TRAIL CONDITION PREFERENCES OF HORSEBACK RIDERS ON THE CLEMSON UNIVERSITY EXPERIEMENTAL FOREST

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Abstract

Horseback riding in natural areas is a legitimate and valued outdoor recreation activity that has the potential to cause changes in trail conditions. Riders are often quite experienced, are attached to both the activity and the resource places where they participate, and have preferences toward trail conditions where they ride. The purpose of this study was to examine the relationship of a verbal measure of trail condition preference to a visual preference measure of riders for various trail impact conditions. During June-October 2003, 197 riders completed a photo-questionnaire of trail conditions at a "staging area" (i.e., where horses are loaded and unloaded) on the 17,500-acre Clemson University Experimental Forest (CUEF). Riders rated 24 trail scenes and 15 written trail condition descriptions. The scenes and descriptions were factor analyzed to form four trail condition dimensions; narrow, dry, flat trails; wide, muddy trails; deep, well-rutted trails; and creek crossings. In addition, four factored dimensions of place bonding items revealed that riders were not dependent on the trails of the CUEF for riding, but were rooted to them, identified with them and were familiar with them. It is concluded that photographs can be used to measure trail condition perceptions, inventory baseline conditions, and allow for future photo/field monitoring of changing trail conditions over time.

1.0 Introduction

Recreationists choose the areas in which they recreate based on a number of criteria, including: environmental and trail preferences, amount of experience they have participating in the activity, and the degree to which they feel attached to an area. There is little research that looks at horseback trail riders with the intent to understand whether these factors are employed when choosing the areas in which they ride.

In addition, there is a significant lack of literature available concerning recreational use of horses, including horseback trail riding preferences and trail impact issues that result from heavy horseback trail riding. This suggests that a more concentrated look into this activity is necessary. As land available for public recreation reaches a premium, it is necessary for land-use managers to inventory, monitor, and manage the conditions of multiple-use trails. Wood, Cox and Perry (2000, pg 3) emphasize the importance of managing trail conditions by stating, "the most fundamental issue is the need to create and manage trail systems that fit use to the capacity of the land to accommodate that use, thus harmonizing users with the land."

This study focused on horseback trail riding preference and place bonding in an attempt to understand trail condition preferences and factors that affect them.
The purpose of this study was to compare the visual preferences of horseback riders for various levels of trail impacted conditions to verbal descriptions of measured trail conditions and to examine the relationship of place bonding to horseback rider perception of visual trail conditions.

2.0 Literature Review

Due to the expense and difficulty of surveying participants at multiple, specific field sites, photographs have become an important tool in visual preference research. Many researchers have discussed the validity of photographs actually representing landscapes. Shafer and Tooby (1973) and Shafer and Richards (1974) found that a photograph could accurately measure onsite preference for a landscape, if the photographic presentations contain most of the visual variation found in the actual landscape. Daniel and Boster (1976) found high correlations between people's reactions to photographs and actual on-site visits, averaging a range of r = 0.85 to 0.95. Some researchers have also questioned whether black and white photographs are as effective at conveying the dimensions of the scene, as are colored photographs. Kaplan, Kaplan and Deardoff (1974) state that the use of black and white photographs as representative simulations of natural environments for preference rating research is supported by both theory and experience. They also confirm that results are quite reliable, valid and intuitively meaningful across a broad selection of environments and groups.

Photographs are a useful way in which participants are presented a scene that they either may be familiar with or may be familiar with scenes of a similar nature. By providing the critical dimensions (e.g., trail slope, tread width and depth, etc.) of the scene along with the photographs, survey respondents can more accurately interpret the trail scene and conditions they are viewing.

Because photographs have been shown to be a reliable and valid form of stimuli presentation in environmental perception research, they have been used extensively in studying environmental preferences (Kaplan & Kaplan 1989), visual preferences (Noe & Hammitt 1988; Ulrich 1988), and scenic beauty (Buhyoff, Gauthier, & Wellman 1984). In contrast to the aesthetic and scenic beauty focus of previous studies, our study focused on the functional preferences of horseback riders for trail conditions depicted through visual images.

