IDENTIFYING PREDICTORS FOR QUALITY AND QUANTITY RESTORATIVE CHARACTER OF WILDERNESS: USING EVENTS AS AN ANALYSIS UNIT

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Abstract.—The purpose of this research is to understand whether and how trail design and resource impacts influence the quality and quantity of restorative experiences. The focus of past research has been on understanding the quality-side (what happens). What is missing is a better understanding of the quantity-side of experiences (how much happens). Gibson's environmental perception theory was used to conceptualize quality and quantity experiences. He suggests that events involving the coupling of actors and environments are meaningful. Events were used as a unit of analysis in this study. Quantity (i.e., amount of events) was measured on an eventfulness scale. Continuous Audience Response Technology was used to record degree of eventfulness during the viewing of videos simulating hiking events in the Monongahela National Forest. While walking along each of eight wilderness trail segments, 90 seconds of visual media was filmed as stimuli. As study participants (N=42) watched each video, they rated the restorative character by turning a handheld dial from 0 (low) to 100 (high). Following each video, respondents evaluated five components of restorative environments, overall quality, and eventfulness. The number of dial turns was correlated with eventfulness (r=0.21, p<.001) but not quality. Average restorative character across the video was more strongly related to quality (r=.65, p<.001) than to quantity (r=0.30, p<.001). Two models predicting quality (Adjusted R^2=0.54, p<.001) and quantity (Adjusted R^2=0.16, p<.001) of restorative character were developed. Independent variables include components of restorative character, average restorative character across the video, and number of changes (positive and negative dial turns) in character. Average restorative character and fascination were more strongly related to overall quality than to quantity. The number of positive changes in character and novelty were more strongly related to quantity. Results revealed that quality and quantity are different constructs. Quality is related to a cognitive process (fascination). Quantity seemed to be more objective and related to novelty—a process associated with direct perception. Providing more variety in scenery and minimizing resource impacts contribute to eventful and high-quality restorative opportunities.

1.0 INTRODUCTION

Recreation involves the production and transaction of goods and services, and the productivity of these markets is influenced by the perceived quality and quantity of the units produced. Brown (1984) proposed the recreation opportunity production process and suggested that the recreation product involves a combination of opportunities including activities, settings, experiences, and benefits. However, the evaluative measures of recreation opportunities used in research have not given equal consideration to both quality and quantity. Considering that the underlying goal of outdoor recreation has traditionally been to provide high-quality outdoor recreation opportunities (Manning 1999), managers have focused primarily on defining *quality* recreation opportunities; but what is missing from this goal and the evaluation of this goal is the *quantity* of events individual recreationists perceive during a recreational engagement. The purpose of this research was to use events as a unit of measurement and analysis to better understand whether and how trail design and resource impacts influence both the quality and quantity of restorative character of three hiking trails in the Monongahela National Forest, WV.

An event is an underlying concept in Gibson's (1986) environmental perception theory and was the main unit of analysis used in this research. Eventfulness was defined as the number of events perceived during a recreational engagement. For example, a hiking event might consist of several unfolding events such as stepping over downed trees, hiking to a vista, or hiking through mud. We propose that more events contribute to more eventful recreation outings, and the qualities afforded by each unfolding event can contribute to either improving or reducing the overall quality of the visit.

1.1 Traditional Measures of Recreation Quality

Manning (1999) documented the wide acceptance of satisfaction as a single-item measure of quality in outdoor recreation by highlighting its long history of use by managers and decision-makers starting in the early 1960s. The concept also has a strong theoretical foundation. Both recreation setting and subjective evaluation of participants are concepts that contribute to overall satisfaction (Whisman & Hollenhurst 1998). Expectancy/discrepancy theory suggests that satisfaction is a function of the degree of congruence between aspirations and the perceived reality of experiences (Vroom 1964, Porter & Lawler 1968). When visitor perceptions of reality meet or exceed their expectations, they tend to be more satisfied (Manning 1999).

Although a single-item measure of satisfaction has been widely used, it does have limitations. For example, visitors have uniformly reported high levels of satisfaction even when recreation opportunities change. The variable's lack of sensitivity to changing conditions is understandable given that visitors often self-select places that meet their recreational needs and are sometimes able to cope with less than high quality conditions (Manning 1999).

1.2 Traditional Measures of Quantity

The quantity of recreation has typically been measured as a total number of visitors, number of visits to an area, acres of recreational land, or length of visit. For example, a recreation visit day equal to 12 hours of recreation site use by any combination of users, is the measurement unit traditionally used by federal agencies such as the Forest Service. People at one time (PAOT) is a unit often used in crowding research and measures the number of people at one place and at one moment in time. However, none of these techniques simultaneously consider both the spatial and temporal dimensions of an individual's perception and experience. In fact, they inaccurately imply that high quantity (i.e., high number of visitors) equates to successful recreation management. In contrast, meeting new people and other social experiences are often rated as undesired experiences by recreationists (Manning 1999), and crowding is a common impediment to visitors achieving their expectations and motivations in wildland areas (Schreyer 1990). For example, Heberlein and Kuentzel (2002) found that higher hunter densities improved the success for doe hunters, but more hunters also increased crowding and decreased satisfaction. Length of stay measures can also be problematic. Losing track of clock time or the transformation of time is an important element of an optimal recreational experience that has been defined by Csikszentmihalyi (1990). Therefore, a more holistic and dynamic unit of recreation is needed to help measure the quantity of the recreation product. The measure needs to be effective in various recreation environments and applicable to visitors seeking different recreational outcomes. We propose an alternative concept, eventfulness.

