The Measurement of Place Attachment: Validity and Generalizability of a Psychometric Approach

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ABSTRACT. To enhance land managers' ability to address deeper landscape meanings and place-specific symbolic values in natural resource decision making, this study evaluated the psychometric properties of a place attachment measure designed to capture the extent of emotions and feelings people have for places. Building on previous measurement efforts, this study examined the validity and generalizability of place attachment across measurement items, places, and dimensions (place dependence and place identity) of attachment. Colorado State University students ($n = 65$) rated four forest-based recreation sites on two dimensions of place attachment. In addition, data from a sample of University of Illinois students ($n = 380$) and visitors to Shenandoah National Park ($n = 2005$) and Mt. Rogers National Recreation Area ($n = 369$) were analyzed and compared to the Colorado sample. Confirmatory factor analysis of these four data sets demonstrated that subjects distinguish between two dimensions of attachment and assign different levels of attachment to the different areas. Generalizability analysis of the Colorado data provided additional evidence for the two-dimensional structure and suggested that each attachment dimension can be reliably measured with as few as four questionnaire items. Convergent validity was supported through analyses of the relationships between the place attachment measures and both behavioral and psychological variables predicted to be related to place attachment. For. Sci. 49(6):830–840.

Key Words: Measurement, scale development, reliability, recreation, sense of place.

Public land management in the United States has been guided for nearly 100 yr by a utilitarian philosophy laid down by Gifford Pinchot and the scientific progressives of his time. Over the past decade, however, a new kind of "ecological" thinking has taken root in governmental and nongovernmental organizations responsible for managing and protecting natural resources. The reasons motivating this shift, though many and complex, appear to have both a scientific and social component. First, ecologists have recognized that typical production management models (e.g., engineering a timber stand to maximize fiber yield) do not adequately account for the ecological changes that may result, particularly in the larger spatial-temporal context of ecosystems (Franklin 1989). Second, society increasingly values natural resources in ways not easily captured by the commodity and production metaphors of "use" and "yield" generally associated with utilitarianism (Bengston 1994).

The emergence of ecosystem management as a resource management philosophy is in many ways an effort to rethink these metaphors. Rather than focusing exclusively on the tangible or objective properties of the environment, the shift towards ecosystem management underscores the importance

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of also understanding the subjective, emotional, and symbolic meanings associated with natural places and the personal bonds or attachments people form with specific places or landscapes (Williams and Stewart 1998). Symbolic meanings, what a place signifies or stands for, may range from the very personal (coming-of-age symbolized in a favored childhood stomping ground) to the publicly shared (American heritage symbolized in national parks) and may contribute to the formation of emotional bonds with that place. Similarly, emotional bonds may form with particular landscapes or places because their use has come to symbolize the user's sense of identity. Such bonds intensify resource management conflicts as different segments of society assign different kinds and degrees of meaning to the same place.

To improve our understanding of the emotional and symbolic relationships people form with natural resources, this article examines the validity and generalizability of quantitative measures of attachment to nature-based places. Existing research suggests that place attachment is amenable to psychometric scaling in large-scale social surveys to identify places where strong emotional and symbolic meanings are at stake in natural resource decision making (Williams et al. 1992a, Jorgensen and Stedman 2001). Developing ways of measuring emotional/symbolic attachments to places provides a means for people to articulate natural resource values in the land management planning process and may help to resolve natural resource conflict. There are two specific objectives for this study:

1. To evaluate the dimensional structure and construct validity of a place attachment measure by examining behavioral and psychological factors that influence the formation of attachments.

2. To examine the generalizability of a place attachment measure across multiple places.

Place Attachment

Interest in understanding the attachments that people form with places can be found in a variety of disciplines. Sociology, for example, emphasizes how the symbolic meanings of settings influence the social context of human interactions (Grieder and Garkovich 1994). Anthropology seeks to understand the cultural significance of places in day-to-day life (Gupta and Ferguson 1997). Human geography has explored the concept of "sense of place" (Relph 1976, 1997, Buttimer and Seamon 1980, Tuan 1977, 1980), which is similar to the notion of "place attachment" as developed in environmental psychology (Brown 1987, Altman and Low 1992). When viewed from this latter discipline, attachment represents a positive connection or bond between a person and a particular place (Giuliani and Feldman 1993, Williams and Patterson 1999).

Early studies of place attachment were directed at the built environment. Recent efforts have studied residents' attachments to resource and tourism dependent communities (McCool and Martin 1994, Vorkinn 1998, Vorkinn and Riese 2001), local residents' attachments to nearby "special places" (Eisenhauer et al. 2000), visitors' attachments to recreation and tourist destinations (Williams et al. 1992a, Moore and Graefe 1994, Bricker and Kerstetter 2000, Vaske and Kobrin 2001, Warzecha and Lime, 2001), and place attachment among second home owners (Kaltenborn 1997a, 1997b, Jorgensen and Stedman 2001). This article extends the psychological study of attachment to recreational places by evaluating the psychometric structure and performance of a commonly used place attachment measure designed to measure two dimensions of place attachment previously identified in the literature—place dependence and place identity (Williams et al. 1992a, Jorgensen and Stedman 2001).

