



Understanding place meanings in planning and managing the wildland–urban interface: The case of Florida trail hikers

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HIGHLIGHTS

- ▶ Little research exists on social benefits related to place meanings in WUI areas.
- ▶ Hikers with higher trail meanings reported preferences for natural trail settings.
- ▶ Hikers with higher place meanings preferred recreation experiences more than others.
- ▶ WUI planners and managers will need to use appropriate spatial scales or zones.

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ABSTRACT

As urban sprawl encroaches into natural ecosystems and recreational use of wildland–urban interface (WUI) areas increases, a better understanding of the values and attitudes of visitors could assist both those visitors and WUI area managers. This study examines the influence that place meanings have on WUI visitors' benefits sought and preferences for landscape attributes and trail settings and suggests management implications. Data from on-site interviews with the Florida National Scenic Trail hikers through WUI areas were analyzed. Confirmatory factor analysis revealed that place meanings consisted of place dependence, place identity, community identity, legacy identity, and nature and natural process. Cluster analysis generated high, -medium, and -low place attached clustered groups. Sociodemographic variables were not significantly related to place meanings, but visitors' trail use history and the trail's proximity to their residences were related. Significant differences in desired experiences were found between three clustered WUI groups. The highly attached WUI group desired escape, nature learning/exploration, and achievement more strongly than the other clustered groups. Similarly, the highly attached group preferred natural features (e.g., undisturbed nature, wildlife habitat, air, water, and soil quality) and traveling on natural trails more strongly than other groups. These results highlight the importance of maintaining natural conditions in WUI areas that provide biodiversity, higher water and air quality, protection of wildlife habitat, and recreation/tourism opportunities, which support human emotional and psychological feelings and well-being and higher levels of meanings ascribed to WUI trails.

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1. Introduction

Urban sprawl has been increasing around inland and coastal areas possessing natural amenities or proximal to protected areas

in the US (Radeloff et al., 2005). Sprawl often instigates a blurring of the line between developed settings and natural environments (Dwyer & Childs, 2004) often referred to as the wildland–urban interface (WUI). WUI includes areas where natural habitat is located adjacent to or intermixed with urban land uses (Zipperer, 2005). More than nine percent of U.S. lands lie in WUI areas (Duryea & Vince, 2005; Radeloff et al., 2005) and the percentage is increasing (Theobald & Romme, 2007).

Urbanized environments cause adverse impacts such as habitat loss and fragmentation, wildlife disturbance, and deterioration of water and air quality and scenic assets (Dwyer & Childs, 2004; Radeloff et al., 2005; Theobald, Miller, & Hobbs, 1997; Zipperer,

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2005). These impacts can result in a failure to maintain not only biodiversity and ecological integrity (Dwyer & Childs, 2004; Nilon, Long, & Zipperer, 1995; Radeloff et al., 2005; Theobald & Romme, 2007; Theobald et al., 1997), but also social values (Nilon et al., 1995) or social aspects of the areas (Dwyer & Childs, 2004).

Often, easy access to WUI areas results in higher recreation use levels; therefore, local residents are likely to have regular interaction with those areas (Stein, 2005). Also, since the public is increasingly aware of how WUI natural resources are managed, they might be sensitive to how management decisions impact their recreational activities and everyday lives. Consequently, decisions affecting WUI areas likely affect the meanings residents and visitors assign to those areas. Increasingly, changes in WUI areas can affect the public's emotional connection and may even displace current visitors (Warzecha & Lime, 2001).

Identifying visitors' preferences and attitudes (e.g., meanings) about WUI areas is potentially important for WUI planners and managers. Most research on meanings ascribed to natural places has focused on more natural and reserved settings (Stein, 2005). Like all nature-based recreation users, most users of WUI areas seek beneficial experiences through recreational activities (Stein, 2005). However, not much information is known about WUI user groups' perceived beliefs, emotional attitudes and management preferences for WUI areas and how they might differ from visitors to more pristine natural areas. Management of WUI areas may improve when managers understand visitors' attitudes towards WUI attributes and the meanings people place on those attributes. It is particularly important to understand how visitors, local communities, and ecosystems benefit from natural area management (Anderson, Nickerson, Stein, & Lee, 2000; Driver & Bruns, 2008; Lee & Driver, 1999). Research concerning recreation-related benefits is common in more pristine areas, but is lacking in WUI areas (Driver, 2008). Identifying socially valuable aspects of natural resources in WUI areas from the viewpoint of users who perceive various tangible and intangible meanings can be important in providing effective recreation and benefit opportunities. This study attempts to accomplish this through two objectives:

1. Understand the influence that place meanings have on WUI visitors' benefits sought and preferences for landscape attributes and trail settings and
2. Explore management implications.

2. Literature review

2.1. WUI and ecosystem services

The wildland–urban interface is an area where developed structures (e.g., residential, business facilities or public structures) meet or intermingle with undeveloped vegetation (USDI & USDA, 2001). The WUI can be divided into two categories: intermix and interface (USDI & USDA, 2001). Intermix WUIs are areas where urban and wild environments intermingle and developed structures are scattered throughout (or among) wildland vegetation. There is no clear line of demarcation between the natural and developed areas. Alternatively, interface WUI areas are where developed structures and wildland vegetation are directly abutted or adjacent, and there is a clear boundary between natural and developed areas (Dwyer & Childs, 2004; Radeloff et al., 2005; Silvis Lab, 2010; USDI & USDA, 2001).

Given the proximity of development and people, WUI managers often struggle to apply natural resource management strategies (e.g., prescribed fire, timber harvesting, and trail construction). The public tends to have inherent attitudes and values, and they expect managers to integrate their values into management actions

(Dwyer & Chavez, 2005). Research to identify specific user groups' important values or meanings of interface areas is needed to better manage the socio-ecological system to simultaneously produce opportunities to benefit from these areas and conserve the areas' sensitive natural attributes. Research along this vein can be based on the evolving outcomes-focused management concept, centering on the provision of the values and benefits of WUI areas to environments, humans and society.