1.3 Environmental Perception Theory

Gibson (1986) suggests that information is exchanged between a perceiver and the environment during human activity. The light, sounds, smells, tactual sensation, and taste of objects in the environment make up the type of information that is perceived. This information flows as the perceiver moves through the environment, runs his/her hand over an object, etc. The pattern of change perceived in this flow of information makes up a storyline consisting of unfolding events. A pattern of change can be perceived at various space-time scales and characterized as an event that affords positive or negative qualities. An event was operationally defined by Pierskalla et al. (in press) as the activity-movement (or preposition)-setting sequence (e.g., hiking-to-the overlook) of language that describes the relationship that exists between humans and the environment. For example, stepping (activity) over (preposition) downed trees (setting) is a pattern of change (event) that can afford positive or negative experiences (affordances)

depending on the motives of the perceiver. Therefore, there are two basic concepts when examining perception, affordances and events. Stoffregen (2000) suggested that the two concepts are not identical.

Recreational affordances are the relations between people and their environment that have aspects with functional consequences for action (e.g., hiking) and attainment (e.g., restorative experiences or family bonding) (Hammitt 1983). Affordances in a recreation environment (involving social and physical properties) infer a certain degree of compatibility between what the perceived environment has to offer and how a person prefers to function in that environment. Affordances provide the meaning associated with functions or events in an environment. "Affordances are not fully objective in that they make sense only in the context of an animal-environment system" (Chemero 2000, p. 38). Depending on the skills of visitors, the perception of certain kinds of affordances can be enhanced or limited (Pierskalla & Lee 1998). Affordances help define the qualities (ranging from low to high quality) of an event. By comparison, events are more objective (Chemero 2000). Because events are countable units, we propose that they can be quantified in terms of eventfulness (ranging from not much happened to a lot happened).

Marginal utility measures have been adopted from production economists to evaluate the effect of increasing visitor use on total units of satisfaction produced in a recreational area (Clawson & Knetsch 1966, Manning 1999). This type of productivity calculation includes both quality (satisfaction per visit) and quantity (number of recreationists) measurements; however, it fails to consider the multiple events that visitors might perceive during a single visit. As a result, it may over or underestimate the total productivity of a visit depending on the number of events an individual perceives. This assertion seems true only if an eventful and high-quality experience is desirable by recreationists seeking different experiences and benefits in different environments.

In an attempt to find instances where recreationists might seek uneventful but high-quality experiences, Pierskalla et al. (2005) conducted a meta-analysis of five studies including hunters, anglers, rock climbers, hikers, scenic drivers, and campers. Regardless of visitor motives, the researchers found significant relationships between quality and eventfulness measures. Although the strength of the relationships varied, they were consistently positive regardless of the experiences and benefits afforded by the events. Quality was also significantly greater and more uniform than eventfulness. Their findings suggest that visitors seek more eventful visits as the quality of their experiences improves. Based on their conclusions, it is proposed that eventfulness can also be a valid measure of restorative character—the focus of this study.

1.4 Components of Restorative Environments

Kaplan and Kaplan (1989) developed a theory to explain why viewing natural scenes contributes to reducing stress, promoting more positive moods and feelings, and facilitating recovery from fatigue. Restoration is a central concept in their theory and is defined as the recovery from mental fatigue, through environments that offer involuntary attention, by having four restorative components: being-away, extent, fascination, and compatibility. Laumann et al. (2001) added a fifth component based on their factor analysis of 22 restorative items. The "being-away" rating scales loaded on two separate factors, novelty and escape. The following were among those factor items with the highest factor loading scores in their study: I am in a different environment than usual (Novelty), I am away from my obligations (Escape), The elements here go together (Extent), I am capable of meeting the challenge of this setting (Compatibility), and I am absorbed in these surroundings (Fascination).

2.0 METHOD

2.1 Data Collection

Continuous Audience Response Technology (CART) was used to collect moment-to-moment responses from respondents about restorative character of video clips collected from three trails in the Monongahela National Forest. The technology has been used to conduct focus groups and to measure audience reaction to video (e.g., advertisements, films, and campaign messages). CART was used in this study to develop a timeline that recorded continuous measurement of change in response over time, and was used to pinpoint aspects of a video viewers liked or disliked. Data were entered by respondents continuously using a handheld dial.

Three trails in or near the Dolly Sods and Otter Creek Wilderness areas were used as study sites. The trails are important indicator trails identified in a monitoring program. Use of the area is expected to increase upon completion of a highway (Corridor H) within 20 miles of the Wilderness areas, thus substantially reducing the driving time from the Washington D.C./Baltimore area.