Place dependence (a functional attachment) reflects the importance of a place in providing features and conditions that support specific goals or desired activities (Schreyer et al. 1981, Stokols and Shumaker 1981, Williams and Roggenbuck 1989). This functional attachment is embodied in the area's physical characteristics (e.g., accessible rock climbing routes, collectable nontimber forest products, or navigable whitewater rapids), and may increase when the place is close enough to allow for frequent visitation. A relatively small river with class II and III rapids, for example, may not provide the best kayaking. However, if the place is close to an individual's home, an avid kayaker may still float the river frequently to improve specific skills. Place dependence thus suggests an ongoing relationship with a particular setting. Though local natural resource areas (e.g., community open space) may be ideal for establishing this functional attachment, such attachments may form with any place supporting highly valued goals or activities.

Place identity (an emotional attachment) refers to the symbolic importance of a place as a repository for emotions and relationships that give meaning and purpose to life (Williams and Roggenbuck 1989, Shamai 1991, Giuliani and Feldman 1993). As such, place identity has been described as a component of self-identity (Proshansky et al. 1983) that enhances self-esteem (Korpela 1989), increases feelings of belonging to one's community (Relph 1976, Tuan 1980), and is an important component of communications about environmental values and policies (Cantrill 1998). Some investigators have suggested that a history of repeat visitation due to place dependence may lead to place identity (Moore and Graefe 1994). However, place identity is not necessarily a direct result of any particular experience with the place (Proshansky et al. 1983), though it generally involves a psychological investment with the place that tends to develop over time (Giuliani and Feldman 1993).

Initial Place Attachment Measurement

Psychometric scaling follows a series of steps (DeVellis 1991, p. 51-80). In Step 1, the researcher develops a comprehensive understanding of the theoretical literature regarding the constructs to be measured. In Step 2, a comprehensive pool of questionnaire items designed to measure each of the study's concepts (place dependence and place identity) is constructed. The questionnaire items are administered to a sample of respondents for item testing and analysis in Step 3. Step 4 evaluates the items for reliability and validity using the data from Step 3. The goal of these analyses is to evaluate the performance of the individual items so that appropriate ones can be identified to constitute the scale.

This study builds on previously completed scale development work. In a series of studies drawing on the psychological approaches described above, Williams and colleagues (Williams and Roggenbuck 1989, Williams et al. 1992a, 1995) have identified and evaluated 61 potential place attachment questionnaire items (including both place dependence and place identity items) for potential inclusion in a place attachment measure. In these studies subjects responded to items such as "I wouldn't substitute any other area for doing the type of things I did here" (place dependence) and "This place means a lot to me" (place identity) on a five-point "strongly disagree" to "strongly agree" scale. In two studies subjects were asked to respond with respect to a "wilderness, backcountry, roadless or natural area" they had visited recently. In two other studies conducted in Virginia, visitors to specific sites (Mount Rogers National Recreation Area and Shenandoah National Park) were asked to rate how attached they were to that place. Each study utilized different but overlapping sets of items ranging from as few as 15 to all 61 items.

Other investigators have employed, modified, and in some cases translated into other languages, these items for application in various natural resource contexts (see Young et al. 1991, Moore and Graefe 1994, Watson et al. 1991, 1994, Kaltenborn 1997a, 1997b, 1998, Johnson 1998, Nanistova 1998, Bricker and Kerstetter 2000, Jorgensen and Stedman 2001, Vaske and Kobrin 2001, Vorkinn 1998, Vorkinn and Riese 2001, Warzecha and Lime 2001). Most of these applications have been in reference to places people visit, typically for recreation, but have also included second homes (Kaltenborn 1997a), local communities (Kaltenborn 1998, Vorkinn and Riese, 2001), and birthplaces (Nanistova 1998). These studies have tended to confirm the existence of two dimensions of attachment (place dependence and place identity) and have shown that people form attachments that influence how individuals view various natural resource management issues (Young et al. 1991, Watson et al. 1994, Vaske and Kobrin 2001, Vorkinn and Riese 2001). These studies also confirm that attachment is strongly associated with familiarity and extent of contact with a place (Williams et al. 1992a).

Although researchers have pursued various applications of place attachment, important psychometric properties and refinements to the scales remain largely unexamined (Jorgensen and Stedman 2001). These include the traditional issues of item selection and reliability, the dimensional structure of the construct, evidence of construct validity, and the generalizability of place attachment dimensions across places. Conceived as a person-place bond or relationship, a valid measure of place attachment should differentiate not only among people with different levels of attachment for a given place, but should also be able to differentiate levels of attachment that a single individual holds for various places. Finally, given the differing forms of place attachment identified in the literature, questions remain about the validity of the two dimensional model place attachment (place dependence and place identity).