When research does not use visual stimuli (i.e., photographs) to investigate environmental conditions and preferences it relies on verbal statements that characterize the environments conditions) to measure preferences. This is commonly done through a series of statements describing different realistic conditions often encountered by participants in an activity. Participants are asked to read the stated condition and answer the degree to which they like or agree with the statement. A number of different factors influence the decision and it is important to give enough information within the statement so the individual can create a mental picture of what the statement is describing. From this mental image the participant can determine their feelings concerning the statement, in our study, existing trail riding conditions.

There are many factors that can relate to the trail condition preferences of horseback riders. Place attachment, a positive affective bond developed between individuals or groups and their environment over time (Altman & Low 1992) is an influencing factor to analyze when considering recreation choice and preference behavior. Place attachment to recreation resource places and sites incorporate both the affective and behavioral notions of individuals' past experience and attached feelings toward a recreational setting.

Traditionally, place attachment literature has used two dimensions of attachment, place identity and place dependence (Williams & Vaske 2003). More recently this concept has been reconceptualized into place bonding, containing the five dimensions of place familiarity, belongingness, identity, dependence, and rootedness, in an attempt to gain a richer perspective of people's connections to their recreation destination (Hammitt, Backlund, & Bixler 2005). The bond-attachment construct has been alternatively titled by various researchers as sense of place, place identity, place dependence, place attachment, and place bonding. Hammitt, Backlund, and Bixler (2004) suggest that despite different names, the connecting theme among these concepts is that humans form affective bonds to significant places in their lives, whether the focus of the investigation is their home, their community, or the places they recreate.

3.0 Methods

The study area was the 17,500-acre Clemson University Experimental Forest (CUEF), established during the 1930s and located adjacent to the university campus in Clemson, SC. Today, the area offers many opportunities for multiple recreation uses on its approximately 109 miles of trails. One particular area (Fants Grove) within the CUEF has been developed for recreational horseback riding, containing horse-trailer unload facilities and 43 miles of developed trail. It was at the Fants Grove site that horseback riders were sampled.

There were two populations of interest for this study; horseback riders who used the Fants Grove Trails on the CUEF and members of the Pendleton, SC Area Saddle Club. A non-probability convenience sample was drawn from these populations. The resulting number of completed surveys was 197, of which 137 were from onsite sampling at the Fants Grove staging area and 60 from attendance at a monthly Saddle Club meeting and mail back procedure.

Data collection was conducted over a six months period on weekends and weekdays; in late spring through early fall of 2003. Riders were approached as they arrived at the staging area, some returning from their ride and others before they set out. Members of the Saddle Club were addressed at a monthly meeting in early May 2003, and asked to complete the survey. Members were given the opportunity to complete the questionnaire at the meeting or were given a postage paid envelope in which to mail the completed questionnaire back. This procedure resulted in a 79 percent mail back response rate (60 of the 79 members returned surveys). The onsite survey response rate was 66 percent.

The questionnaire consisted of 10 pages, containing both photographic and verbal items. The first section of the photo-questionnaire was a series of 24 black and white digital photographs of different horse-use trail conditions of the Fants Grove area. Each photograph was accompanied by the trail site's exact slope, tread width and depth. Photographs were selected based on a previous study in which the photo sites had been inventoried, measured for trail impact conditions and entered into a GPS location system. Thus, all photos used in the questionnaire corresponded to inventoried trail sites. These locations were determined to have slight to significant amounts of trail tread impact. A regular school backpack was used as a frame of reference or scale in each photograph to make it easy for the respondent to accurately judge the dimensions of the scene. Participants rated each photograph on a scale of one to five based on how much they liked riding their horse through conditions like those depicted in each picture.

The verbal preference measure consisted of 15 verbal descriptions of the trail conditions. The descriptions represented the conditions depicted in 15 of the photographs; all 24 of the photographs were not described due to similarities in content. An example of one of the trail conditions is, "a medium eroded trail width of 7 feet, depth of 12 inches, no water or mud present and a slope of 20 percent." Participants were asked to rate each description on a scale of one to five of how much they like riding their horses through conditions described in each written statement, where one indicated "like not at all", two was "a little", three indicated "somewhat", four was "quite a bit" and five was "like very much".

A series of 26 place bonding statements were rated by respondents, on a 5-point agreement scale to determine the type and degree of affective bonds that riders of the CUEF might have formed with the area's horse trails. The 5-point agreement scale for the place bonding items consisted of: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree.

