of the cliff-top. Furthermore, assessments of site expansion potential, which examine barriers to future expansion based on topography and vegetation, suggest that substantial future expansion could occur. Previous recreation ecology research suggests that attempting to address these impacts through use limits would require substantial reductions in use or closure to improve resource conditions under these circumstances (Cole et al., 1987; Cole, 1992; Leung & Marion, 2000). Conversely, educating visitors about rare plants inhabiting LSMC and the consequences of trampling cliff-top vegetation may reduce the amount of travel off existing trails and sites (Cole et al., 1997; Marion & Reid, in press). For example, reduction of instances of trampling may be achieved by communicating minimum impact

hiking practices such as Leave No Trace to visitors (www.LNT.org; Cole et al., 1987). Concentrating visitor use on trampling-resistant natural surfaces or on core bare substrates of existing recreation sites through spatial containment strategies may also reduce the extent of trampling impacts (Cole, 1992; Leung & Marion, 1999; Marion & Farrell, 2002).

Results of the visitor observation work in this study suggest day hiking use constitutes the majority of recreational activity at LSMC and is particularly concentrated on weekends and in the afternoon. Furthermore, day hikers were observed trampling soil and vegetation in all three observation zones more frequently than either rock climbers or backpackers. In addition, supplemental observations found that most day hikers entered LSMC from the north on the Appalachian Trail (Figure 5.1), with many entering the lightly impacted North Zone because it offered the first cliff-top vista. Supplemental observations also suggest that while rock climbers tend to cluster at the top of climbing routes, day hikers were more likely to disperse along the cliff edge during crowded, peak use periods and are the probable cause of the site expansion noted by prior rare plant surveys. Thus, day hikers may have been more likely to trample soil and vegetation in the Cliff Zone as they sought a place to enjoy the cliff-top view away from other visitors. These findings suggest that educational efforts designed to promote low-impact visitor behaviors to minimize soil and vegetation trampling in the North and Cliff Zones might be most productive if they are focused particularly on day hiking visitors. This would require the placement of educational signs onsite, though trailhead placement could also prove effective.

While representing the lowest percentage of overall visitor use of LSMC, rock climbers' generally spend more time on the cliff-top than day hikers or backpackers. Eighty-nine percent of all trampling by rock climbers observed in this study occurred in the Forest Zone. Supplemental observation data suggest the high percentage of trampling by rock climbers in the Forest Zone is largely due to time spent constructing climbing anchors using trees. Resource impact measurements provide additional evidence in support of this explanation for the high percentage of trampling by rock climbers occurring in the Forest Zone. In particular, virtually all bark damage on cliff-top trees occurred at the base of trees and was mostly due to abrasion from ropes used for climbing anchors. However, in contrast to findings of Kelly and Larson (1997), no severe tree damage was found on the LSMC cliff-top as a result of rock climbing use. Thus, efforts to reduce rock climbing-related impacts at LSMC should focus on reducing soil and vegetation trampling in the Forest Zone. For example, the installation of fixed anchors on the cliff-edge would eliminate the need for rock climbers to use trees in the Forest Zone to construct anchors and could therefore substantially reduce trampling in the Forest Zone. In addition, installing fixed anchors on LSMC could minimize damage to cliff-top trees and cliff-edge vegetation caused by rope abrasion (Baker, 1999).

Visitor use of LSMC was found to be unevenly distributed, with day hiking, and to a lesser extent, rock climbing use particularly concentrated on weekends and during the afternoons. Enforcement of and perhaps a reduction in parking capacity at the Skyline Drive parking lot might help reduce use density during peak hours. These actions, combined with site management actions that concentrate use to already impacted

locations on the cliff-top, may reduce the lateral expansion of trampling along the cliff-top.

In contrast to day hikers and rock climbers, results of this study suggest backpackers are less frequent LSMC visitors, spend the shortest length of time at the cliffs, and are less likely to trample soil and vegetation than day hikers and rock climbers. These findings are consistent with the general nature of backpacking, in which people are typically covering relatively long hiking distances and thus may occasionally stop to enjoy the view from LSMC, but often continue down the trail without spending sustained time at the cliffs. Thus, management actions designed to minimize visitor-caused impacts at LSMC should focus primarily on day hikers and rock climbers as described above.

The incidence of informal trails at LSMC is low and accounts for relatively little disturbance with the exception of the descent trail south of the cliffs. The descent trail is characterized by a high rate of erosion resulting in substantial soil loss, the trailside presence of rare plants, and possible degradation of Shenandoah Salamander habitat (NPS, personal communication). Several factors exist that explain such large scale erosion, most importantly its direct ascent/descent alignment to the topography and steep grade, both of which are influential factors in trail erosion (Cole et al., 1987; Marion & Leung, 2001). Given the substantially degraded state of the descent trail and its unsustainable alignment, one possible management response would be to close the trail. However, it is likely that illegal use of the trail would occur unless an alternate but sustainable route was constructed on the opposite end of the cliff. Installation of rock steps would require importing rock from a distance as native rocks in the area provide

habitat for the Shenandoah Salamander. Development of a rappel station with a permanent anchor could also help to reduce descent trail traffic and impact.

While characterized by less severe erosion than the descent trail, informal trails on the cliff-top are cause for concern as they may provide impetus for further site expansion and deterioration of areas containing rare plant populations such as the North Zone (Cole, 1993; Cole et al., 1997; Leung & Marion, 2000). To prevent further site expansion associated with the use of informal trails on the cliff-top, managers might use rocks, natural vegetation, and woody debris to barricade these trails from use by visitors. Educating visitors about the importance of staying on formal trails may also discourage off-trail hiking.