Construct Validity

Construct validity employs multiple forms of analysis aimed at revealing how well a measure fits theory. The first objective of this study focuses on establishing construct validity by determining (1) how well items fit the hypothesized two-dimension structure (place dependence and place identity) and (2) examining the extent to which the measure "behaves" in ways predicted by theory (DeVellis 1991, p. 46). The first approach to construct validity examines how well measurement items factor into theoretically predicted dimensions using confirmatory factor analysis techniques and goodness-of-fit statistics found in structural equation modeling programs (Hayduk 1987, Jöreskog and Sörbom 1993). The second approach employs correlation analysis to examine theoretically related (and unrelated) variables (Campbell and Fiske 1959). Validation of a measure in correlation analysis is established by demonstrating convergent validity (variables hypothesized as related to the construct should be positively correlated) and discriminant validity (variables hypothesized as unrelated would be uncorrelated). For example, economic value (as measured by willingness-to-pay), lack of perceived availability of substitute places, and sensitivity to resource impacts and alternative land uses represent constructs that one might expect to be positively correlated with place attachment. On the other hand, there is little theoretical reason to predict that place attachment would be correlated with most demographic variables (age, income, education).

Generalizability Theory

The second objective of this study is to establish the generalizability of the place attachment measure across multiple places, items and dimensions. Generalizability (G) theory is an extension of classic reliability theory for educational and psychological measurement (Cronbach et al. 1972, Shavelson and Webb 1991, Strube 2000). As applied here, G theory is used to address questions of item reliability, validity of the two dimensions of attachment (place dependence and place identity), as well as generalization across places.

Unlike reliability theory, which treats error as undifferentiated, generalizability theory focuses on isolating and estimating the relative magnitude of specific sources of measurement error. Investigators using G theory are interested in the precision or reliability of a measure because of the desire to generalize from the observation in hand to some class of observations to which it belongs. In classic reliability theory, the class of observations is often an infinitely large domain of items or questions. G theory extends measurement error assessment to include other domains of error besides items. In scenic quality studies, for example, researchers are often interested in generalizing preferences for a single photograph to the broader landscape from which it originated. This involves a generalization across space. As another example, Williams et al. (1992b) examined whether preferences for social encounters in wilderness settings generalize across visitors, time, and area. Using G theory, the investigator specifies a *universe* over which to generalize. In the context of designing a good place attachment measure, measurement should not generalize across places, individuals, or dimensions, but should generalize across items making up each dimension.

Multiple sources of error are estimated in G theory using a "variance components" ANOVA model. In G theory terms, a facet is analogous to a factor in analysis of variance or a set of treatments in an experimental design. G theory distinguishes two types of facets. A *facet of generalization* is a set of conditions (levels of a factor) that contributes unwanted variation (measurement error) to observations in a study. In the use of psychological tests, generalization facets often pertain to the test taking conditions (e.g., locations, occasions, proctors). A good measurement instrument should minimize variance arising from these facets. A *facet of differentiation* is the object of measurement (i.e., the set of conditions that are to be discriminated by a measurement instrument—usually persons). Since differentiation facets contribute desirable variance, the purpose of a measurement instrument is to maximize variability arising from the differentiation facets. In most scale development efforts there is only one differentiation facet (i.e., one object of measurement). In the case of place attachment, however, we are interested in three differentiation facets (persons, dimensions, and areas) and one generalization facet (items nested within dimensions). Each person, dimension, area, and item is a "condition" (level) of its respective facet. Generalizability coefficients are calculated as the ratio of object to total (object plus error) variance. Thus, G coefficients are interpreted in a manner similar to traditional reliability coefficients, but allow the researcher to evaluate multiple sources of error variance simultaneously.

Generalizability (G) studies provide information that can be used to optimize the sampling of measurement conditions in future decision (D) studies. For example, researchers can use the results of a G study to determine the number of scale items necessary to achieve a specified level of reliability and to determine the ability of these items and indices to measure and discriminate the different levels of attachment an individual might hold to different places. More detailed discussions of the mathematical basis of G theory are presented in Cardinet et al. (1981), Shavelson and Webb (1991, p. 17–26), and Strube (2000).

In this study, the generalizability of a place attachment scale is examined across four different Colorado locations. Validity issues are addressed by conducting confirmatory factor analysis across the four Colorado study sites as well as data from previously reported studies of Shenandoah National Park, Mt. Rogers National Recreation Area, and a sample of students from the University of Illinois (preliminary findings from these latter locations and samples have been reported elsewhere in the literature see Williams et al. 1992a, 1995, Williams and Roggenbuck 1989). In addition, construct validity is addressed by relating the place dependence and place identity dimensions to behavioral and psychological variables that should vary by the respondent's attachment to the area.