Descriptive statistics were run on all variables and exploratory factor analysis was completed on three sets of items, the photographs, trail condition descriptions and place bonding. Principal component analysis with varimax rotation was used to factor the item scales. Factoring criteria used were: factor loading 0.40, Cronbach alpha 0.70, and Eigenvalue 1.0. Themes describing trail condition-environments were used to label the photographs and trail condition description factors. Once factors were determined, factor grand-means were computed and used as a basis for interpreting the strength of trail condition preferences and dimensions of place bonding.

4.0 Results

Over half of the riders (53%) in the study group were male, 93 percent had graduated from high school, and 59 percent had some college experience. Forty-nine percent of the respondents described themselves as advanced riders, while only 3 percent considered themselves beginners. The rest were closely divided between intermediate and expert riders. On average, riders spent 3.5 hours riding per trip, rode an average of 10 miles, and had at least three horses per riding party. Over 50 percent of riders drove more than 20 miles to ride at CUEF. Respondents had used the CUEF for riding an average of 12 years, and averaged about 20 trips to the Forest during the last 12 months. The overall mean rating for the 24 photographed conditions was 4.02. The scores were skewed toward the upper end of the 5-point rating scale, indicating a positive response to the trail environment conditions.

When the trail condition preference ratings were factor analyzed to determine underlying themes or commonalities among the photographed trail conditions, three types (factors) of trail scenes were differentiated and identified as: narrow, dry and flat trails; wide muddy trails; and deep, well-rutted trails (Table 1). The narrow, dry flat trails scenes (12 photos) all depicted a trail wide enough for horses to easily travel single file, with the average width of the trails in the scenes being 39.6 inches (3 feet, 3 inches). Some of the scenes showed a narrow trail through an open area, while others represented a narrow trail through a heavily wooded area. The slopes of the trails in each of these scenes ranged from 6 to 25 percent. The average depth of the trail tread in this category, compared against the un-compacted sides of the trail, was 14.5 inches. There was no standing water in any of these scenes nor was there any indication that the areas would retain water after a rain storm. The second dimension, wide muddy trails (5 photos), all contained characteristics common to trail areas that collect water and stay muddy for a period of time. A primary feature of these muddy trail scenes was a wide, expanded area around the original trail site where users have extended the existing path on the sides to avoid traveling through the worst of the mud. These trails were also flat with slopes ranging from 1-9 percent. At the widest point of the trail the width was an average of 87.2 inches (7 feet, 3 inches). The average depth was only 6.9 inches. However, when the trails were wet and muddy, they would be soft and would cause a horse to sink in much further than the average seven inches. Scenes in the final dimension, deep well-rutted trails (4 photos), were each located on an incline with slopes from 15 to 25 percent. Trail width averaged 55.5 inches (4 feet, 7 inches). The most unique feature of these scenes was the trail depth, ranging from 19 inches to 67 inches deep and the terrain of the trail was very rutted. Although the ground is not muddy all of the time, it is assumed that during heavy rain the areas would be muddy and be difficult to navigate, since the depths of the trails are so deep that riders could not avoid the rutted area by expanding the trails as they did in the previous dimension.

When respondents were asked to rate the verbal trail descriptions, consisting of the same trail tread measurements and slopes as used with 15 of the photos, the mean ratings were lower than for the photographed conditions. The overall mean rating for the descriptions was 3.25 (compared to 4.02 for the photos) and the scores were evenly distributed throughout the 5-point scale. The median score was 3.30. Factor analysis resulted in three dimensions of trail conditions. Six trail descriptions were designated as narrow, dry or flat trails. Five trails conditions were identified as wide muddy trails and two were classified as creek crossings (Table 2).

Because there was an apparent difference between the visual and verbal preference ratings for the trail conditions, the paired preference ratings for the 15 scenes/descriptions were correlated to see if riders were responding in a similar pattern to the trail conditions. As indicated in Table 3, 11 of the 15 comparisons had significant, positive correlation coefficients ($p \leq 0.05$). This indicates that while respondents rated the photographed conditions higher, they responded in a similar fashion to the two preference stimuli (e.g., positive, however, not a strong direct relationship). Implications for these findings will be discussed later in the paper.

While place bonding was theorized as consisting of five dimensions, the 26 items factored into only four dimensions, with 24 of the items meeting the factoring criteria mentioned in the methods. Items did not factor into the fifth proposed dimension, Place Belongingness. The four resulting factors were labeled place dependence, rootedness, familiarity, and identity.