Resource impact data show campsites are large contributors to overall site disturbance at LSMC, accounting for nearly 25% of the total area of disturbance in the study area. Past efforts to reduce or eliminate use of the upper campsites through voluntary compliance have been unsuccessful (NPS, direct communication). Thus, effective reduction of impacts associated with campsite use at LSMC might instead require both limiting the number and size of overnight groups and restricting their use to designated, sustainably designed campsites (i.e., sidehill campsites) located away from the rare plant community along the cliff-top (Hilke, 2002; Leung & Marion, 1999; Marion & Farrell, 2002; Smith, 2002).

From a methodological perspective, standard point sampling trail condition assessment methods were readily adapted for documenting the extent and condition of cliff-related informal trails. The shorter lengths of these trails required the use of variable sampling intervals to match trail length to sampling intensity. Standard campsite

condition assessment procedures were also adaptable in measuring cliff-related recreation sites. The linear spatial arrangement of these sites required use of multiple, arbitrarily defined, recreation sites with findings aggregated by cliff location (e.g., cliff-top, cliff-bottom) for presentation. Use of permanently marked recreation site reference points and GPS technology also enables accurate repeat measurements for the purpose of monitoring changes in these conditions over time. Furthermore, to the best of the authors' knowledge, this is the first study to have adapted visitor observation methods to document recreational use and behavior to help determine the causes of resource impacts in a cliff environment or any other type of recreational area. In particular, techniques used to observe the amount and type of cliff-top recreational use were combined with methods to study LSMC visitor behaviors. Further, supplemental observations were recorded to help explain the quantitative observation results. Findings from the quantitative and supplemental observation data provide a means for interpreting the results of resource impact measurements, resulting in an integrative assessment of cliff resource conditions and recreational use at LSMC.

While this study provides managers quantitative measures of resource impacts at LSMC and insights into visitor use and behaviors that might help explain the extent and character of those resource impacts, there are at least two limitations of the integrative approach used in this study. First, the findings from this study do not provide managers with information about the social acceptability of those resource impacts. Previous studies have examined visitors' perceptions and acceptability ratings of resource impacts, however, this research has focused primarily on resource conditions at backcountry campsites (Farrell, Hall, & White, 2001; Shelby, Vaske, & Harris, 1988). Thus,

additional research on public perceptions and the social acceptability of resource impacts is warranted, particularly efforts to extend this work beyond studies of backcountry campsite impacts. Furthermore, this is an area of research that may be particularly well suited for coupling resource impact assessments with social science research, an integrative research approach advocated for in this paper. For example, Farrell, Hall, & White (2001) examined the relationship between campsite conditions as measured through resource impact assessments and campers' ratings of resource conditions at the campsites in the Mount Jefferson Wilderness, Oregon. Second, while the results of this study inform managers about the probable relative effect of rock climbing, day hiking, and backpacking use on cliff resources at LSMC, the data do not provide a basis for developing a quantitative relationship between the amount and type of recreational use of the LSMC cliff-top and resource degradation. Thus, additional research using experimental methods to establish quantitative relationships between recreational behavior and cliff resource impacts may be warranted. For example, additional studies could be developed by adapting experimental methods for studying vegetation trampling to application at cliff sites (Cole & Bayfield, 1993).

Conclusion

The research presented in this paper addressed important gaps in previous cliff impact studies by broadening the scope to include assessing the effects of non-climbers. This was accomplished by measuring trampling impacts to cliff-related trails, recreation sites, and campsites, and by incorporating visitor observation to gain greater insights into how different use types and behaviors contribute to cliff resource impacts. The documentation

of resource impacts, particularly those which threaten rare and endangered species inhabiting LSMC provides a detailed account of present site conditions in addition to indicators of future conditions if visitor use of the cliff-top proceeds without intervention. Visitor observation offers several insights into contributory factors of cliff-top resource damage by showing differences in use and behavior between visitor types. In particular, in the absence of this observational work, park staff may have incorrectly limited climbing activity which our observations revealed was concentrated at a limited number of climb sites. Day hikers were revealed to be the primary cause for the expansion of the cliff-top vista sites, particularly during peak-use periods when visitors dispersed along the cliff-top to avoid crowding. The findings from this study suggest that a management approach characterized by visitor education, some site hardening, and concentration of visitor use on durable surfaces, along with the installation of fixed anchors at the top of popular climbing routes is likely to have the greatest success at balancing visitor enjoyment with resource protection at LSMC.

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Appendix A

Study Questionnaire and Related Documents

Appendix A.1

Study Questionnaire

Shenandoah National Park
Rock Climber Survey

OMB # 1024-0224 (NPS # 05-200)
Expiration Date: 04/30/2007

Location: _____

Group: _____

Date: _____

ID: _____

Time: _____AM / PM

A. Trip Description

The following questions pertain to your rock climbing trip in Shenandoah National Park <u>today</u>.

1. Including yourself, how many people are in your group today?

Number of people: _____

2. Including yourself, how many people in your group are rock climbing (includes bouldering and/or rappelling) today?

Number of rock climbers: _____

3. Prior to this trip, how did you and your group obtain information about rock climbing in Shenandoah National Park? (Check <u>all</u> that apply.)