Methods

Study Design

The study was conducted in two phases. Phase one consisted of an elicitation survey administered to 25 undergraduate students at Colorado State University (CSU). The objective was to identify specific places the students were likely to visit through a series of six scenarios. The scenarios included: (1) a Saturday afternoon in June, (2) a day off in February, (3) a fall weekend, (4) a weekend trip in the summer, (5) spring break from classes, and (6) a general question asking about other places in Colorado that they like to visit. A brief description was provided for each scenario. For example, the first scenario asked: "It is a beautiful Saturday afternoon in June, and you have a few hours before you have to go to work. You call a friend, and together, decide to spend some time outdoors. In the space below, list your top three choices of where you would go to spend your afternoon. Please be specific." The fall weekend scenario read: "Some out of town relatives are planning to visit you for a fall weekend. Since they've never been to Colorado, they are hoping that you will show them what it is about Colorado that you love so much. Where would you take them? Again, please be specific."

The results of phase one suggested four places that most students were likely to have visited. Rocky Mountain National Park is about a 1 hr drive from Fort Collins where CSU is located. The Poudre Wild and Scenic River is approximately 20 minutes from the CSU campus and is known for fly fishing and whitewater kayaking/rafting. Cameron Pass is in the Arapaho-Roosevelt National Forest about a 1.5 hr drive from CSU and is popular for both hiking and cross-country skiing. The Horsetooth Recreation Area is a water reservoir about 10 min. away from the campus that attracts participants in a range of water-related and climbing activities.

The second phase involved the development and administration of a structured survey distributed to a convenience sample of 105 CSU students in spring 2000. The analyses presented here are based on a subset of 65 respondents, who had visited all four of the places included in the survey.

As a check for place order effects on the place attachment ratings, two versions of the questionnaire were constructed. In version A of the survey, respondents evaluated their attachment to Rocky Mountain National Park, Cameron Pass, the Poudre River, and the Horsetooth Recreation Area. This order of evaluation was reversed in version B of the questionnaire. *T*-tests showed no statistical difference in either the place dependence or place identity ratings between the two versions ($t < 1.86$, $P > 0.068$ for all analyses) and therefore, the data were combined for further analyses.

Instrument

The instrument used in the second phase of the study contained a set of questions repeated four times, once for each of the four areas. Place attachment was measured using 12 items taken from several previous studies that have shown good internal consistency (Williams et al. 1995). Six items were selected to represent each dimension (i.e., place dependence and place identity) of attachment (see Table 2 for item descriptions). Items were presented in a 5-point "strongly disagree" (1) to "strongly agree" (5) format with a neutral point of 3. Place identity and place dependence items were presented in an alternating order.

For each area, validity items asked respondents to indicate if they had ever visited the area and if yes, how many times in the past 12 months. Respondents also rated their familiarity with the area on a 9 point scale (1 = not at all familiar to 9 = extremely familiar), and whether the place was a special area for them (1 = Yes, 0 = No).

Analyses

Three analysis strategies were used. Confirmatory factor analyses examined whether the place dependence and place identity items provided a good fit to the data for their respective latent constructs (factor validity). A total of 14 different factor analysis models were examined. These included two for each of the four locations in this study (i.e., Rocky Mountain National Park, Cameron Pass, Poudre River, Horsetooth Reservoir), as well as two from each of three previously reported studies including Shenandoah National Park (n = 2005), Mt. Rogers National Recreation Area (n = 369), and University of Illinois students (n = 380). LISREL 8.14 (Jöreskog and Sörbom 1993) was used for these analyses based on the maximum likelihood estimation procedure and the variance-covariance matrix of the 12 place attachment items. Cronbach alphas were also computed for the items in the place dependence and place identity constructs using SPSS for Windows (Version 11.0). In addition, analysis of variance was used for testing relationships between place attachment dimensions and one behavioral and two psychological variables hypothesized to be related to place attachment (convergent validity).

Following the rationale of generalizability theory, mean squares and variance component estimates were obtained using the SAS VARCOMP procedure, Type I method and a random effects model (SAS Institute, Inc. 1990, p. 1661–1673). In G studies, variance components for generalization facets are typically estimated as random effects on the assumption that the investigator is sampling a small subset of levels of a facet (e.g., scale items) from an infinitely large universe of possible levels of the facet. The variance component estimate represents the variance in the facet universe, subject to sampling error. Thus, the larger the number of levels of a facet the better is the variance component estimate.