Place dependence measures the degree to which the respondent relies on the CUEF, compared to other places to meet their horseback riding needs. The factor grand mean for place dependence was 2.77; with a Cronbach alpha of 0.94, and the amount of variance explained was

Table 1.—Dimensions of trail scenes, based on factor analysis of trail preference ratings.

Factored Dimension (Item)[1]	Factor loading	Factor grand mean	Cronbach alpha
Narrow, dry flat trails (Eigenvalue = 9.28, Variance Explained = 44.20)			
Trail scene 7	0.76	4.11	0.92
Trail scene 9	0.73		
Trail scene 4	0.72		
Trail scene 10	0.72		
Trail scene 3	0.71		
Trail scene 16	0.67		
Trail scene 13	0.65		
Trail scene 2	0.63		
Trail scene 6	0.64		
Trail scene 11	0.64		
Trail scene 17	0.61		
Trail scene 8	0.61		
Wide muddy trails (Eigenvalue = 2.26, Variance Explained = 10.76)			
Trail scene 20	0.86	4.18	0.89
Trail scene 23	0.83		
Trail scene 12	0.79		
Trail scene 21	0.75		
Trail scene 15	0.66		
Deep, well rutted trails (Eigenvalue = 2.13, Variance Explained = 10.13)			
Trail scene	0.85	3.50	0.88
Trail scene	0.83		
Trail scene	0.79		
Trail scene	0.71		

[1]Scenes 1, 14, and 19 did not have a factor loading of 0.40 and were therefore not included in further analyses.

47.03 percent. The mean score related to this dimension suggests weak support for place dependence among the respondents. Conversely, place rootedness, measuring the degree to which a person relies only on the CUEF for riding had a factor grand mean of 3.81; with a Cronbach alpha score was 0.92, and a variance explained of 10.63 percent, suggesting that respondents were moderately to strongly rooted to the CUEF. Place Identity attempts to measure the degree to which an individual has assimilated a place into his/her personal identity. The Cronbach alpha for identity was 0.84 and the amount of variance explained was 5.69 percent. A factor grand mean score of 3.75 suggests a moderate to strong amount of identity for the respondents. Place familiarity deals with the memories and cognitive relationship a person has for a place. The Cronbach alpha was 0.82 and 5.27 percent of variance was explained. The factor grand mean score of 3.20 suggests a moderate amount of familiarity.

It was theorized that place bonding, or one's degree of affective attachment to an area where they ride horses, would be correlated with their preference for

Table 2.—Dimensions of trail condition descriptions based on factor analysis of trail preference ratings.

Factored Dimension (Item)[1]	Factor loading	Factor grand mean	Cronbach alpha
Narrow, Dry Flat Trails (Eigenvalue = 7.20, Variance Explained = 48.05)			
A muddy trail with a tread width of 5' 8", depth of 8", 5% water and 85% mud present on the trail, and a slope of 3%	0.90	2.63	0.89
A muddy trail with a tread width of 10' 10", depth of 6", 10% water and 50% mud present on the trail, and a slope of 2%.	0.88		
A muddy trail with a tread width of 5' 4", depth of 3", 0% water and 90% mud present on the trail, and a slope of 1%.	0.79		
A highly eroded trail with a tread width of 5' 6", depth of 5' 7", no mud or water present, and a slope of 19%.	0.65		
A highly eroded trail with a tread width of 2' 3", depth of 1' 4", no water or mud present, and a slope of 15%.	0.61		
Narrow, dry flat trails (Eigenvalue = 2.17, Variance Explained = 14.49)			
A lightly eroded trail with a tread width of 2' 8", depth of 7", no water or mud present, and a slope of 6%	0.80	3.83	0.86
A lightly eroded trail with tread width of 5' 3" inches, depth of 11", no water or mud present, and a slope of 9%	0.75		
A medium eroded trail with a tread width of 3' 11", depth of 9", no water or mud present, and a slope of 18%.	0.72		
A lightly eroded trail with tread width of 3' 2", depth of 11", no water or mud present, and a slope of 15%.	0.69		
A medium eroded trail with a tread width of 7', depth of 12", no water or mud present, and a slope of 20%.	0.64		
A medium eroded trail with a tread width of 3' 9", depth of 8", no water or mud present, and a slope of 11%.	0.63		
Creek Crossings (Eigenvalue = 1.11, Variance Explained = 7.41)			
A creek crossing, with a tread width of 4' 11", depth of 1' 3", 20% water, and 50% mud present on the trail, and a slope of 18%.	0.82	3.32	0.62
A creek crossing, with a tread width of 3' 9", depth of 1' 10", 5% water, and 20% mud present on a trail, and a slope of 25%.	0.69		