2.2. Outcomes-focused management

Limiting the value of natural resources, including landscapes in most U.S. rural areas, to traditional commodity or market-driven values (e.g., timber and minerals) fails to consider numerous social values people bestow on nature (Kellert, 1996; Stein & Anderson, 2002; Williams, Patterson, Roggenbuck, & Watson, 1992). Planning efforts to identify how humans value natural areas within the context of planning and management of natural ecosystems is ongoing (Stein & Anderson, 2002) and outcomes-focused management (OFM) was designed to assist in this integration (e.g., Driver, 2008; Stein & Anderson, 2002).

OFM is a planning framework that centers on managing nature-based tourism and recreation areas to provide opportunities for a variety of values and benefits for humans (e.g., visitors and local communities/residents), economy, and environments (e.g., natural ecosystems) (Driver, 2008; Stein, 2005; Stein & Anderson, 2002). Benefits are the outcomes that are propitious products gained from resource management and recreational uses (Driver, 2008). Benefits include not only realization of satisfying on-site individual experiences (e.g., personal benefits) but maintenance or improvement of desired conditions beneficial to on-site and off-site individuals, society, economy, and environments (Driver, 2008). The former derives from engagement in recreation and the latter accrues from both resource management and/or participation. Thus, the latter is more encompassing and includes longer-term outcomes. Furthermore, natural resource managers do not directly provide benefits to people in most cases, rather they produce benefit opportunities by managing biophysical, social, and managerial characteristics of natural areas, so people can realize their own desired benefits (Lee & Driver, 1999; Stein & Anderson, 2002). For example, a maintained trail into a forest provides the opportunity to attain benefits such as physical fitness, nature learning, family-togetherness, and stress relief.

The recreation opportunity spectrum (ROS) articulates guidelines to manage natural areas in order to create opportunities for people to realize desired experiences (Clark & Stankey, 1979). ROS guidelines include natural and managed settings and benefits sought by visitors (Anderson et al., 2000). However, ROS was designed to manage large protected natural areas, and managers continue to struggle with how to apply ROS guidelines to WUI areas.

2.3. Place meanings

The concept of place is a hub of subjective meanings built by human experience. As suggested by Tuan (1977), "what begins as undifferentiated space becomes place as we get to know it better and endow it with value" (p. 6). Spaces are more general and broad with indefinite meanings, while places are more specific and concrete and evolve from human experiences and interactions (Tuan, 1977) and represent more than physical environments (Tuan, 1974). For example, as people visit a specific setting, they ascribe meaning to those areas, such as a wilderness area might be a place for person to escape and relax while a local park might be a place for families to bond and exercise (Stedman, 2003). As people ascribe favorable meanings to specific places, they likely become more attached to those places and regard those areas

favorably (Moore & Graefe, 1994; Stedman, 2003; Williams et al., 1992). Researchers are still ascertaining how setting management can best instill place meanings and, hence, attachment to those areas (Hidalgo & Hernández, 2001; Kyle & Chick, 2007; Stedman, 2003; Uzzell, Pol, & Badenas, 2002).

Over the last two decades, place-related concepts have been imprecisely understood. While the sense of place concept is considered synonymous with place attachment by some (e.g., Low & Altman, 1992; Patterson & Williams, 2005), sense of place is also considered as an overarching construct and place attachment is regarded as a narrower concept by others (e.g., Davenport & Anderson, 2005; Farnum, Hall, & Kruger, 2005; Williams & Vaske, 2003). In addition, some researchers would suggest that place attachment is distinct from place meanings and the former is derived from the latter (Kruger, Hall, & Stiefel 2008; Stedman, 2002, 2003; Wynveen, Kyle, Absher, & Theodori, 2011). However, the “place meanings” concept is established as a comprehensive construct that embraces tangible and intangible values such as beauty or scenery, belonging, attachment, and spirituality (Cheng, Kruger, & Daniels, 2003). A wide spectrum of place meanings conceptually encompasses tangible and intangible values such as inherent/aesthetic, instrumental/goal-directed, cultural/symbolic, and individual/expressive meanings (Williams & Patterson, 1999). Furthermore, while place attachment mirrors the intensity of people–place relationships derived from on-site recreation experiences (Davenport & Anderson, 2005; Davenport, Baker, Leahy, & Anderson, 2010; Wynveen et al., 2011), place meanings reflect evaluative thoughts and feelings assigned to place that hold the values and importance of a place (Davenport & Anderson, 2005; Davenport et al., 2010; Stedman, 2002; Wynveen et al., 2011) not limited to recreation experience-centered connections (Davenport et al., 2010). The research conducted here utilizes the place meanings concept as a broad construct that includes the place attachment construct.

A place attachment scale was initially developed by Williams et al. (1992). Place dependence and place identity factors were documented as the main dimensions. Place dependence refers to a connection between an individual and a particular place or setting where his or her needs and goals can be met (Williams et al., 1992). Individuals assess the quality of a particular place, partly based on its ability to satisfy their activities or goals (Warzecha & Lime, 2001). Place identity is described as individuals’ identities resulting from interactions with physical settings (Proshansky, 1978) and also symbolic meanings ascribed to a place (Davenport & Anderson, 2005; Stedman, 2002; Williams et al., 1992). These place dependence and identity dimensions reflect instrumental and expressive aspects of place tied to individuals (Williams & Patterson, 1999).