Results

Confirmatory Factor Analysis

To assess factor validity, the overall fit of each of the confirmatory factor analysis models was assessed using six indicators (χ^2/df, $\Delta\chi^2$, GFI, NFI, CFI, RMR, see Table 1). Two models were examined for each of the seven areas (e.g., Shenandoah National Park, Cameron Pass). The first model assumed one dimension (i.e., place attachment – Model 1), while the second model represented the hypothesized two-dimensional structure (i.e., place identity and place dependence – Model 2). In all analyses, the $\Delta\chi^2$ statistics indicated that the two-dimensional model fit the data better than the single dimension ($\chi^2 \geq 43.69$, $P < .001$, in all models). The other goodness-of-fit statistics comparing

Table 1. Goodness-of-fit indices for 1 and 2 dimension models developed for each of seven locations.

Model	χ^2	df	χ^2/df	$\Delta\chi^2$	P-value	GFI	CFI	NFI	RMR
CSU students—Rocky Mountain National Park									
1. One dimension (place attachment)	109.00	54	2.02			0.74	0.90	0.82	0.07
2. Two dimensions (identity and dependence)	65.31	53	1.23			0.87	0.98	0.89	0.06
Model 1 vs. Model 2				43.69	< 0.001				
CSU students—Cameron Pass									
1. One dimension (place attachment)	120.99	54	2.24			0.72	0.89	0.82	0.06
2. Two dimensions (identity and dependence)	72.27	53	1.36			0.85	0.97	0.89	0.06
Model 1 vs. Model 2				48.72	< 0.001				
CSU students—Poudre River									
1. One dimension (place attachment)	109.88	54	2.03			0.74	0.87	0.78	0.10
2. Two dimensions (identity and dependence)	52.96	53	1.00			0.89	0.99	0.89	0.07
Model 1 vs. Model 2				56.92	< 0.001				
CSU students—Horsetooth Reservoir									
1. One dimension (place attachment)	120.74	54	2.24			0.73	0.87	0.80	0.09
2. Two dimensions (identity and dependence)	67.43	53	1.27			0.84	0.97	0.89	0.06
Model 1 vs. Model 2				53.31	< 0.001				
University of Illinois students									
1. One dimension (place attachment)	378.33	52	7.26			0.79	0.85	0.83	0.08
2. Two dimensions (identity and dependence)	158.63	51	3.11			0.92	0.95	0.93	0.05
Model 1 vs. Model 2				219.70	< 0.001				
Shenandoah National Park									
1. One dimension (place attachment)	1223.55	33	37.08			0.87	0.90	0.90	0.07
2. Two dimensions (identity and dependence)	285.08	32	8.91			0.97	0.98	0.98	0.03
Model 1 vs. Model 2				938.47	< 0.001				
Mt. Rogers									
1. One dimension (place attachment)	369.64	34	10.87			0.85	0.93	0.92	0.05
2. Two dimensions (identity and dependence)	104.58	33	3.17			0.96	0.98	0.98	0.03
Model 1 vs. Model 2				265.06	< 0.001				

NOTE: A χ^2/df ratio of 2:1 to 5:1 indicates an acceptable fit (Marsh and Hocevar 1985). GFI, NFI, CFI values in excess of 0.90 indicate an acceptable fit (Bentler 1990, Bollen 1989).

the two models provided additional support for treating place identity and place dependence as distinct dimensions of place attachment. Consequently, the following discussion emphasizes the two-dimensional structure.

Marsh and Hocevar (1985) suggest that a model's χ^2/df ratio of 2:1 to 5:1 indicates an acceptable fit. With the exception of the model for Shenandoah National Park data ($\chi^2/df = 8.91$), the ratios for the remaining six models were within this range. For the Goodness of Fit Index (GFI), the Normed Fit Index (NFI), and the Comparative Fit Index (CFI) statistics, values in excess of 0.90 indicate an acceptable fit for the model (Bentler 1990, Bollen 1989). Findings from Shenandoah National Park, Mt. Rogers, and the University of Illinois students ranged from 0.92 to 0.98 for these three goodness of fit statistics. Results for the Colorado State University students were slightly lower on these statistics (range = 0.84 to 0.99), but generally acceptable given the relatively small sample size (n = 65) for these models. Finally, the Root-Mean-Square-Residual (RMR), which measures the average discrepancies between the observed and the model-generated covariances, ranged from 0.03 to 0.07 for the seven equations, suggesting a close fit of the data (Church and Burke 1994).

In all seven models, the factor loadings for the items in the place identity dimension were all statistically significant ($t \geq 5.57$, $P < 0.01$ in all cases) with relatively small standard errors (SE <0.10). For the Colorado State University sample, the factor loadings ranged from 0.64 to 0.91 (Table 2). Although the number of place identity items in the other three samples (UI students, Shenandoah, Mt. Rogers) did not always exactly match those used in the CSU study, the factor loadings were similar (range = 0.55 to 0.90).