____Received no information

____Previous visit(s)

____Friends/relatives

____Outfitter/guide service (Please specify.): _____

____Website (Please specify.): _____

____Guidebook (Please specify.): _____

____Other (Please specify.): _____

4. Which of the following best describes your visit to Shenandoah National Park on this trip? (Check <u>one</u>.)

____Overnight visitor

____Day use visitor (SKIP TO QUESTION 7)

5. **If you are an overnight visitor to Shenandoah National Park, how many nights are you spending in the park on this trip?**

   Number of nights: _____

6. **If you are an overnight visitor to Shenandoah National Park, which of the following overnight accommodations have you or will you use on this trip? (Check <u>all</u> that apply.)**

   ____Car-access campground in the Park

   ____Lodge/cabin in the Park

   ____Backcountry campsite in the Park

   ____Accommodations outside the Park

   ____Other (Please specify.): _____

7. **Which of the following best describes your group? (Check <u>one</u>.)**

Note, organized rock climbing groups are comprised of individuals who, in some way, share a common association. Examples of organized rock climbing groups include but are not limited to rock climbing or outdoor clubs, church groups, camps, and commercially guided groups.

   ____Organized group

   ____Family (SKIP TO QUESTION 13)

   ____Friends (SKIP TO QUESTION 13)

   ____Family and friends (SKIP TO QUESTION 13)

   ____Alone (SKIP TO QUESTION 13)

   ____Other (Please specify.): _____(SKIP TO QUESTION 13)

8. **Shenandoah National Park is interested in conducting outreach with organized rock climbing groups in the future and would like to know the names and locations of organized rock climbing groups visiting the park. If you are part of an organized group, please list the name and location of origin of the group.**

   Name of group: _____

   City and state of origin of group: _____

9. If you are part of an organized group, which of the following best describes your group? (Check one.)

____Church group

____Youth camp

____University climbing/outdoor club

____Commercially guided group

____ Scouts (i.e., Boy Scouts, Girl Scouts, Cub Scouts, etc.)

____Other (Please specify.): _____

10. If you are a part of an organized group, please indicate how many leaders and participants are in your group today including yourself?

Number of leaders: _____

Number of participants: _____

11. If you are a part of an organized group, please indicate whether you are a leader or participant of this group today. (Check one.)

____Leader

____Participant (SKIP TO QUESTION 13)

12. If you are a leader of an organized group, which of the following did you teach participants in your group prior to or during this visit to Shenandoah National Park? (Check <u>all</u> that apply.)

____Minimum-impact rock climbing practices

____Rock climbing etiquette

____Rock climbing safety

____Rock climbing skills/techniques

____Other (Please specify.): _____

B. Previous Rock Climbing Experience and Involvement

13. At which of the following locations in Shenandoah National Park have you rock climbed today or on previous visits? (Check all that apply.)

____Little Stony Man

____White Oak Canyon

____Old Rag Mountain

____Blackrock/Split Rock

____Mount Marshall

____Mary's Rock

____Other (Please list): _____

14. Have you ever previously visited Shenandoah National Park to rock climb? (Check one.)

____Yes

____No (SKIP TO QUESTION 17)

15. If you have previously rock climbed in Shenandoah National Park, approximately how many times have you visited Shenandoah National Park to rock climb including this trip?

____2-5 times

____6-10 times

____11-20 times

____more than 20 times

16. During which season do you rock climb in Shenandoah National Park <u>most often</u>? (Check <u>one</u>.)

____Fall (Oct.-Nov.)

____Winter (Dec.-Feb.)

____Spring (Mar.-May)

____Summer (June-Sept.)

17. Approximately how many years have you been rock climbing?

Years: _____

18. How would you describe your current knowledge of minimum impact or Leave No Trace (LNT) <u>rock climbing</u> practices? (Check <u>one</u>.)

____No knowledge

____Novice

____Intermediate

____Advanced

____Expert

19. Please rate your ability for the following climbing activities? (Circle <u>one</u> number for each type of climbing activity.)

	No Experience	Novice	Intermediate	Advanced/ Expert
Bouldering	1	2	3	4
Top-roping	1	2	3	4
Gym climbing	1	2	3	4
Traditional climbing	1	2	3	4
Sport climbing	1	2	3	4
Ice climbing	1	2	3	4
New route development and/or bolting	1	2	3	4

20. Which of the following <u>best</u> describes you as a rock climber? (Check <u>one</u>.)

____Sport climber

____Traditional rock climber

____Boulderer

____Indoor/gym climber

____Rappeller

____Don't know/not sure

____Other (Please specify.):_____

21. Do you belong to any rock climbing or conservation organizations (e.g. Access Fund, Sierra Club, Appalachian Trail Conservancy)?

____Yes

____No

22. What is the approximate retail value of all the rock climbing equipment you have ever purchased? (Only include equipment you use solely for rock climbing purposes.)

____ I do not own any rock climbing equipment

____Less than $100

____$100 to $249

____$250 to $499

____$500 to $1,000

____More than $1,000

23. Have you ever participated in a volunteer service project at a rock climbing area?

____Yes

____No (SKIP TO QUESTION 25)

24. If you have ever participated in a volunteer service project at a rock climbing area, please specify the name of the climbing area and the year of the <u>most recent</u> service project you participated in.

Name of rock climbing area: _____

Year of most recent project: _____

C. The Rock Climbing Experience

In this section, we are interested in your thoughts about the rock climbing experience you had during your visit to Shenandoah National Park today.