Efforts to develop a place attachment scale have resulted in additional place-related dimensions. More recent researchers suggested additional dimensions besides the traditional place dependence and identity dimensions. For example, Jorgensen and Stedman (2001), Kyle, Mowen, and Tarrant (2004), Kil, Holland, and Stein (2010), and Tapsuwan, Leviston, and Tucker (2011) included affective attachment (Low & Altman, 1992). Other bonding dimensions reported are social bonding (Kyle, Graefe, & Manning, 2005; Kyle, Mowen, et al., 2004), place familiarity, place belongings, and place rootedness (Hammit, Backlund, & Bixler, 2006).

Although those constructs are essential to place–human bonding and meanings, they lack an assessment of a more inclusive relationship between humans and environments from the planning perspective of benefit opportunities. More recently, additional domains included broad sets of place meanings ranging from more tangible nature and natural processes (i.e., ecological integrity), economic dependency, and place dependence dimensions to more intangible identity dimensions (e.g., family, community, and

individual place identities) which were conceptually postulated and empirically reported by researchers (Davenport & Anderson, 2005; Davenport et al., 2010; Smith, Davenport, Anderson, & Leahy, 2011). These components could be framed within the concept of “landscape meanings” (Williams & Patterson, 1999) which are broadly targeted as benefits by the outcomes-focused management model (Driver, 2008).

Nature and natural processes represent what individuals believe about the ecological functions of a place in producing healthy ecosystems (Smith et al., 2011) and mainly result from the ecological interplay between biotic (living organism) and abiotic (physical and chemical) parts of ecosystems (de Groot, Wilson, & Boumans, 2002). Nature and natural processes are related to regulation functions that represent an ability of natural ecosystems to sustain ecological and life support processes (e.g., water supply, soil formation/retention, air quality, pollination, and aesthetic landscapes) (de Groot et al., 2002; Hein, Van Koppen, de Groot, & van Ierland, 2006). Many individuals believe undisturbed landscapes being protected from development and providing environmental services (e.g., habitat for wild species, clean water and air quality) (Davenport et al., 2010) are important.

Economic stability/dependency relates to the degree to which natural resources help sustain economic benefits in communities and upon which humans depend on for their livelihood. This dimension reflects humans’ beliefs about the extent that resources contribute to economic revenue and serve as a source of income such as by drawing tourism dollars to communities.

Extending the individual place identity dimension, legacy identity is coupled with the special heritage recognized from past long-term bonding between landscapes and social entities (e.g., family and group). Unique social memories formed through family time spent together in landscapes are examples of family legacy identity meanings. Finally, community identity is analogous to family identity in that both embody special associations between resources and social groups. But community identity meanings represent the degree to which landscapes symbolize the local character, culture, and identity that lead to a sense of community pride. It involves humans’ beliefs that natural and historical/cultural landscapes contribute to community identity (Davenport et al., 2010; Smith et al., 2011). Locations like Sedona, AZ, Lake Tahoe, CA or Daytona Beach, FL are examples.

3. Place meanings associated with other variables

3.1. Related to sociodemographic and visit characteristics

Environmental meanings ascribed to a place can vary by different social-cultural groups and individuals, based on a sociocultural paradigm that conceptually views an individual as a social agent endowing meanings on specific places. Different age, ethnic, and income groups would hold different levels of meanings for places (Kellert, 1996; Saegert & Winkel, 1990; Williams & Carr, 1993; Williams & Patterson, 1999). A few studies (but not all) indicate age has a significant effect on meanings ascribed to a place (e.g., Hidalgo & Hernández, 2001; Kil et al., 2010; Kyle, Graefe, & Manning, 2004), while other sociodemographic variables (e.g., gender, income, and education) reportedly have an inconsistent relationship with place attachment across previous studies (e.g., Hidalgo & Hernández, 2001; Kil et al., 2010; Kyle, Graefe, et al., 2004; Tapsuwan et al., 2011).

Levels of place meanings were fostered by a history of recreation resource use (e.g., number of visits, length of association with recreation resources) (Hammit et al., 2006; Kil et al., 2010; Moore & Graefe, 1994; Moore & Scott, 2003; Williams & Vaske, 2003), proximity of recreation resources to residence (Kil et al., 2010; Moore &

Graefe, 1994; Moore & Scott, 2003) and familiarity with recreation resource areas (Williams & Vaske, 2003).

3.2. *Related to benefits sought*

The relationship of beneficial experiences to place meanings is based on Lawler's (1973) expectancy-value model of motivation suggesting that humans seek to attain personal benefits from natural environments. Personal recreational benefits/outcomes contribute to the formation of meanings ascribed to natural settings (Kyle, Mowen, et al., 2004). The recreation experience preference (REP) scale validated by Manfredo, Driver, and Tarrant (1996) has been used to measure recreationists' experience preferences and outcomes in the context of outdoor recreation settings. Previous studies verified that higher place attachment to recreation areas are generally tied to beneficial experiences such as nature enjoyment, escape from noise, solitude, nostalgia, and learning (Kil et al., 2010; Kyle, Graefe, et al., 2004).

3.3. *Related to landscape attributes and setting preferences*

Walker and Ryan (2008) found that residents in the rural–urban fringe of Monmouth, Maine felt natural features and farms to be major attributes contributing to the rural character and sustaining higher levels of attachment to water, farm, and forested and open land scenes engendering strong conservation support. A more recent study implemented by Lokocz, Ryan, and Sadler (2011) among residents facing urban development in rural Massachusetts also found strong support for conservation of natural areas, agricultural lands, and cultural areas was held by residents with higher levels of attachment.

Similarly, the influence of place meanings on desired management outcomes was examined by Smith et al. (2011) on local residents living within the Kaskaskia River Watershed, in Illinois. Their results reported a significant relationship between the two constructs. Respondents who ascribed ecological values to the lake expressed support for conservation of natural resources and opposed management for economic gains. On the other hand, respondents who held community identity values for the lake supported diverse management outcomes such as conservation or distinct community features, quality of life, community cohesion, and economic opportunities.