Five of the six items in the place dependence dimension followed a pattern similar to the place identity findings ($t \geq 5.30$, $P < 0.01$; SE $\leq$ 0.13; factor loading range = 0.64 to 0.93; Table 2). The exception was the item "The things I do at 'X' I would enjoy doing just as much at a similar site." In the Colorado sample, this question was not statistically related to place dependence for evaluations of Rocky Mountain National Park, Cameron Pass, or Horsetooth Reservoir. While the item was significant for the Poudre River responses, the factor loading was relatively low (0.30). Similar factor loadings on this item were evident for the University of Illinois sample (0.28) and the Shenandoah National Park visitors (0.45). The question was not asked in the Mt. Rogers survey.

Overall, the confirmatory factor analyses demonstrated that the data provide an acceptable fit for the place identity and dependence dimensions. With the exception of the one item in the place dependence dimension just noted, the factor loadings were consistent with those typically reported in the literature. Moreover, the modification indices produced by LISREL indicated none of the items in the place identity dimension would provide a better fit to the data if allowed to load on the place dependence dimension. Similarly, allowing the place dependence items to load on the place identity dimension would not improve the fit for any of the seven

Table 2. Reliability and confirmatory factor analyses of place identity and place dependence items for each location.

	Colorado State University Students						
Place attachment items[a]	Rocky Mountain National Park	Cameron Pass	Poudre River	Horsetooth Reservoir	University of Illinois Students	Shenandoah National Park	Mt. Rogers
Place Identity							
I feel "X" is a part of me.	0.85	0.78	0.85	0.83	0.81	0.81	0.90
"X" is very special to me.	0.76	0.90	0.75	0.90	0.79	n.a.[c]	0.66
I identify strongly with "X".	0.86	0.84	0.91	0.83	0.84	0.89	0.90
I am very attached to "X".	0.85	0.88	0.87	0.89	0.79	0.78	0.83
Visiting "X" says a lot about who I am.	0.74	0.64	0.71	0.75	0.62	0.55	n.a.[c]
"X" means a lot to me.	0.79	0.89	0.79	0.83	0.81	n.a.[c]	0.62
Cronbach's alpha	**0.91**	**0.92**	**0.92**	**0.94**	**0.90**	**0.84**	**0.90**
Place dependence							
"X" is the best place for what I like to do.	0.82	0.78	0.69	0.71	0.71	0.80	0.85
No other place can compare to "X".	0.63	0.77	0.62	0.74	0.78	0.75	0.88
I get more satisfaction out of visiting "X" than any other.	0.89	0.88	0.85	0.87	0.85	0.84	0.89
Doing what I do at "X" is more important to me than doing it in any other place.	0.93	0.93	0.85	0.86	0.78	0.81	0.88
I wouldn't substitute any other area for doing the types of things I do at "X".	0.77	0.88	0.63	0.64	0.66	0.76	0.84
The things I do at "X" I would enjoy doing just as much at a similar site.	0.02[b]	0.11[b]	0.30	0.13[b]	0.28	0.45	n.a.[c]
Cronbach's alpha	**0.83**	**0.86**	**0.81**	**0.82**	**0.85**	**0.89**	**0.94**
Sample size	65	65	65	65	308	2100	510

[a] "X" refers to the specific location.
[b] Not significant.
[c] n.a.: item "not available" for this analysis.

models. The Cronbach alphas for both place identity (range = 0.84 to 0.94) and place dependence (range = 0.81 to 0.94) provide additional support for both dimensions of place attachment.

Convergent Validity

The convergent validity of the place identity and place dependence measures was examined using three independent variables: (1) the number of prior visits to each of the four locations in Colorado during the last 12 months, (2) perceived familiarity with each location, and (3) whether each location was a special place for the respondent.

As anticipated, respondents who had made more visits to each of the four areas in the last 12 months reported higher average scores on the place identity dimension than those who had visited less frequently (Table 3). For example, individuals with 0 to 2 trips to Rocky Mountain National Park last year had an average score of 3.02 (i.e., neutral) while those with 7 or more visits had a mean of 4.13 on the 5-point disagree (1) to agree (5) scale. For place identity, all of the F-ratios were statistically significant ($F \geq 5.67$, $P \leq 0.006$ for each of the four Colorado locations). For place dependence, the means were also consistently in the predicted direction, however, only two (Rocky Mountain National Park and Horsetooth Reservoir) of the four ANOVAs were statistically significant.

Perceived familiarity with each place was statistically related to both place identity and place dependence across all four of the Colorado locations examined in the study ($F \geq 3.57$, $P \leq 0.034$ in all cases). Respondents who indicated that they were "extremely familiar" with the place reported higher average scores on both dimensions than those who were "not" or only "somewhat" familiar with the place.