In the summer of 2005, researchers used a handheld DV Canon ZR100 camcorder to collected 90 seconds of visual and audio stimuli of six trail segments per indicator trail. Video clips were collected approximately every 1/3 mile from the start of each trail, resulting in a total of 18 video clips. Eight video clips that represented a wide range of trail conditions and environments were selected for use in this study. They include: Blackbird Knob trail (n=2), Red Creek trail (n=2), and Otter Creek trail (n=4).

A total of 42 West Virginia University students in an upper-level undergraduate outdoor recreation management course participated in the study in groups of 10. Each session lasted one hour. The session started by asking respondents to enter basic information (e.g., session and identification number) to help them become familiar with the handheld dials. Next, the researchers defined the functions of restorativeness in natural environments as the degree to which scenes contribute to stress reduction, promote positive moods and feelings, and facilitate people's well-being. The restorative character scale was anchored by asking respondents to turn their dials to the left until it read 0 when a picture of a natural environment with low restorative character was presented and to the right until it read 100 when a picture of a highly restorative environment was presented. Before playing each video clip, respondents were asked to turn their dial to the midpoint (50). As they watched each video, students were instructed to rate the restorative character of randomly ordered trail segments by turning a handheld dial with a scale ranging from 0 (low) to 100 (high). Data were automatically recorded at one-second intervals. Following each video, respondents were asked to evaluate the visual stimuli by rating the five components of restorative environments on a 7-point scale (1=very little, 2=rather little, 3=neither little or much, 4=rather much, 5=very much, and 6=completely). The items representing the five components include: In these surroundings I would feel I am in a different environment than usual (Novelty); In these surroundings I would feel away from my obligations (Escape); All of the elements of this scene go together (Extent); I feel I would be capable of meeting the challenge of these surroundings (Compatibility); and I would feel absorbed in these surroundings (Fascination). Respondents were also asked to rate the overall quality (0=poor to 100=excellent) and eventfulness (0=uneventful or not much happened to 100=eventful or a lot happened), and write down elements that improved or detracted from the restorative character of the video.

2.2 Data Coding

The pattern of change in restorative character was coded by counting the number of positive (improving restorative character), negative (declining character), and total dial turns (changes in character) that were made by each participant during the videos.

The average restorative character was plotted on a timeline for each video clip. Events of Significance (EoS) were identified and coded for each of the eight timelines using the following two criteria: (1) at least 30 percent of participants simultaneously turned the CART dial during a one-second moment in time that potentially marked the approximate start and end of an event (ascending or descending trend or pattern of restorative change identified on the timeline) and (2) the average restorative character reported during the start and end of an event changed by at least one standard deviation. The setting elements that improved or detracted from the restorative character for each EoS were coded by referring back to the video and coded open-ended comments.

2.3 Data Analysis

Pearson's correlation coefficients were used to examine correlates of eventfulness and overall quality with the following: total number of dial turns, number of positive dial turns, number of negative dial turns, and overall average restorative character. Stepwise regression was used to develop two models that predict eventfulness and overall quality (dependent variables). The independent variables that were entered into the analysis included:

Table 1.—Description of events of significance (EoS)