Integrating the concepts and ideas of outcomes-focused management, benefits sought and various sub-dimensions of place meanings and natural resource values, a study was designed to explore these concepts in WUI trail areas.

4. Research methods

4.1. *Study area*

The Florida National Scenic Trail (FNST) is one of eleven National Scenic Trails in the United States (Florida Trail Association, 2011). The FNST stretches about 1400 miles throughout Florida from the extreme northwest of the state in Pensacola to the southern part of the Florida Peninsula, ending in Big Cypress National Preserve. The FNST is administered by the US Forest Service, but the trail actually runs through multiple agencies' properties, which include state parks, state forests, wildlife and water management areas, federal and county parks, and other public lands. The Florida Trail Association (FTA) oversees and partners with all managing organizations to monitor and maintain the trail's condition (Florida Trail Association, 2011; USDA Forest Service, 2011). As it traverses through Florida, the FNST moves through diverse ecosystems. These ecosystems have varying degrees of development, and include natural areas in the WUI (defined as an intermix/interface

of natural areas and housing density) and non-WUI (categorized as vegetated or non-vegetated with very low or no housing density) areas (Silvis Lab, 2010). Surveying visitors to all access points along the trail would be impossible given limited budget and time. However, surveyors identified seven trailheads located in WUI areas that served as appropriate study sites. The majority of sites where visitors were surveyed were linear trails (i.e., visitors hiked a portion of the trail and then back-tracked the same length of trail).

4.2. *Survey instrument*

A questionnaire was developed to measure visitors' levels of place meaning and attachment to the trail, recreation benefits sought, landscape attribute and trail setting preferences, and demographic and visit characteristics. Each measure is described below.

4.2.1. *Place meanings*

Items were adopted from previous studies on place meanings (Anderson, Davenport, Leahy, & Stein, 2008; Davenport & Anderson, 2005; Moore & Graefe, 1994; Williams et al., 1992). The five dimensions of place meanings included in the questionnaire were nature and natural processes, place dependence, family legacy identity, community identity, and place identity. All items were measured on 5-point Likert scales ranging from 'strongly disagree' to 'strongly agree.'

4.2.2. *Recreation benefits sought*

Recreation experience preferences (REP) items adopted from Manfredo et al. (1996) were included to measure benefits sought. Items were rated on 5-point Likert scales ranging from 'not at all important' to 'most important.'

4.2.3. *Landscape attribute preferences*

To measure visitors' preferences for landscape attributes, items representing characteristics of natural features, historical/interesting sites, and availability of recreation activities were measured on 5-point Likert scales ranging from 'not at all important' to 'most important.'

4.2.4. *Trail setting preferences*

The survey included items commonly utilized with the ROS (e.g., Clark & Stankey, 1979; Stein & Lee, 1995) to measure setting preferences. Items were measured on 5-point Likert scales anchored from 'strongly disagree' to 'strongly agree.' The items consisted of managerial, social, and physical setting attributes.

4.2.5. *Demographics and visit characteristics*

Sociodemographic questions included gender, age, education, and income. Also, visit characteristics such as first/repeat visit, the number of visits over the past year, and proximity to trails from residence were sought.

4.3. *Survey sample and participants*

This study utilized data from on-site exit interviews with Florida National Scenic Trail (FNST) users of WUI areas between May 2008 and April 2010. Stratified random sampling was implemented to reach a representative sample of trail users of seven WUI recreation areas along the FNST (Babbie, 2004). Sampling was stratified by sites and weekends/weekdays and based on general use estimates from mechanical counters set up on the trails or researchers' previous observations on use levels of trails where counters were not utilized. Sampling sites were proportionately stratified by the number of WUI areas distributed along the Florida Trail. WUI trail areas located in northern Florida and in southern Florida were randomly chosen. A total of 301 trail users of WUI areas were asked

to participate with 41 individuals refusing, and 242 interviews completed, yielding an 80% response rate. The two-year data collection timeframe allowed a minimum sample size (>200) to be reached to allow for appropriate multivariate statistics. All procedures were performed in compliance with relevant laws and institutional guidelines and the University of Florida institutional review board approved the survey content and process.

4.4. Data analysis

Data analyses, including response and non-response bias checks and descriptive statistics for demographics, trip characteristics, and scale-related variables, were performed using SPSS 18.0. Confirmatory factor analyses (CFA) were performed with Amos 18.0 to validate major constructs, place meanings, benefit preferences, and landscape attribute preferences.

The primary constructs were validated with CFA, using the standard checks of Chi-square to degrees of freedom ratio (≤ 5) (Bollen, 1989; Schumacker & Lomax, 2004), comparative fit index (CFI, $\geq .90$), and root mean square error of approximation (RMSEA, $\leq .08$) (Bollen, 1989; Hu & Bentler, 1999) scores all being acceptable. In addition, Cronbach's alpha scores ($\geq .60$) for each factor were examined to determine an acceptable internal consistency (Cortina, 1993) and factor loading ($\geq .50$) scores for items were checked for a statistically acceptable convergent validity (Hair, Black, Babin, Anderson, & Tatham, 2006).

Cluster analysis was used to group respondents on dimensional scores of place meanings. Chi-square analyses were performed to test associations between sociodemographic/trip characteristics (e.g., gender, first/repeat use) and place meaning clustered groups. One-way analysis of variance (ANOVA) investigated the relationships of place meaning clustered groups to benefits sought, landscape attribute preferences, and trail setting preferences, respectively. Scheffe's post hoc test was selected since it handles unequal group sizes and provides more conservative results (Vaske, 2008).