25. People have many potential reasons for rock climbing. We would like to know what motivated you to rock climb at Shenandoah National Park today. Please indicate how important each of the experiences listed below was to you as a reason to rock climb today. (Circle <u>one</u> number for each item.)

	Not at all Important				Somewhat Important	Extremely Important
To view the scenery	1	2	3	4	5	
To use my equipment	1	2	3	4	5	
To learn new skills	1	2	3	4	5	
To be with people who enjoy the same things I do	1	2	3	4	5	
To get exercise	1	2	3	4	5	
To experience solitude	1	2	3	4	5	
To teach my rock climbing skills to others	1	2	3	4	5	
To test my abilities	1	2	3	4	5	
To get away from the usual demands of life	1	2	3	4	5	
To be close to nature	1	2	3	4	5	
To be challenged	1	2	3	4	5	

26. How much of a problem do you think the following issues are at Shenandoah National Park? (Circle <u>one</u> number for each item.)

	Not a Problem				Big Problem	Don't Know
Large numbers of bolts on climbing routes	1	2	3	4	5	DK
Tree damage caused by climbers using trees as anchors	1	2	3	4	5	DK
Erosion/trampling impacts caused by rock climbing use	1	2	3	4	5	DK
Too many visitor-created trails to climbing areas	1	2	3	4	5	DK
Other groups leaving ropes/equipment on routes that are not being used	1	2	3	4	5	DK
Crowding at climbing areas	1	2	3	4	5	DK
Too many large rock climbing groups	1	2	3	4	5	DK
Too many organized rock climbing groups	1	2	3	4	5	DK
Long wait-time for preferred climbing routes	1	2	3	4	5	DK
Disturbances to wildlife caused by rock climbing use	1	2	3	4	5	DK
Damage to historical and/or archeological sites caused by rock climbing use	1	2	3	4	5	DK
Lack of overnight camping near the climbing areas	1	2	3	4	5	DK

D. Rock Climbing Management

In this section, we are interested in your attitudes about rock climbing management at Shenandoah National Park.

27. Please indicate the extent to which you would support or oppose each of the following potential rock climbing management actions at Shenandoah National Park. (Please circle <u>one</u> number for each item.)

	Strongly Oppose		Neither Oppose nor Support		Strongly Support	Don't Know/ Not Sure
Provide more information regarding minimum-impact climbing practices	1	2	3	4	5	DK
Provide more information on climbing areas and routes	1	2	3	4	5	DK
Provide fixed anchors at the top of climbs to minimize resource impacts	1	2	3	4	5	DK
Require climbers to use designated trails to access climbing areas	1	2	3	4	5	DK
Limit the size of rock climbing groups	1	2	3	4	5	DK
Require leaders of organized groups to attend a program in the park on minimum impact climbing as part of the permit process	1	2	3	4	5	DK
Limit the number of permits issued to organized groups	1	2	3	4	5	DK
Require organized groups to climb only during specially designated dates and times	1	2	3	4	5	DK
Require organized groups to climb in specially designated climbing areas	1	2	3	4	5	DK

Continued on next page

	Strongly Oppose		Neither Oppose nor Support		Strongly Support	Don't Know/ Not Sure
Allow unregulated bolting of climbing routes	1	2	3	4	5	DK
Require a permit to place bolts on climbing routes	1	2	3	4	5	DK
Limit the placement of bolts to specified areas	1	2	3	4	5	DK
Prohibit the placement of bolts on climbing routes throughout the Park	1	2	3	4	5	DK
Close climbing routes in areas where climbing use is causing impacts to cultural/archeological resources	1	2	3	4	5	DK
Close climbing routes in areas containing sensitive rare plant species	1	2	3	4	5	DK
Temporarily close areas to climbing use during critical wildlife seasons (e.g., nesting, breeding)	1	2	3	4	5	DK

28. Did you encounter any other rock climbers at the base or top of climbs during your visit to Shenandoah National Park today?

____Yes

____No

29. How crowded did you feel while rock climbing in Shenandoah National Park today? (Circle <u>one</u> number.)

1	2	3	4	5	6	7	8	9
Not at all Crowded		Somewhat Crowded			Moderately Crowded		Extremely Crowded	

E. Organized Rock Climbing Groups

In this section we are interested in your thoughts about organized rock climbing groups.

30. Please indicate the extent to which you agree or disagree with each of the following statements about organized rock climbing groups. (Circle <u>one</u> number for each item.)

Note, organized rock climbing groups are comprised of individuals that, in some way, share a common association. Examples of organized rock climbing groups include but are not limited to rock climbing or outdoor clubs, church groups, camps, and commercially guided groups.

	Strongly Disagree		**Neutral**		**Strongly Agree**	**Don't Know**
Organized groups are an effective way to introduce people to the sport of rock climbing	1	2	3	4	5	DK
Organized groups are a safety concern	1	2	3	4	5	DK
Organized groups are an effective way to educate rock climbers about rock climbing ethics	1	2	3	4	5	DK
Organized groups cause conflict with other climbers	1	2	3	4	5	DK
Organized groups are an effective way to increase public support for rock climbing	1	2	3	4	5	DK
The presence of organized groups detracts from my climbing experience	1	2	3	4	5	DK
Organized groups are an effective way to teach rock climbers safe rock climbing practices	1	2	3	4	5	DK
Organized groups cause no more environmental impact than other climbers	1	2	3	4	5	DK
Organized group use of climbing areas at Shenandoah National Park is a problem	1	2	3	4	5	DK

31. Have you ever encountered an organized rock climbing group on any rock climbing trip (including places other than Shenandoah National Park)?