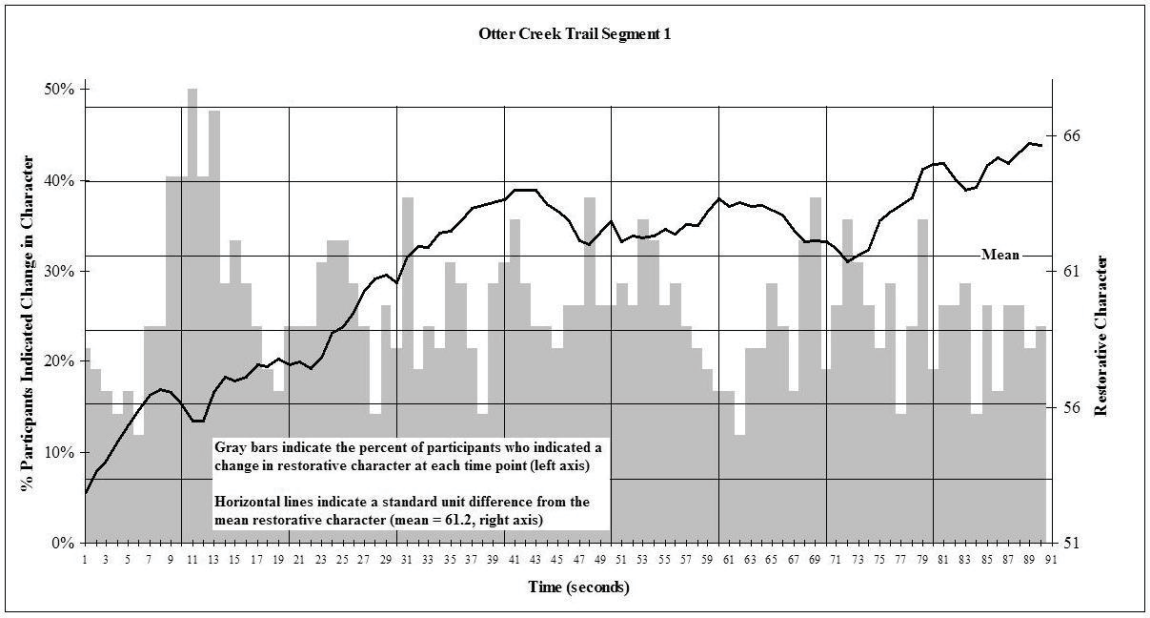
Trail Segment	EoS	Event Description
Otter Creek 1	1	Crossing over stream.
	2	Lush forest; wide and defined trail; hear and occasionally see river.
Otter Creek 3	1	Walking through mud/standing water with squishy noise; sounds of running water.
	2	Leaving muddy area; narrow and well defined trail along ridge between steep hill and steep drop off to water; glimpses of water.
Otter Creek 5	1	Entering a dense vegetative enclosure.
	2	Cannot see trail or ground in the dense enclosure; hear vegetation brushing against video
	3	photographer.
		Park like stand of large trees with low ground vegetation buffer; well defined straight trail; quiet.
Otter Creek 6	1	Well defined trail; plenty of clearing space; see river through trees; buffer of low vegetation along trail.
	2	Approaching/stepping over a series of 3 downed trees crossing trail (on the ground & slightly elevated).
	3	Completed crossing downed trees; well defined trail along ridge between steep hill and steep drop off to water; glimpses of water; slight sounds of running water.
	4	Maneuvering over limbs crossing trail (elevated and off the ground); slight sounds of running water.
	5	Completed maneuvering through limbs; well defined trail along ridge between steep hill and steep drop off to water; glimpses of water; slight sounds of running water; step over decomposed tree crossing trail.
Blackbird Knob 4	1	Through an enclosure prior to field; multiple tread; narrow clearing width.
	2	Open field; knee height grasses and flowers; well defined single trail tread.
Blackbird Knob 5	1	Park like stand of small trees with view beyond into field; well defined narrow trail.
	2	Park like stand of small trees with view beyond into field; trail widens and is eroded.
	3	Leaving park like stand of trees; smaller shrubs; sever erosion and multithread.
Red Creek 1	1	Hikers emerge from around a corner and pass by.
	2	Passed by two hikers in a field of high grasses; narrow trail with little clearing width; well defined trail; approaching a stream crossing.
	3	Crossed stream; very wide and eroded trail with scattered rocks.
	4	Ground vegetation buffering large trees along trail; well defined straight trail; crepuscular rays present.
Red Creek 4	1	Through a rhododendron enclosure; patchy sun; well defined trail; open view; sounds of running water.
	2	Walking around a corner to open vista of river with an open expanse of rocky shore and conifers in background; sounds of running water.

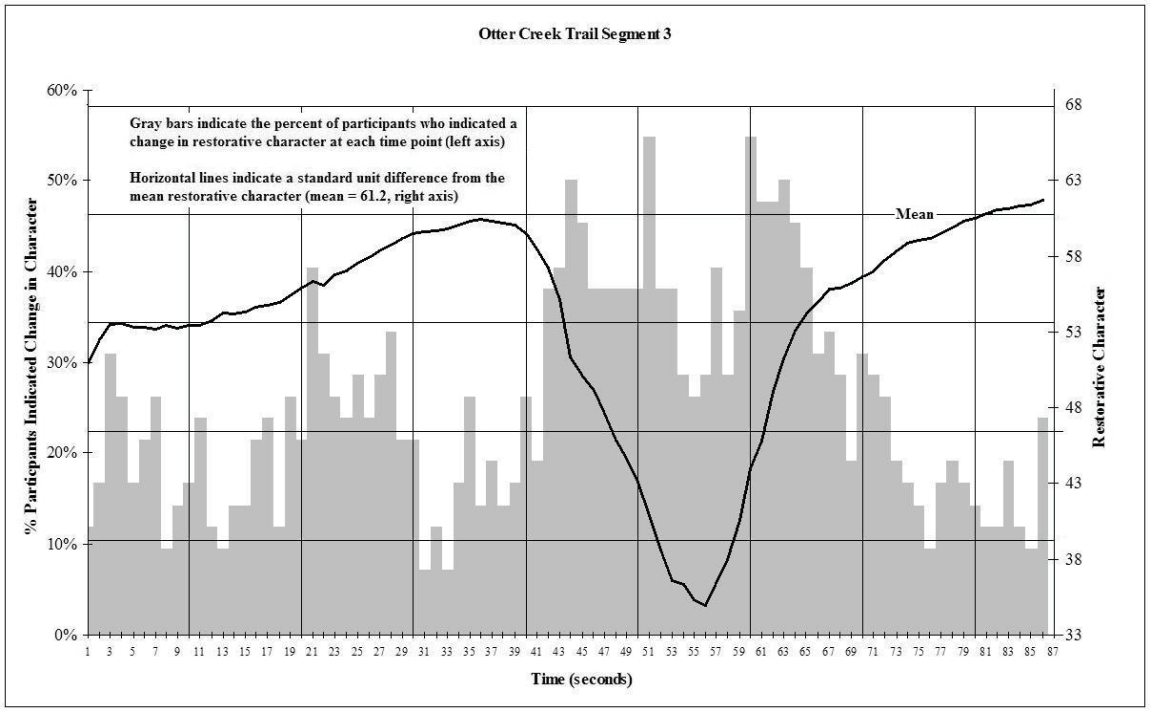
total number of dial turns, number of positive dial turns, number of negative dial turns, overall average restorative character, and ratings for the five components of restorative character.