5. Results

5.1. Measurement of place meanings

CFA results indicated that the place meanings construct was multidimensional, consisting of nature and natural processes, place dependence, family legacy identity, community identity, and place identity (Table 1). The Chi-square ratio to its degrees of freedom ($\chi^2/df=2.63$) was a good fit. The other fit indices (CFI=.92, RMSEA=.08) revealed an adequate fitting model and valid constructs. All Cronbach's alpha scores showed acceptable internal consistency, except the reliability score for the community identity dimension (.57) was lower than the minimum threshold value of .60 (Cortina, 1993) and raised a slight concern. Factor loadings for items within their respective factor ranged from .51 to .93.

5.2. Clustered segments of attached hikers

Repeated use of *K*-means clustering for a sample size of 200 or more cases (Kyle, Graefe, et al., 2004) produced three distinct clusters with similar sets of place meanings dimensions. ANOVA analysis results verified that mean scores of each place meaning factor differed significantly across the three clusters (high, -medium, and -low attachment) (Table 2). The highly attached group tended to express significantly higher levels of nature and natural processes ($F=30.47, p<.001$), place dependence ($F=142.12, p<.001$), place identity ($F=283.77, p<.001$), family legacy identity ($F=74.65, p<.001$), and community identity ($F=47.17, p<.001$) than moderately and low-attached user groups, respectively. Also, nature

and natural processes ($M=4.54, SD=.46$), place identity ($M=4.40, SD=.44$), and community identity ($M=4.22, SD=.58$) scores, on average, were higher than scores of place dependence ($M=3.76, SD=.61$) and legacy identity ($M=3.41, SD=.86$) across the clustered groups. These three clustered groups were utilized to examine differences in respondents' sociodemographic and visit characteristics, recreation benefits sought, landscape attribute preferences, and trail setting preferences.

5.3. Main characteristics of hikers

Results indicated that sociodemographic variables were not associated with place meanings (Table 3). However, the number of visits ($\chi^2=14.78, p=.005$), repeat use ($\chi^2=29.18, p<.001$), and proximity to trails from residence ($\chi^2=10.30, p=.036$) were related to how WUI trail users ascribe meanings to recreation areas. Hikers who recreated on specific WUI trails more often and lived closer to the trails where they were interviewed reported higher place meaning levels.

5.4. Benefits sought

CFA results indicated that each of the benefits sought was related to their respective constructs (Table 4). All reliability coefficients ranged from .70 to .80, meeting the threshold criteria. Factor loadings for items within their respective concept ranged between .53 and .91. In addition, CFA fit statistics ($\chi^2/df=2.70$, CFI=.92, RMSEA=.08) revealed a good fitting model.

ANOVA results indicated substantially significant differences among the clusters on the benefits sought domains (Table 5). Of the 4-benefits sought factors, the three groups rated three factors significantly different. Generally, the factor "escape" was rated the highest among all participants, but the highly attached group reported a higher mean benefit score ($M=4.71, SD=.45$) for "escape" ($F=14.27, p<.001$) than the medium ($M=4.35, SD=.61$) and low-attached groups ($M=4.25, SD=.63$). The highly attached group also rated "environmental exploration" ($F=15.59, p<.001$) and "achievement" ($F=10.07, p<.001$) significantly higher than the medium- and low-attached groups. The degree of attachment to a place did not relate to "family bonding", which was not significantly different between the three groups ($F=1.64, p=.196$).

5.5. Landscape attribute preferences

CFA results indicated that each of the landscape attribute preferences was related to their respective constructs (Table 6). All reliability coefficient scores ranged between .79 and .81, meeting threshold criteria. Factor loadings for items within their respective concept were significant, ranging between .64 and .84. Also, CFA fit statistics ($\chi^2/df=2.66$, CFI=.95, RMSEA=.08) showed good fit.

All groups rated natural features high (mean ratings from 4.10 to 4.44), but significant differences were noticed (Table 7). The highly attached group preferred natural environmental features ($F=4.71, p<.05$) and historical/interesting sites ($F=4.74, p<.05$) more strongly than the low-attached groups (Table 7). The three groups' preferences did not significantly differ on the availability of activities attribute ($F=2.19, p=.115$).

5.6. Trail setting preferences

Significant differences in preferences for ROS-based settings were found among the clusters (Table 8). For the managerial setting category, most WUI trail users expressed positive preferences for walking on natural ($M=3.96, SD=1.10$) and loop ($M=3.81, SD=1.03$) trails. Highly attached trail users were significantly higher than low-attached trail users ($F=4.58, p=.011$) for walking

Table 1
Confirmatory factor analysis of place meaning items.

Variables ^a	α	λ	t-Value	Mean	SD
Nature and natural processes	.77			4.17	
This trail is important in protecting the landscape from development		.73	–	4.29	.73
This trail is important for providing habitat for wildlife		.88	10.03	4.35	.74
This trail is important in protecting the water quality		.59	8.38	3.87	.93
Place dependence	.85			3.11	
No other trail can compare to this trail		.66	–	3.08	.99
I get more satisfaction out of visiting this trail than any other		.69	9.30	3.33	1.01
What I do at this trail is more important to me than doing it in any other		.87	11.09	3.05	.92
I wouldn't substitute any other trail for doing the types of things I do		.84	10.86	2.96	1.01
Family legacy identity	.75			3.10	
This trail is a special place for my family		.78	–	3.36	1.12
Many important family memories are tied to this trail		.51	4.90	2.83	1.11
Community identity/character	.57			3.75	
This trail contributes to the character of my community		.78	–	4.17	.82
My community's history is strongly tied to this trail		.51	5.91	3.33	1.03
Place identity	.94			3.57	
I am very attached to this trail		.81	–	3.79	1.01
This trail means a lot to me		.83	15.10	3.77	.99
I feel this trail is a part of me		.84	15.44	3.26	1.07
This trail is very special to me		.93	18.02	3.55	1.02
I identify strongly with this trail		.92	17.67	3.49	1.04

^a Items were measured on a 5-Likert scale where 1 = strongly disagree, 3 = neutral, and 5 = strongly agree. Fit statistics: $\chi^2_{(94)} = 249.14$, $\chi^2/df = 2.65$, root mean square error of approximation (RMSEA) = .083, comparative fit index (CFI) = .933.