____Yes

____No

32. Did you encounter any organized rock climbing groups during your visit to Shenandoah National Park today?

____Yes

____No (SKIP TO QUESTION 35)

33. Which of the following best describes your encounter with an organized rock climbing group or groups today?

____My encounter with an organized rock climbing group or groups today added to the quality of my experience (SKIP TO QUESTION 35)

____My encounter with an organized rock climbing group or groups today neither added to nor detracted from the quality of my experience (SKIP TO QUESTION 36)

____My encounter with an organized rock climbing group or groups today detracted from the quality of my experience today

34. If your encounter with an organized rock climbing group or groups today detracted from the quality of your experience, please indicate which of the following issues you thought were a problem. (Check <u>all</u> that apply.)

____An organized group or groups caused crowding in the area where I was climbing (SKIP TO QUESTION 36)

____An organized group or groups left ropes on climbing routes they were not using (SKIP TO QUESTION 36)

____An organized group or groups practiced unsafe climbing techniques in the area where I was climbing (SKIP TO QUESTION 36)

____An organized group or groups failed to use minimum impact climbing practices (SKIP TO QUESTION 36)

____Other (Please specify.):_____(SKIP TO QUESTION 36)

35. If your encounter with an organized rock climbing group or groups today added to the quality of your experience, please indicate which of the following factors added to your experience. (Check <u>all</u> that apply.)

____An organized group or groups provided useful information to me about rock climbing in Shenandoah National Park

____I was pleased to observe leaders of the organized group or groups I encountered instructing participants in minimum impact climbing practices

____The members of the organized group or groups I encountered demonstrated good climbing ethics

____An organized group or groups provided me with first aid supplies/help

____I was pleased to observe leaders of the organized group or groups I encountered instructing participants in safe climbing practices

____I was please to observe members of an organized group or groups being introduced to the sport of rock climbing

____Other (Please specify.): _____

G. Background Information

The information in this section will help us better understand who is rock climbing in Shenandoah National Park. Your responses to the questionnaire are strictly confidential and results of this section will only be reported as overall averages.

36. What is your sex? (Check <u>one</u>.)

____Male

____Female

37. In what year were you born?

Year born: _____

38. If you live in the United States, what is your state and zip code of residence?

State of residence: _____

Zip code of residence: _____

} (SKIP TO QUESTION 40)

39. If you do not live in the United States, what country do you live in?

Country of residence: _____

40. What is the highest level of formal schooling you have completed? (Check <u>one</u>.)

____Some high school

____High school graduate or GED

____Some college, business or trade school

____College, business or trade school graduate

____Some graduate school

____Master's, doctoral or professional degree

41. Are there any other comments you would like to make regarding rock climbing or your rock climbing trip to Shenandoah National Park today?

_____

_____

_____

_____

Thank you for your help with this survey!
Please return the completed questionnaire to the survey administrator.

Please address correspondence regarding the survey to:

Dr. Steven R. Lawson
307 Cheatham Hall (0324)
Department of Forestry
Virginia Polytechnic Institute and State University
Blacksburg, VA 24060

PRIVACY ACT and PAPERWORK REDUCTION ACT statement: 16 U.S.C. 1a-7 authorizes collection of this information. This information will be used by park managers to better serve the public. Response to this request is voluntary. No action may be taken against you for refusing to supply the information requested. The permanent data will be anonymous. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. BURDEN ESTIMATE statement: Public reporting burden for this form is estimated to average 15 minutes per response. Direct comments regarding the burden estimate or any other aspect of this form to the Information Collection Clearance Officer, WASO Administration Program Center, National Park Service, 1849 C Street, N.W., Washington, D.C. 20240.

Appendix A.2

Survey Refusal Log

Shenandoah National Park Rock Climber Survey
Refusal Log

Surveyor: _____ Date: _____

Location: _____ Weather: _____

Time	Sex (M or F)	Group Size	Refuse

Appendix A.3

Onsite Contact Sheet – Mailback Respondents

Shenandoah National Park Rock Climber Survey
Onsite Contact Sheet (Mail-back Respondents)

Date: _____

Location: _____

Group: _____

ID: _____

Name: _____

Mailing Address:
_____
_____
_____

Appendix A.4

Postcard Reminder/Thank You – Mailback Respondents

Shenandoah National Park Rock Climber Survey
Postcard Reminder/Thank-you

March 30, 2005

Last week a questionnaire seeking information about your recent rock climbing trip to Shenandoah National Park was mailed to you. Upon contact at the trailhead you expressed a willingness to complete and mail back the questionnaire.

If you have already completed and returned the questionnaire to us, please accept our sincere thanks. If not, please do so today. We are especially grateful for your help because it is only by asking people like you to share your experiences and opinions about rock climbing in Shenandoah National Park that the National Park Service can understand and better serve visitors. The information gained from this survey will be utilized by the National Park Service for the purpose of writing a cliff resource management plan.

If your questionnaire was misplaced, please call us at 540-231-8303 and we will get another one in the mail to you today.