3.0 RESULTS

Using the criteria described earlier, each EoS was identified by examining the continuous measurement of change in average restorative character over the course of time (Figures 1-8). The overall mean score of restorative character is labeled in each figure. Each horizontal line indicates one standard deviation. The vertical bars represent the percent of respondents that turned the dial (indicating the percent of agreement). The solid bars indicate the temporal duration and pattern of change (improving or declining) associated with each EoS in the videos. Each EoS is described in detail in Table 1.

Pearson's correlation coefficients (2-tailed) were used to examine correlates of eventfulness and overall quality with the following variables: total number of dial turns, number of positive dial turns, number of negative dial turns, and overall average restorative character. The total number of dial turns was correlated with eventfulness ($n=313$, $r=0.21$, $p<0.001$) but not quality ($n=316$, $r=0.10$, $p=0.077$). Average restorative character across the video was more strongly related to quality ($n=317$, $r=0.65$, $p<0.001$) than to eventfulness ($n=314$, $r=0.30$, $p<0.001$). Positive dial turns (improvement in restorative character) were related to both quality ($n=316$, $r=0.21$,

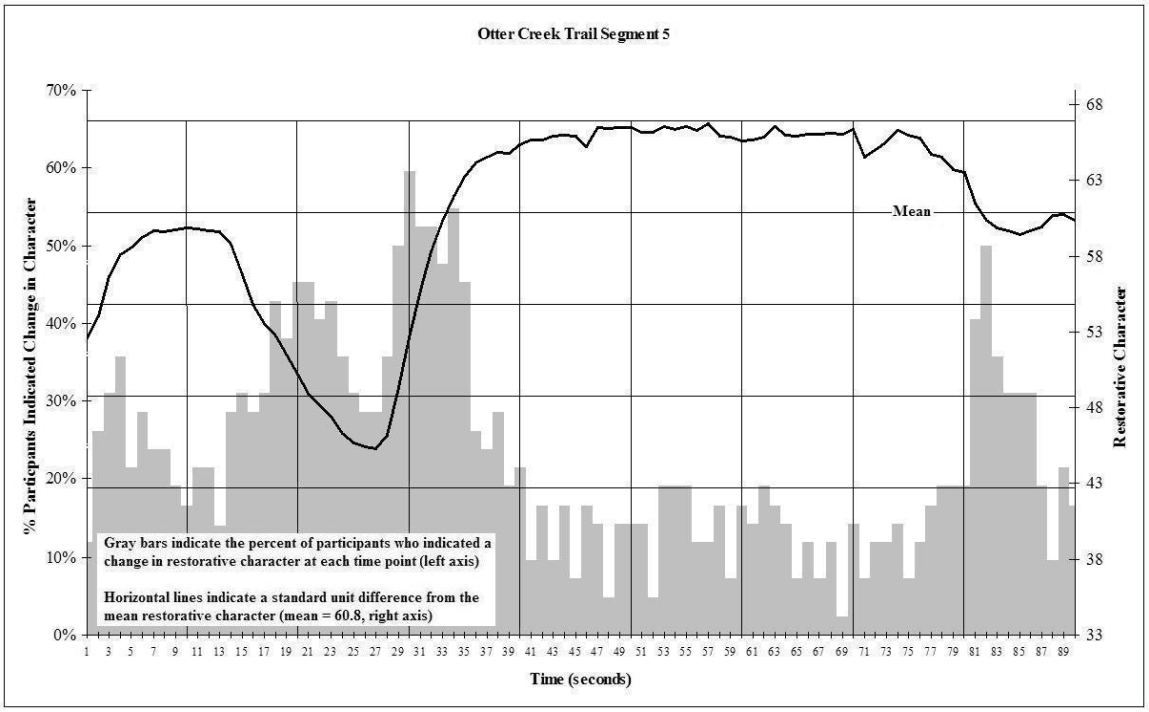


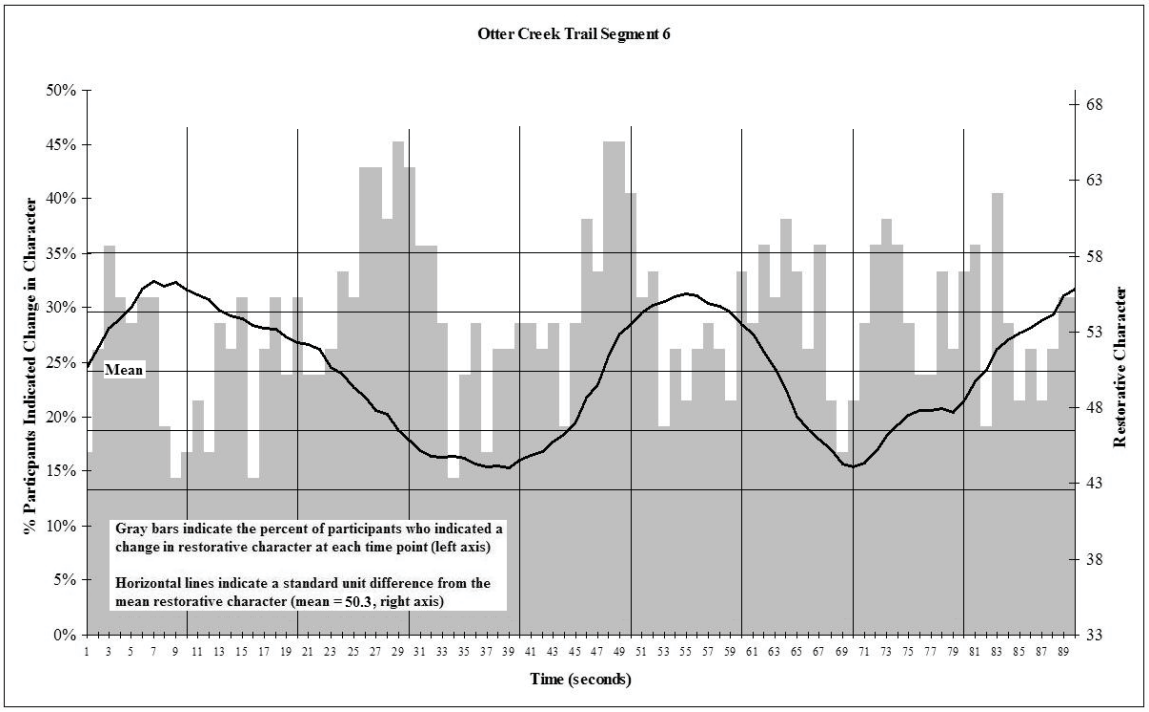


Figures 1 and 2.—Otter Creek Trail.

p<0.001) and eventfulness (n=313, r=0.26, p<0.001). Negative dial turns (detraction of restorative character) was related to eventfulness (n=311, r=0.13, p=0.027) and not quality (n=314, r=-0.04, p=0.533).

Two models predicting quality (F(3, 309)=124.6, Adjusted R^2=0.543, p<.001) and quantity (F(3, 306)=20.2, Adjusted R^2=0.157, p<.001) of restorative character were developed using stepwise regression (Tables 2 and 3). Independent variables considered in the analysis included the five components of restorative character, average restorative character across the video, and number of changes (positive and negative dial turns) in character. Average character and fascination (absorption in the surroundings) were more strongly related to overall quality when compared to quantity.