Table 2
Mean scores of place meaning factors by clustered place meaning groups.

Factor	Cluster						F-test	p
	High (n = 90)		Medium (n = 107)		Low (n = 45)			
	Mean	SD	Mean	SD	Mean	SD		
Nature and natural processes	4.54 ^a	.46	4.00 ^b	.55	3.81 ^b	.86	30.47	<.001
Place dependence	3.76 ^a	.61	2.99 ^b	.46	2.09 ^c	.63	142.12	<.001
Family legacy identity	3.41 ^a	.86	2.92 ^b	.71	1.96 ^c	.77	74.65	<.001
Community identity/character	4.22 ^a	.58	3.63 ^b	.65	3.09 ^c	.81	47.17	<.001
Place identity	4.40 ^a	.44	3.44 ^b	.47	2.24 ^c	.66	283.77	<.001

Note: Cluster means with different superscripts indicate significant difference.

Table 3
Visitor characteristics by clustered place meaning groups.

Characteristics ^a	Cluster			Chi-square	df	p
	High	Medium	Low			
Gender						
Male	48%	62%	53%	3.88	2	.144
Female	52	38	47			
Age						
18–39 years old	28	31	33	5.98	4	.200
40–59 years old	43	41	51			
60 years or older	34	28	16			
Education						
High school diploma/GED or less	23	18	16	3.68	4	.451
Some college-College graduate	54	49	46			
Some graduate - Graduate degree or beyond	23	33	38			
Income						
\$39,999 or below	36	33	35	2.03	4	.730
\$40,000–\$69,999	30	26	20			
\$70,000 or more	34	41	45			
Times visited during the last year						
6 times or less	29	43	60	14.78	4	.005
7–30 times	23	19	22			
More than 30 times	48	38	18			
Type of user						
First-time user	7	8	38	29.18	2	<.001
Repeat user	93	92	62			
Proximity to trails from residence						
30 miles or less	88	91	73	10.30	4	.036
31–60 miles	1	2	7			
61 miles or more	11	7	20			

^a Percentages are by columns.

Table 4
Confirmatory factor analysis of benefits sought items.

Variables ^a	α	λ	t-Value	Mean	SD
Achievement	.80			3.47	
Challenge myself and achieve personal goals		.76	–	3.79	1.17
Depend on my skills and abilities		.83	11.44	3.55	1.17
Feel a sense of independence		.67	9.73	3.84	1.05
Take risks		.58	8.34	2.72	1.30
Escape	.70			4.47	
Reduce tensions and stress from everyday life		.65	–	4.50	0.70
Escape noise/crowds		.79	7.56	4.42	0.76
Promote physical fitness		.53	6.43	4.48	0.78
Family bonding	.82			3.79	
Be with friends and family		.91	–	3.94	1.22
Strengthen family kinship		.76	7.31	3.65	1.28
Environmental exploration (Nature/learning exploration)	.73			4.12	
Learn about the natural environment of the area		.60	–	3.72	1.03
Explore the area and the natural environment		.80	8.36	4.10	0.84
Enjoy nature		.68	7.80	4.55	0.60

^a Items were measured on a 5-Likert scale where 1 = not at all important, 3 = neutral, and 5 = most important. Fit statistics: $\chi^2_{(48)} = 129.70$, $\chi^2/df = 2.70$, Root mean square error of approximation (RMSEA) = .084, Comparative fit index (CFI) = .915.

Table 5
Benefits sought by place meaning-based segments.

Factor ^a	Cluster						F-test	p
	High (n = 90)		Medium (n = 107)		Low (n = 45)			
	Mean	SD	Mean	SD	Mean	SD		
Achievement	3.80 ^a	.93	3.33 ^b	.77	3.17 ^b	1.08	10.07	<.001
Escape	4.71 ^a	.45	4.35	.61	4.25 ^b	.63	14.27	<.001
Family bonding	3.95	1.18	3.75	1.09	3.59	1.20	1.64	.196
Nature/learning exploration (Environmental exploration)	4.41 ^a	.65	3.98 ^b	.58	3.90 ^b	.69	15.59	<.001

^a Items for each factor were measured on a 5-Likert scale where 1 = not at all important, 3 = neutral, and 5 = most important. Cluster means with different superscripts indicate significant difference.

Table 6
Confirmatory factor analysis of landscape attribute preference items.

Variables ^a	α	λ	t-Value	Mean	SD
Natural features	.79			4.25	
Wilderness and undisturbed nature		.84	–	4.24	.902
Chance to see wildlife/birds		.74	9.63	3.92	1.07
Good environmental quality of air, water, and soil		.68	9.23	4.29	.87
Historical/interesting sites	.81			2.52	
Historical, military, or archeological sites		.77	–	2.50	1.25
Local crafts or handiwork		.79	10.96	2.23	1.09
Interesting small towns		.73	10.39	2.84	1.33
Availability of activities	.80			2.12	
Good fishing		.83	–	2.18	1.26
Good hunting		.81	11.92	1.80	1.04
Availability of campgrounds		.64	9.67	2.38	1.26

^a Items were measured on a 5-Likert scale where 1 = not at all important, 3 = neutral, and 5 = most important. Fit statistics: $\chi^2_{(24)} = 63.76$, $\chi^2/df = 2.66$, root mean square error of approximation (RMSEA) = .083, comparative fit index (CFI) = .952.

Table 7
Landscape attribute preference by place meaning-based segments.