Finally, individuals who considered each area to be a "special place" for them consistently reported higher average scores on both dimensions than those who did not hold such feelings. With the exception of the place dependence dimension for Rocky Mountain National Park, all of these differences were statistically significant ($F \geq 6.69$, $P < 0.012$ in seven of the eight analyses).

Overall, these findings provide evidence for the validity of the place identity and place dependence dimensions. As frequency of visitation, perceived familiarity, and the belief about the place being special increased, place attachment increased. Examination of results in Table 3, however, also suggests that the average scores for place identity were consistently higher than those reported for the place dependence dimension.

Generalizability

Several variance components models were estimated from the Colorado data. The first model was a three-facet partially nested random effects model including subject, area, dimension and item nested within dimension facets ($s \times a \times d \times [i{:}d]$). As with the confirmatory factor analyses, the variance components estimates provide additional evidence for a two-dimensional interpretation of place attachment (Table 4). The large variance component for the dimension facet (22.6% of the total) suggests that place attachment measurement does not generalize across dimensions (i.e., across place identity and place dependence). Each place attachment dimension appears to represent a different form of attachment. In contrast, place attachment does appear to generalize across items (at least within dimensions) as evidenced by the low variance component for item (3.8% of the total variance). In other words, scores on the one place identity dimension cannot be generalized to place dependence dimension (and vise versa), but within each dimension scores can be generalized from one item to another.

Table 3. Concurrent validity analyses for place identity and place dependence indices for the four Colorado locations.[1]

	Rocky Mountain National Park		Cameron Pass		Prouder River		Horsetooth Reservoir	
Place attachment scales[2]	Place identity	Place dependence	Place identity	Place dependence	Place identity	Place dependence	Place identity	Place dependence
No. visits[3]								
0-2	3.02^{a}	2.52^{a}	2.69^{a}	2.32	3.26^{a}	2.81	2.14^{a}	1.81^{a}
3-6	3.88^{b}	2.91^{ab}	2.23^{b}	2.46	3.26^{a}	2.39	3.10^{b}	2.19^{ab}
7+	4.13^{b}	3.07^{b}	3.51^{b}	2.73	3.89^{b}	2.72	3.48^{b}	2.60^{b}
F-value	19.82	3.71	5.67	1.78	5.82	1.58	16.21	9.58
P-value	.001	.030	.006	.178	.005	.214	.001	.001
Familiarity[4]								
Not	3.01^{a}	2.55^{a}	2.42^{a}	2.14^{a}	2.88^{a}	2.22^{a}	2.27^{a}	1.67^{a}
Somewhat	3.41^{a}	2.61^{a}	3.13^{b}	2.36^{a}	3.30^{a}	2.51^{a}	2.67^{a}	2.13^{a}
Extremely	4.01^{b}	3.56^{b}	3.79^{c}	2.96^{b}	4.07^{b}	2.84^{b}	3.63^{b}	2.69^{b}
F-value	10.31	3.57	20.60	8.78	19.10	4.11	14.98	12.63
P-value	.001	.034	.001	.001	.001	.021	.001	.001
Special[5]								
No	2.58	2.37	2.42	2.13	2.50	2.03	2.44	1.96
Yes	3.74	2.87	3.50	2.69	3.83	2.74	3.65	2.64
F-value	18.03	3.15	33.88	9.82	20.55	6.69	44.99	19.88
P-value	.001	.081	.001	.003	.001	.012	.001	.001

[1] Means with different superscripts differ significantly at $P < .05$ using Least Squares Difference test.
[2] Place attachment scales based on variables shown in Table 1, with 1 = strongly disagree and 5 = strongly agree.
[3] Number of visits to "X" in the past 12 months.
[4] Perceived familiarity with "X."
[5] Is "X" a special place for you?

Table 4. Generalizability study of place attachment using a three-facet partially nested random effects ($s \times a \times d \times [i{:}d]$) model for the four Colorado locations.

	Place attachment			
Source	*df*	Mean square	Estimated variance component.	Percent of total variance
Subject (s)	64	10.57	0.0863	6.3
Area (a)	3	48.70	0.0497	3.6
Dimension (d)	1	502.41	0.3086	22.6
Item ($i{:}d$)	10	13.79	0.0514	3.8
sa	192	4.58	0.3450	25.2
sd	64	2.28	0.0770	5.6
ad	3	5.79	0.0137	1.0
Residual ($i{:}da, i{:}ds, sai{:}s, e$)	2782	0.437	0.4367	31.9
Total	3119		1.3684	100.0

Variance components for subject and area were relatively small (6.3% and 3.6% respectively). However, the subject by area interaction was the largest non-residual variance component at 25.2%, which suggests that attachment scores do not generalize across either subjects or areas. Low subject by dimension (5.6%) and area by dimension (1.0%) variance components are consistent with expectations of a good psychometric scale.