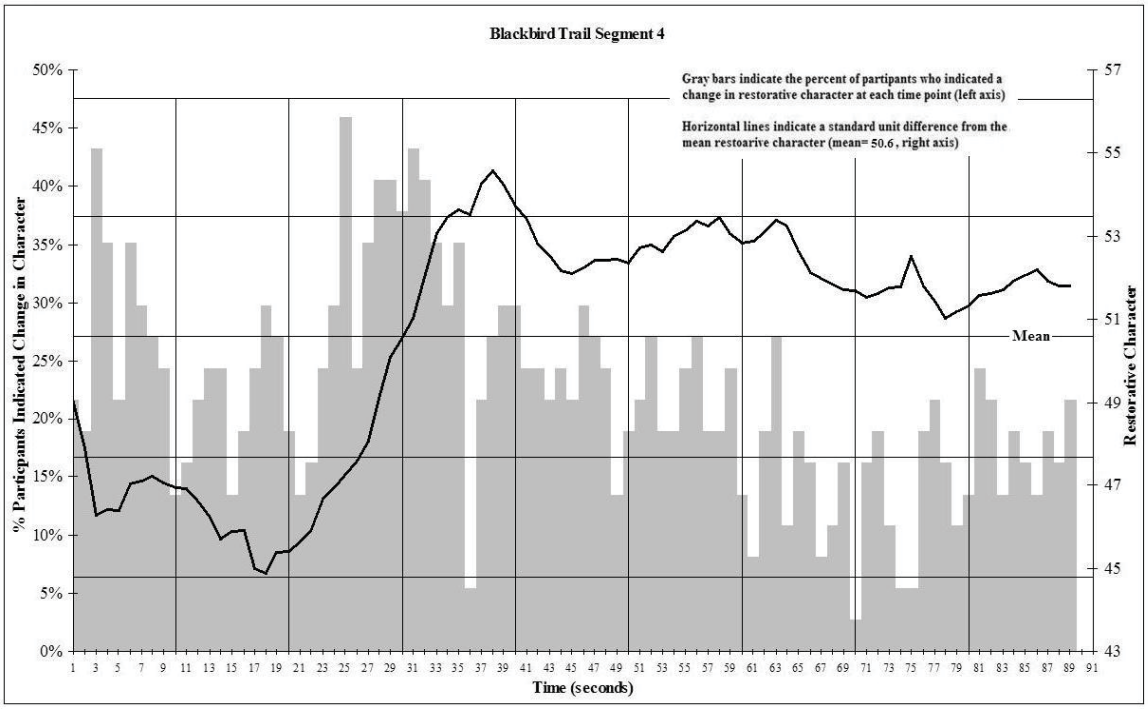


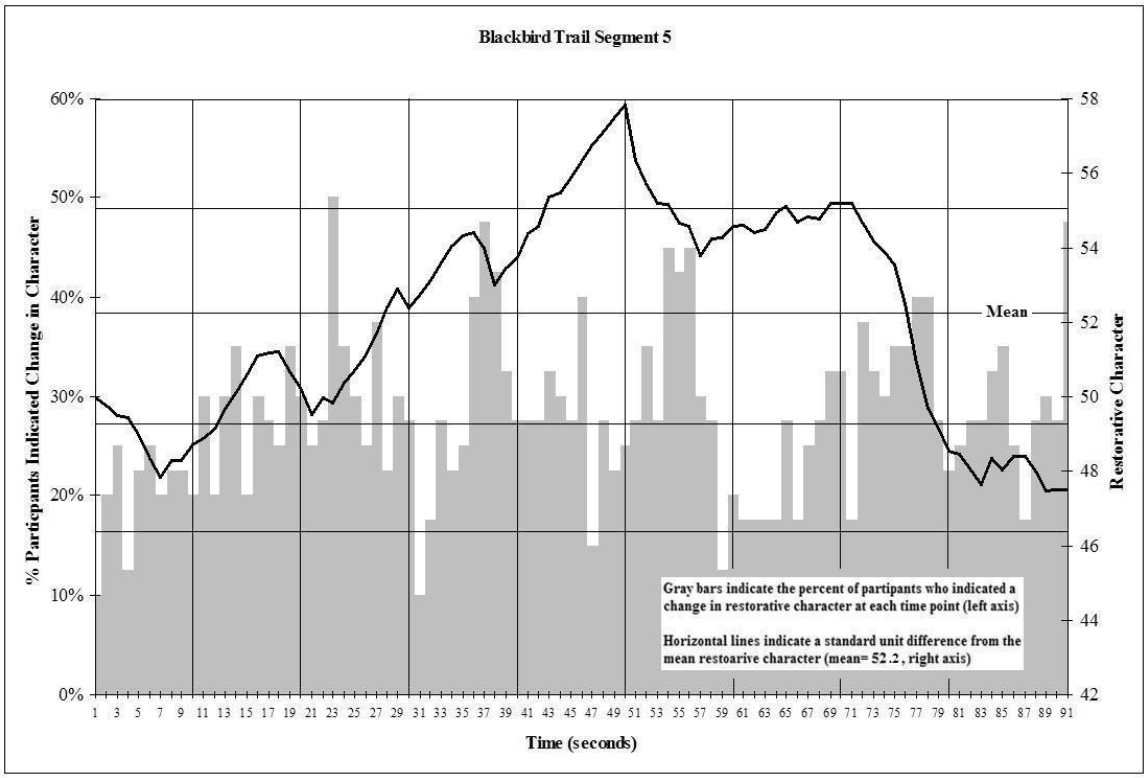
Figures 3 and 4.—Otter Creek Trail.

The number of positive changes in character and novelty (differences perceived in the environment) were more strongly related to quantity.

4.0 DISCUSSION

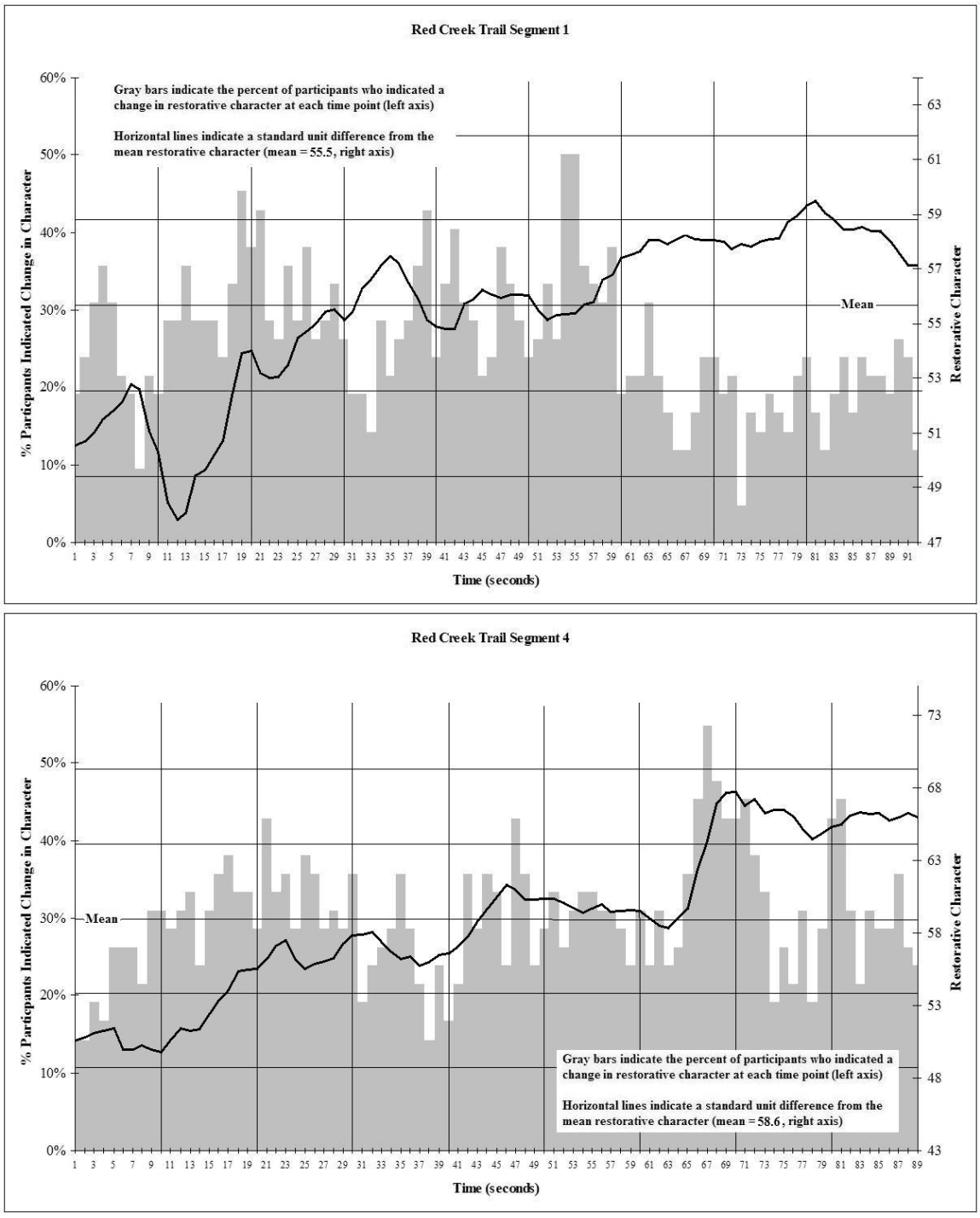
The purpose of this research was to use events as a unit of measurement and analysis to better understand whether and how trail design and resource impacts influence both the quantity and quality of restorative character. A total of 22 EoS (or approximately 2 EoS per minute of video) were identified in our study of three trails (eight trail segments). At least one EoS that detracted from the restorative character was identified in each of the study trails. These findings suggest that certain segments of