Factor ^a	Cluster						F-test	p
	High (n = 90)		Medium (n = 107)		Low (n = 45)			
	Mean	SD	Mean	SD	Mean	SD		
Natural features	4.44 ^a	.76	4.15 ^b	.73	4.10 ^b	.77	4.71	.010
Historical/interesting sites	2.66 ^a	1.10	2.59 ^a	.95	2.10 ^b	1.03	4.74	.010
Availability of activities	2.16	1.17	2.21	.89	1.84	.88	2.19	.115

^a Items for each factor were measured on a 5-Likert scale where 1 = strongly disagree, 3 = neutral, and 5 = strongly agree. Cluster means with different superscripts indicate significant difference.

Table 8
ROS-based setting preferences by place meaning-based segments.

Variables ^a	Cluster						F-test	p
	High (n = 90)		Medium (n = 107)		Low (n = 45)			
	Mean	SD	Mean	SD	Mean	SD		
Managerial setting								
To travel on trails that are natural; dirt or grass	3.96	1.10	3.59	1.07	3.71	1.14	2.77	.065
To travel on trails that are paved	3.60	1.33	3.70	1.18	3.38	1.11	1.10	.334
To travel on trails that are linear	3.39 ^a	1.17	3.15	.90	2.82 ^b	1.05	4.58	.011
To travel on loop trails	3.81	1.03	3.70	.85	3.71	1.12	0.35	.708
Social setting								
Very little contact outside my own group (less than 6 people)	3.49	1.09	3.22	.95	3.56	1.06	2.39	.094
Little contact outside my own group (7–15 people)	3.34	.98	3.09	.91	3.09	1.16	1.85	.160
Moderate contact outside my own group (15–30 people)	2.91	1.06	2.94 ^a	.91	2.49 ^b	.99	3.71	.026
Constant contact with others outside my own group	2.57	1.23	2.50	.98	2.29	1.10	0.96	.383
Physical setting								
To travel in areas untouched by man	3.49	1.31	3.40	1.03	3.22	1.29	0.75	.471
To travel in areas that have been modified but appear natural	3.89	1.00	3.81 ^a	.69	3.47 ^b	1.08	3.52	.031
To travel in areas that appear to be man-made and natural	3.51	1.09	3.37	.85	3.42	.99	0.49	.613
To travel in areas where roads and power lines dominate	2.07	1.30	2.09	.98	1.67	.98	2.58	.078

^a Item was measured on a 5-Likert scale where 1 = strongly disagree, 3 = neutral, and 5 = strongly agree. Cluster means with different superscripts indicate significant difference.

on linear trails, with low-attached trail users expressing a negative preference for linear trails ($M = 2.82$, $SD = 1.05$).

For the social setting category, all three groups generally preferred “little” to “very little” contact with people outside of their own group. Medium-attached trail users were significantly more tolerant ($F = 3.71$, $p = .026$) than low-attached trail users about “moderate contact outside their own group (15–30 people),” but both groups generally did not prefer encountering large groups (>30) of other people.

For physical setting attributes, results mirror what one might expect from WUI trail users. Most respondents preferred “to travel in areas that have been modified but appear natural.” Medium-attached trail users expressed preferences for these areas (e.g., modified but appear natural) with a statistically significant higher score than low-attached trail users ($F = 3.52$, $p = .031$). In general, the highly attached group preferred to travel in areas that have been no more than slightly modified but remain essentially in a natural condition.

6. Discussion: implications for WUI planning

Little knowledge exists on WUI user groups’ perceived benefits, emotional attitudes and management preferences for WUI recreation areas. Unlike most other studies, we utilized an enhanced place meaning construct with tangible and intangible values to better identify perceived place meanings of WUI trail user groups.

First, levels of multidimensional place meanings did not differ by hikers’ demographic characteristics such as gender, income, and education. Age was also not related to emotional meanings of places, which is contrary to some previous results (e.g., Hidalgo & Hernández, 2001; Kyle, Graefe, et al., 2004).

On the other hand, place meanings did significantly differ by WUI hikers’ trip characteristics such as recreation resource use history (the number of visits, repeat use) and proximity from residence to trail. This verifies previous research findings that the degree of place attachment is related to the magnitude of visitors’ physical interactions with resources (e.g., Moore & Graefe, 1994; Williams & Vaske, 2003) or closeness of their residence to resources (e.g., Kil et al., 2010; Moore & Scott, 2003).

WUI hikers with higher place meanings significantly preferred recreation benefits sought such as achievement, escape, and nature/learning exploration, which is consistent with previous research findings (e.g., Kil et al., 2010; Kyle, Graefe, et al., 2004; Warzecha & Lime, 2001). In general, these results verify

the significant relationship between beneficial experiences and place meanings based on the expectancy-value model (Lawler, 1973) which posits that the benefits people perceive are highly influenced by the expectations they had or were lead to develop before the experience. Also, the highly attached hikers expressed stronger preferences for recreational benefits, particularly in exploring/learning about nature and escaping noise.

Managing for social benefits is a challenge for natural resource managers. This study’s results showed that the desire for social benefits did not differ by the degree of place meanings, which is consistent with past studies (e.g., Kil et al., 2010; Warzecha & Lime, 2001). However, Kyle, Graefe, et al. (2004) found that group bonding experiences were sought more strongly by highly attached hikers. Although not strong, this study’s WUI trail users expressed some preference for social benefits, and managers might also want to consider individuals who are not visiting WUI areas. Attracting more families might benefit the agencies that manage these areas through garnering more support with local residents since place meanings are generally created by achievement of experiences in social settings as well as physical environments (Hidalgo & Hernández, 2001; Kyle & Chick, 2007; Stedman, 2003).