[1]Statements that did not have a factor loading of ≥ 0.40.
A highly eroded trail with a tread width of 2' 7", depth of 1' 8", no mud or water present, and a slop of 19%.
A creek crossing with a tread width of 5' 3", depth of 2', 20% water and 60% mud present on trail and a slope of 25%.

Table 3.—Trail scene and trail condition description comparison including significant mean differences and relational patterns between preference ratings.

	Visual rating	Verbal rating		
	Mean[1]	Mean[1]	r = 0.20	p-value
Photo 13	4.11	3.96	0.14	0.07
Photo 19	4.20	3.69	0.28	0.00
Photo 4	4.21	3.75	0.23	0.00
Photo 10	3.92	2.94	0.36	0.00
Photo 1	4.10	3.33	0.12	0.18
Photo 2	4.31	3.86	0.30	0.00
Photo 11	4.12	3.15	0.20	0.02
Photo 12	4.18	2.45	0.04	0.67
Photo 6	3.85	3.30	0.19	0.02
Photo 18	3.53	2.83	0.25	0.00
Photo 3	4.15	3.72	0.34	0.00
Photo 5	3.71	2.95	0.27	0.00
Photo 14	3.87	2.42	0.08	0.35
Photo 20	4.23	2.39	0.09	0.24
Photo 15	4.29	4.01	0.23	0.00

[1]Means based on a 5 point scale, where 1 = "like not at all", 2 = "like a little", 3 = "like somewhat", 4 = "like quite a bit", 5 = "like very much"

various trail riding conditions. However, only 3 of 12 correlations tested were significant and none were above r = 0.20. Thus, place bonding failed to show much of a relationship to trail condition preferences.

5.0 Discussion and Implications

Horseback trail riders in the CUEF generally preferred existing trail conditions as depicted in trail photographs, however, the deep, well rutted trail conditions were preferred least. All 24 trail scenes received a fairly strong response as demonstrated by their mean scores of 3.27 to 4.31 on a scale of one to five. An average mean score of 4.02 indicated that riders "liked quite a bit" the trail tread conditions found at the Fants Grove Area of the CUEF.

Preferences changed when respondents were given written descriptions of existing trail conditions. On average all descriptions received lower scores, ranging from 2.42 to 4.01. The average mean score was 3.25. The biggest difference was found in the preference for the wide muddy trail conditions, with the scenes receiving a score of 4.18 versus the description score of 2.63. Also, while trail conditions that were deep and well-rutted factored as a focused dimension among the photographs, they did not in the written descriptions; instead the descriptions of creek crossings factored as a coherent condition.

How might one explain the differences found in the preference ratings of the visual conditions with accompanying tread measurements versus the ratings for the verbal descriptions that contained the same tread measurement data? Which of the two represent the more valid data? If "a photograph is worth a thousand words," then one could suggest that the scenes provide more content for riders to base their preference decision. One could speculate that beyond the amount of information given by a scene, the photographed information is likely to be more realistic and correlated to actual on-site conditions (Daniel & Boster 1976), and perceived more consistently by respondents than the verbal descriptions. For example, how much variation or how accurately can a rider perceive a verbal trail description of 20 percent slope or 90 percent mud present at a trail location? In defense of the verbal descriptions, how do we know for sure that riders are providing a “functional preference” for riding through the visual trail conditions and not a broader “scenic preference” for the visual medium stimuli? These validity questions, while important, go beyond the basic research implications of this study.

Beyond the research implications just discussed, there are management implications which this research addressed, as follows:

- Photographs, accompanied with actual trail condition data, may be a better tool for soliciting user perception input to trail management than verbal descriptions of trail conditions.
- GPS photographs and trail tread measurements of existing trail conditions can serve as a baseline inventory for trail management.
- The GPS trail scenes, trail tread data, and rider visual preferences can be monitored at 3 to 5 year intervals to document any change in trail conditions and rider perceptions over time.

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