Steven R. Lawson, Associate Professor
Department of Forestry
Virginia Polytechnic Institute and State University
Blacksburg, VA 24060

Kerry T. Wood, Graduate Research Assistant
Department of Forestry
Virginia Polytechnic Institute and State University
Blacksburg, VA 24060

Appendix B

Visitor Observation Forms
Little Stony Man Cliffs

People At One Time (PAOT)/Behavior Observation Form

Rope Across Trail		
ID	Start	End

PAOT & Behavior Observations at Little Stony Man Cliff Area

Date: __________ Weather/Temp: __________

Day of Week: __________ Observer: __________

Start Time: __________ End Time: __________

	Cliff Zone				North Zone				Forest Zone			
Time	B	RC	H	BP	B	RC	H	BP	B	RC	H	BP

	Visitor	Cliff Zone				North Zone				Forest Zone				Time	% V/S
ID	Type	OS	OV	PV	TO	OS	OV	PV	TO	OS	OV	PV	TO	(min.)	(min.)

B= Belayer RC= Rock Climber
H= Hiker BP= Backpacker

OS= On Soil OV= On Vegetation
PV= Picking Vegetation TO= Throwing Object
% V/S= % time (min.) impacting vegetation or soil

Total Daily Use/Length of Stay Observation Form

Sheet ___ of ___

Total Visitor Use & Length of Stay Observations
At Little Stony Man Cliff Area

Date: _________
Day of Week: __________
Start Time: __________

Weather/Temp: __________
Observer: __________
End Time: __________

Total Visitor Use Tally

Rock Climber	Hiker	Back-packer	Other

Length of Stay Observations

	Visitor Type (RC=rock climber, H=hiker, BP= backpacker)			Entry/Exit Point (N=north, S=south, C=cliff)		Time in Cliff Area (h:mm)	
ID	RC	H	BP	Enter	Exit	Start	End

Appendix C

Zip Codes of Residence

Table C.1. If you live in the United States, what is your state and zip code of residence?				
	LSMC		**OR**	
Zip code of residence	*Frequency*	*Percent*	*Frequency*	*Percent*
22903	3	3.4	3	4.6
20164	0	0.0	4	6.2
22182	0	0.0	4	6.2
22901	4	4.5	1	1.5
22152	2	2.3	2	3.1
22180	3	3.4	1	1.5
22301	1	1.1	2	3.1
20112	2	2.3	1	1.5
20783	2	2.3	1	1.5
22202	3	3.4	0	0.0
22401	3	3.4	0	0.0
20001	0	0.0	2	3.1
20191	0	0.0	2	3.1
20816	0	0.0	2	3.1
20852	0	0.0	2	3.1
21228	0	0.0	2	3.1
23185	0	0.0	2	3.1
20010	1	1.1	1	1.5
21043	1	1.1	1	1.5
21231	1	1.1	1	1.5
22033	1	1.1	1	1.5
22201	1	1.1	1	1.5
22204	1	1.1	1	1.5
22209	1	1.1	1	1.5
22601	1	1.1	1	1.5
23692	1	1.1	1	1.5
20016	2	2.3	0	0.0
20659	2	2.3	0	0.0
22902	2	2.3	0	0.0
22936	2	2.3	0	0.0
23320	2	2.3	0	0.0
23901	2	2.3	0	0.0
27312	2	2.3	0	0.0
14527	0	0.0	1	1.5
20009	0	0.0	1	1.5
20017	0	0.0	1	1.5
20120	0	0.0	1	1.5
20171	0	0.0	1	1.5

Table C.1. If you live in the United States, what is your state and zip code of residence?				
	LSMC		**OR**	
Zip code of residence	*Frequency*	*Percent*	*Frequency*	*Percent*
20186	0	0.0	1	1.5
20187	0	0.0	1	1.5
20190	0	0.0	1	1.5
20705	0	0.0	1	1.5
20850	0	0.0	1	1.5
20901	0	0.0	1	1.5
20906	0	0.0	1	1.5
21108	0	0.0	1	1.5
21122	0	0.0	1	1.5
22027	0	0.0	1	1.5
22042	0	0.0	1	1.5
22079	0	0.0	1	1.5
22193	0	0.0	1	1.5
22303	0	0.0	1	1.5
22312	0	0.0	1	1.5
23505	0	0.0	1	1.5
23602	0	0.0	1	1.5
63108	0	0.0	1	1.5
10803	1	1.1	0	0.0
17268	1	1.1	0	0.0
20002	1	1.1	0	0.0
20008	1	1.1	0	0.0
20024	1	1.1	0	0.0
20124	1	1.1	0	0.0
20130	1	1.1	0	0.0
20143	1	1.1	0	0.0
20155	1	1.1	0	0.0
20170	1	1.1	0	0.0
20629	1	1.1	0	0.0
20905	1	1.1	0	0.0
20910	1	1.1	0	0.0
20912	1	1.1	0	0.0
21093	1	1.1	0	0.0
21204	1	1.1	0	0.0
21207	1	1.1	0	0.0
21217	1	1.1	0	0.0
21217	1	1.1	0	0.0
21218	1	1.1	0	0.0
22003	1	1.1	0	0.0

Table C.1. If you live in the United States, what is your state and zip code of residence?				
	LSMC		**OR**	
Zip code of residence	*Frequency*	*Percent*	*Frequency*	*Percent*
22066	1	1.1	0	0.0
22101	1	1.1	0	0.0
22107	1	1.1	0	0.0
22153	1	1.1	0	0.0
22302	1	1.1	0	0.0
22305	1	1.1	0	0.0
22306	1	1.1	0	0.0
22314	1	1.1	0	0.0
22405	1	1.1	0	0.0
22900	1	1.1	0	0.0
22923	1	1.1	0	0.0
22971	1	1.1	0	0.0
23005	1	1.1	0	0.0
23188	1	1.1	0	0.0
23221	1	1.1	0	0.0
23223	1	1.1	0	0.0
23294	1	1.1	0	0.0
23960	1	1.1	0	0.0
24060	1	1.1	0	0.0
24330	1	1.1	0	0.0
60505	1	1.1	0	0.0

Appendix D

Open-Ended Responses Concerning Any Additional Comments
Little Stony Man Cliffs

Open-ended responses for the following question:

Are there any other comments you would like to make regarding rock climbing or your rock climbing trip to Shenandoah National Park today?