Figures 5 and 6.—Blackbird Knob Trail.

each study trail had conditions that significantly and negatively impacted restorative character and visitor experience. Without monitoring and managing these conditions over time, the situation is likely to worsen due to heavy visitor use on soils that are often poorly suited for trail use. The 2004 National Visitor Use Monitoring study indicated that forest trails are the most used facility in the Monongahela National Forest (USDA Forest Service 2006). Use of the Forest trails is likely to increase upon completion of Corridor H, especially in Dolly Sods and Otter Creek Wilderness areas.



Figures 7 and 8.—Red Creek Trail.

Given current visitor use trends, poor suitability of soils, and the number and wide range of EoS that are realized on trails, there is good reason to continue monitoring restorative conditions on trails, especially those conditions identified as most salient in this study. Well defined and narrow trails, park-like stands of trees, ground vegetation buffer along trails, glimpses/sounds of water, enclosures with views of openings, and vistas were among the setting attributes that contributed positively to restorative character. Mud, downed trees, eroded trails, undefined and wide trails, multitread, adequate trail clearing width, and encounters with other hikers were among the setting attributes that detracted from restorative character. These attributes should

Table 2.—Predictors of eventfulness

Variable	Regression coefficient (B)	Stand. coefficient (β)	Adj. R-Square
Intercept	3.510	-2.97	0.543
Average restorative character	.750	.477	
I would feel absorbed in these surroundings	5.052	.369	
Number of positive changes in restorative character	.184	.092	

Table 3.—Predictors of eventfulness

Variable	Regression coefficient (B)	Stand. coefficient (β)	Adj. R-Square
Intercept	6.523	1.668	0.157
Average restorative character	.455	.220	
Number of positive changes in restorative character	.554	.212	
In these surrounding I would feel I am in a different environment than usual	2.938	.176	

be considered when developing indicators for trail monitoring in the future.

The study findings also suggest that quality and quantity are different constructs and are related to different components of restorative character. Quality seems to be related more to the cognitive process associated with evaluating and experiencing fascination and average restorative character, whereas quantity seems to be more objective and more closely related to novelty and changes in restorative character—a process associated with direct perception. Events had both positive and negative qualities, and eventfulness was related to positive and negative changes in character. Rationalization is among several coping behaviors that have been used to explain why people consistently report high-quality evaluations regardless of conditions (Manning 1999, Festinger 1957). Given the relatively stronger association between positive qualities and eventfulness measures, it is possible that perceivers might tune-out some undesired information when evaluating trail conditions.

Providing more variety in scenery (e.g., spur trails and vistas) and minimizing resource impacts through management can contribute to more eventful and high-quality restorative opportunities for hikers—a more productive wilderness experience. When evaluating these conditions in the future, both quality and quantity measures are needed to more completely assess the productivity of recreation. Using quality as the only indicator of productivity might underestimate or overestimate the value of a recreation outing, and it can misinform managers about the needs of their visitors.

Additional research is needed to expand the ecological and external validity of the results reported in this study. The findings reported in this paper represent the perceptions of students that participated in a laboratory study. The perceptions of other stakeholders of the forest will need to be considered. Perhaps future research will confirm that recreation productivity (quality*eventfulness) might be a better global measure than either quality or quantity alone. That is, by pursuing only the goal of quality in recreation, we may be learning only part of the story.

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