Most participants in this study preferred landscape attributes such as natural features and historic/interesting sites, preferred traveling on natural soil, linear trails, and accepted a moderate number of encounters with other hikers more strongly than lower-attached hiking groups. These are common characteristics in WUI areas, but it shows that managers must be protective of some of these more sensitive characteristics. For example, a higher number of users are likely in certain WUI areas, and maintaining moderate participation in an area might be difficult, though approaches such as reducing parking spaces, closing side trails providing access to main trails or reducing/removing mentions of certain trail access points on maps or brochures, or removing access directional signs are potential control measures should user densities become problematic.

Overall, this study demonstrated that the degree of meanings ascribed by trail users of the WUI is related to the types of personal benefits they hope to attain in that area. As discussed earlier, both personal benefits achieved through recreation and place meanings not limited to recreation experiences are deemed to be desirable outcomes posited by OFM. This research identified personal benefits sought by WUI-trail user groups who perceived various tangible and intangible meanings. Secondarily, the degree of meanings is also related to setting attributes, mostly related to specific

setting characteristics. Therefore, the OFM perspective applies to the management of WUI areas, and could be improved by including attachment levels.

Highly attached WUI hikers frequently preferred benefits such as nature exploration/learning, natural landscape features, and hiking on natural trails. These social values highlight the importance of maintaining natural ecosystems in WUI areas that provide biodiversity, improved water and air quality, protection of wildlife habitat, and recreation/tourism opportunities (de Groot et al., 2002; Hein et al., 2006), which foster human emotional and psychological feelings and well-being (e.g., Chiesura, 2004; Kellert, 1996; Ulrich, 1986). Prior research also showed that the emotional meanings ascribed by humans to natural environments is sustained by humans' perception or presence of natural visual landscapes (e.g., trees and vegetation, wildlife) (e.g., Kil et al., 2010; Ulrich, 1986) and attainment of nature exploration/learning experiences (Kil et al., 2010; Kyle & Chick, 2007; Stedman, 2003).

7. Implications for management and future research

WUI hiking groups with higher place meanings valued natural conditions in recreation areas for their intrinsic and psychological benefits such as exploring/learning about nature or experiencing solitude as well as other natural ecosystem benefits such as wildlife habitat or water quality protection. WUI trail users with lower degrees of place meanings also value these experiences, but not to the extent as highly attached trail users.

Managing for highly attached WUI trail users should be a priority for natural resource managers who wish to make immediate and positive impacts on an important constituency. Highly attached visitors are the types of resource users who are more likely to actively support the management agency when budgetary and other resources (e.g., volunteering and public involvement) are threatened (e.g., Moore & Graefe, 1994; Moore & Scott, 2003; Stein, 2005). This is a particularly important group since many of these users live close to WUI recreation areas and are likely to be fairly active in decisions concerning these areas. Also, this research shows that the benefits and settings highly attached WUI trail users desire are consistent with managing ecologically healthy natural areas – likely a major goal of most public natural resource management agencies (e.g., US Forest Service). Multiple meanings beneficial to individuals, society, economy, and environments are derived from natural landscapes (e.g., Davenport et al., 2010; Williams et al., 1992). Therefore, it is important for resource planners and managers to provide and maintain physical, ecological, and social/cultural attributes of landscapes to facilitate those ecosystem benefits (Zipperer, 2005). WUI planners and managers can use the OFM philosophy to simultaneously provide ecological benefits while also providing desired recreation opportunities for all users, but particularly opportunities desired by highly attached trail users. Although this might be challenging due to peripheral urbanization that negatively affects managers' ability to provide the benefits focused on more natural ecosystems (Duryea & Vince, 2005), this study shows that managing for more natural areas likely provides more opportunities for agencies to achieve multiple goals.

Overall, WUI areas need to provide diverse recreation and benefit opportunities for diverse publics (Stein, 2005). Therefore, WUI planners and managers will need to use appropriate spatial scales or zones. For example, developed outdoor recreation facilities can be offered at some areas, while natural settings for ecosystem benefits such as aesthetics, wildlife habitat, and outdoor recreation might be of higher importance in other zones. This study highlights the importance of maintaining natural characteristics in the WUI, and it shows that existing concepts and management frameworks (e.g., ROS and OFM) are useful in providing for diverse beneficial

opportunities. Not only will WUI planners and managers satisfy specific goals of creating quality recreation opportunities and conserving natural ecosystems, but they will also contribute to the formation of diverse meanings ascribed to natural settings, as demonstrated in this study.

Interestingly, most place meaning item mean scores were slightly above neutral in this trail study. Interestingly, this finding is similar to results from other trail studies (e.g., Kyle, Graefe, et al., 2004; Moore & Graefe, 1994; Moore & Scott, 2003) where they noted “an overall mean score of attachment to a “park” is a little higher than that of attachment to a “trail” within the park” (Moore & Scott, 2003). This may suggest that users may become more attached to static areas (e.g., parks, playgrounds) than to more generic corridors (e.g., trails, rivers). As stated by Moore and Scott (2003, p. 883), the way they experience the areas they recreate in and develop attachment may vary by “focused” (spending more time at specific locations) and “unfocused” (experiencing it in passing) activities. Thus, people traveling (e.g., hiking) through corridor areas (unfocused use) are probably not as likely to develop higher place attachments (since they are usually spending less time in specific areas) and they are generally less “unique” (many trails and rivers areas are similar) than fixed places that people spend more time in for personally important reasons (focused use). Future research should compare place meaning levels by different types of recreation areas and activities to better understand this phenomenon.

In addition, spatial zoning planning should reflect trail setting preferences such as a moderate preference for loop trails and a relatively low preference for long linear trails across all clustered user groups. Future studies may replicate this study, utilizing data collected from users of loop trails in WUI and/or non-WUI (e.g., more natural) areas and contrasting hikers who may linger longer in a trail area with those who pass through quickly. Additional future research could examine differences between proximate and distant hikers (e.g., local vs. non-local residents) using WUI's by applying constructs such as place meanings with additional dimensions and setting preferences such as those included in this study and others.

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