Little Stony Man Responses

Enjoyed it immensely. This was my 1st time rock climbing, and I would love to try it again!!

Beautiful spot. If everyone is being safe, the more the merrier.

First time and it was a great experience. We met an organized group that was very helpful in terms of instruction and support. It was a bit crowded though.

Excellent day! Lovely. Please be cautious in your attempts to control it.

Bolting top anchors and sport routes will make the sport safer.

Looking forward to better guard books!

Train group leaders in LNT; if you allow bolting, than heavily regulate it.

Had fun – It was a great day – Thanks!

Rock climbing will challenge and bring together the participants on Project Marj. Little Stony Man is a convenient place to do this while enabling students to backpack also.

The impact of Day hikers (non-climbing) has an impact on cliff top areas. Note the debris and impact on Big Stony Man and it is only a hiking destination.

In the past, rock climbing at Little Stony Man - found amounts of human waste around the climb site, uncovered.

My experience in SNP covers several years so my exposure to other climbers has been minimal. Large groups are only an issue when they're loud and when they set up multiple routes without using them right away. I strongly support the care of nature over my ability to climb somewhere. I didn't move to VA to climb – I moved here to enjoy the scenery and natural habitat.

I find the rock climbing 'situation' in SNP to be quite satisfying – still a quiet, peaceful experience, particularly at Old Rag where the climbing areas are so spread out that you can just step off the Ridge/Saddle Trails and disappear…

It was fun!

Nice weather today – Stellar!!

I believe Little Stony Man Cliff is a great place to teach beginner level climbing. Bolting the rock would add an entire new population of sport climbers. I would like to see the cliffs left in their natural state – environmentally and socially.

It is fun and educational.

It is a beautiful park and I would love to come back as soon as possible! Thank you!

I really enjoyed the seclusion while rock climbing – seems like this is the best kept secret.

This is a great place to climb.

A nice place to climb – good scenery.

Hard to be too critical of organized groups when I was in one.

Don't organize it too much.

Very nice!

At this point, I don't believe rock climbing presents a problem in the park. In my experience the number of climbers here is small.

Good Climbing.

I love it here.

It was great.

It is a beautiful place to climb.

Would support etiquette program by park; Climbers (low impact) has no more impact than hikers; If regulated – do no more than you would with hikers and campers.

Thanks, let me know results.

What I like most about climbing here is that the place is not so well known despite good quality climbing. I want it to remain unnoticed by deliberate effort to publicize less and keep the area from crowds. Thank you for the work!

Climbing is fun but the environment is far more important.

Thanks.

It is an amazing way to challenge yourself and appreciate the beauty of nature!!

Great day in the woods – enjoyed chatting with the surveyors.

Very fun.

Make trail maps for Old Ridge and other rock climbing areas.

Fun!

Personally I prefer to be taught by a friend who is a good climber. Organized groups are a good alternative for those who don't know any climbers. I feel very strong that places should be kept clean, that nothing should be disturbed, etc., but I don't consider any fixed anchors to be a problem. Many of the questions on the environment impact seem to be out of proportion compared to the impact caused by cars and road construction.

The $10 entrance fee detracted from the experience a wee bit but if it goes towards trail maintenance and things like that it is well spent. I simply don't believe in charging a fee to experience nature's finest!

Providing fixed anchors at the top of many routes would promote safety, reduce impact of anchoring and improve the experience (we would get more climbs in a trip).

I wrote a note about City of Rocks, New Mexico earlier - they opened it to climbers three years ago and created amazing safe climbs. Fixed anchors would be tremendous.

Little Stony Man Cliffs is a fantastic place to introduce kids to climbing. Good longish climbs, beautiful view, great camping ½ mile south, glad to be at Little Stony Man.

Thank you for doing this! It will be a great resource. I am working on an undergraduate degree in geology at Earlham College in Indiana, and I would love to help out if possible. Please contact me if you need help. I have spoken with Steve Bair about a possible SCA position and he was very supportive. Thank you!

This is a fantastic place to climb – I'm coming back!

Appendix E

Open-Ended Responses Concerning Any Additional Comments
Old Rag

Open-ended responses for the following question:

Are there any other comments you would like to make regarding rock climbing or your rock climbing trip to Shenandoah National Park today?

Old Rag Responses

Perhaps allow or require permits for the guides or leaders of groups – like Seneca Rocks "guiding permit only" type deal, not many people climb here generally I think though.

Marking and defining trails more clearly would make climbing here more enjoyable. Make a more developed guide book specific to Old Rag.

Everything is well managed and great the way it is, a fine experience.

My first time climbing at Old Rag. – it was great fun.

Educating group leaders on NTLB is a great idea! For some, group climbing is effective for learning while for others little is effective. Climbers are individuals but most have the best interest of the earth when out.

I've had a wonderful time.

I love it!

I love Old Rag. – the scenery, the quiet, the wilderness, and the relative solitude.

We enjoyed it!

NPS current policy banning mechanized hammer drills effectively limits bolt placement to only those placements critical for safety. It is also a lot of work to place a bolt by hand drill in granite. I believe these two factors will contribute to keep the number of bolts low at Old Rag. and climbing will develop in a slow and environmentally friendly sustainable way.

5.11a is HARD.

The side trail to/from rock area we climbed was very difficult to find, i.e. did <u>not</u> indicate over use. Condition at base of rock showed some impact but, in my opinion, acceptable – no erosion, trash, chopped up or broken vegetation. I would support a marked, formal trail to the climb areas. <u>Lower Sunset Wall</u>.

Do not close any of Great Fall's N.P. to any climbing activity. New permit should be required. Rare species is a farce! Safety concerns are bogus! That park is historically significant for climbing.

More resources on safe climbing area will help out climbers and keep them safe.

The guide we bought, a little misleading. Weather was great, had some good luck with the faces we chose.

Better trail access.

Small outhouse hallway or at the top that prevents tissue being left in the forest – very helpful for girls and people would be able to be better hydrated. Thank you!

I have never seen crowds climbing at Old Rag. In regard to your questions on groups, the responsibility/maturity/knowledge of groups (<u>especially</u> commercial) can vary significantly. If issues are identified, climbers and climbing groups such as the Access Fund, AMC, PATC, are typically more than willing to work with the Park to resolve the issues, provided information, or organize volunteers.

Improved trails to the climbing area (e.g. 'Reflector Oven' area) would minimize erosion/damage potential.

Thanks.

There is some great climbing here (Old Rag.). Trails instead of bushwhacking and trampling plants would help for some of the more "off the beaten path" areas. This place is great.

Access to rock climbing area at least on Old Rag Mountain is generally very poor.

Climbing at Old Rag: probably won't do it again; approach is long; there are no trails established to the climbs; finding them is difficult.

Had a great time! Great place to climb/hike.

Rock climbs are very clean.

I am for <u>some</u> development.

I think there should be better guide books; helps everyone. ☺

Old Rag is beautiful and the hike does a great job of regulating impact.

The climbing at Shenandoah will always be self-regulating. First of all, it's not very good on any standard. Second, the access isn't easy on Old Rag.

Rock climbing has little impact on SNP compared to hikers and cars.

Routes were difficult to find and did not seem to be used very often.

Looking forward to doing it next month.

More information about climbing sites.

On the whole, rock climbers are sensitive to cultural and environmental impact. Aggressive P.R. would significantly alleviate problems in these areas.

Great wilderness climbing. Doesn't need excessive regulation. No permits for access on bolting.

Do not limit climbing.

Nice day! I love climbing at Old Rag.

I have climbed/rappelled/backpacked in SNP for years. I am a thru hiker of the A.T. I understand backcountry regulations and make sure to the best of my ability that my group always abides the rules.

Appendix F

Verbatim Informal Observations
Little Stony Man Cliffs

5/29/05

"3 other climbing groups south of observation area."

"Hikers picnicking in forest zone (6 to 8 people)."

"Climbers (south) gear spread out through forest zone & hanging in trees."

"Trees in forest zone slung with ropes/webbing for anchors using multiple rap method."

5/30/05

"Low number of people (looks like rain)."

"Hikers in forest zone to take pictures of people on cliff-edge."

6/10/05

"Family of three ate lunch in forest zone, presumably for the shade. They were there for 10 minutes."

"Saw three thru-hikers, sat on rocks and rested for a bit."

"Hikers go into north zone 1st, don't know the rest of the cliffs exist, trample grass, etc."

6/11/05

"Rock climbers did not know where climbs on cliffs were or where to anchor. Both seem new to the sport and have little experience. More information about climbing here would most likely help."

"Tourists seem to enjoy watching/learning about rock climbing. Don't mind stepping over webbing etc. Backpackers don't seem to like it."

"Six-member party of rock climbers (with one setting up two climbs by himself) took eighty minutes to set up climbs. It was mentioned that the leader climbed traditional; supposing he owned gear he still set up climbs w/static rope (by slinging trees) instead of placing gear."

6/18/05

"Group of 4 rock climbers, very little experience. Unsafe!"

"Weird belay/anchor system – unsafe."

"Ropes draped across trail (AT), hikers have to walk into forest to get around, rope coiled on trail, no regard for others.

- Although clearly the hikers are not pleased.
- Waist high rope across trail. Tied to tree & belayer waist.
- Camping in LSMC cliffs campsite (upper)"

"The hikers like to watch the climbers and ask questions."

"For most it most likely adds to their experience. The thru-hikers don't much like them."

7/2/05

"Very slow for a Saturday, may be due to July 4th weekend. No rock climbers, very few backpackers (most thru-hikers should be past Shenandoah by now)."

7/4/05

"Family/friends (group of 6), loud, obnoxious mother told her son to come to middle of cliff to throw rocks. I informed them that there was a trail below and that there were a group of rock climbers on the cliff (despite the introduction of bias I did this in the interest of safety). She (mother) instructed the child to not throw rocks. On their way back down (they hiked towards Stony Man) one of the adults (20-25) asked me for a piece of paper so that he could make a paper airplane."

9/10/05

Rock climber came up to set an anchor for climbers already on the route. The route he set an anchor for (the chimney) does not have any good placements (gear) on the top to use as an anchor. Therefore, he climbed down 10-15 ft. to find rock suitable for an anchor (typically three good placements close enough to equalize). The climber had a lot of gear, most likely indicating he has been climbing for a while (or he's rich, or both), he was in his late 40's; he rappelled the route."