Given the confirmed lack of generalizability across dimensions, the variance components analysis was run separately for each dimension (place identity and place dependence) of attachment (Shavelson and Webb 1991, p. 65). Variance components were estimated for each dimension using a two-facet fully crossed random effects ($s \times a \times i$) model. In addition, following procedures recommended by Shavelson and Webb (1991, p. 65–82), variance components were also calculated with "area" as a fixed facet, which has the effect of eliminating area and area related interactions as variance components (Table 5). Since there is an infinite number of areas that could have been sampled in a G study, treating area as a random facet allows investigators to estimate variance within the theoretical universe of areas, of which we sampled four. On the other hand, area as conceptualized in this study is a differentiation facet (an object of measurement). Accordingly in a random facet model, a good place attachment measure should have a high proportion of variance in "area" or "area by subject" interactions. However, for estimating item generalizability (scale reliability) for each dimension, it is more appropriate to treat the area facet as a fixed or finite set of areas. This in effect gives us "average" variance component estimates for subject, item, and residual (subject by item interactions) built from data that include observations of all four Colorado locations.

With respect to the random effects model, Table 5 shows modest variance components for area (8.1% and 3.4% for place identity and place dependence, respectively) and large area by subject interactions (47.4% and 25.2% respectively). The large variance component for place identity indicates that different subjects assign different levels of attachment to different study areas as would be expected if place attachment is a personal bond formed with different places depending on one's own history of use. Somewhat less dramatic results were found for place dependence. Taken together, these results suggest that place attachment does not generalize from area to area, but rather reflect personal relationships to the areas. In addition, the item facet and item interactions constitute relatively small variance components in proportion to the total (approximately 10% and 16% of the total for place identity and place dependence respectively), suggesting high levels of item generalizability.

Table 5. Generalizability study of place attachment using a two-facet fully crossed ($s \times a \times i$) model for the four Colorado locations.

		Area random			Area fixed	
Source	*df*	Mean square	Estimated var. comp.	Percent var.	Estimated Var. comp.	Percent var.
Place identity dimension						
Subject (s)	64	6.845	0.1315	11.8	0.2636	60.5
Area (a)	3	39.082	0.0899	8.1	—	—
Item (i)	5	11.429	0.0396	3.5	0.0420	9.7
Sa	192	3.420	0.5283	47.4	—	—
Si	320	0.519	0.0674	6.0	0.1298	29.8
Ai	15	0.862	0.0094	0.8	—	—
Residual (sai, e)	960	0.250	0.2497	22.4	—	—
Total	1,559		1.1158	100.0	0.4354	100.0
Place dependence dimension						
Subject (s)	64	6.004	0.1541	15.4	0.2173	45.8
Area (a)	3	15.407	0.0340	3.4	—	—
Item (i)	5	16.152	0.0583	5.8	0.0583	12.5
Sa	192	1.920	0.2527	25.2	—	—
Si	320	0.790	0.0967	9.6	0.1976	41.7
Ai	15	0.617	0.0033	0.3	—	—
Residual (sai, e)	960	0.404	0.4036	40.3	—	—
Total	1,559		1.0027	100.0	0.4811	100.0

Following the procedures given by Shavelson and Webb (1991, p. 67–68), the variance components were recomputed with the area facet fixed (Table 5). This essentially reduces the model to a single facet fully crossed design averaged across area. Using these variance components it becomes possible to calculate item generalizability coefficients (Table 6), which can be interpreted as the equivalent of Cronbach's alpha coefficients of the internal consistency (item reliability). Table 6 also shows the effect of number of items on the reliability of each dimension. Place identity tends to be somewhat more generalizable (more reliable) with fewer items. For example a generalizability coefficient of 0.89 can be achieved with as few as four items for the place identity dimension, but four items for the place dependence dimension would only yield a generalizability coefficient of 0.815.

Discussion

Natural landscapes, places, and spaces are more than containers of natural resources and staging areas for enjoyable activities. They are locations filled with history, memories, and emotional and symbolic meanings. In an effort to enhance land managers ability to take into account the deeper meanings and symbols associated with the resources they manage, the objectives of this study were to evaluate the psychometric properties of a two-dimensional place attachment measure. The results presented here demonstrate that such place bonds can be systematically identified and measured and that people develop different levels and forms of attachment to different places.

The two dimensional model of place attachment, at a minimum, suggest that the bonds people hold for places may have distinct origins and meaning. In addition, being able to measure these differing forms of attachment may prove useful in the management of natural landscapes. For example Vaske and Kobrin (2001) found that place identity was more strongly associated with measures of environmentally responsible behavior. Similarly some evidence suggests that support for user fee policies vary with the level and type of attachment. Kyle et al. (2003) found that place identity was a significant positive moderator of fee support whereas place dependence was unrelated to fee support. In contrast, Bricker (1998) found place dependence was positively related to support for management development of amenities, trails, and extractive uses, whereas place identity decreased support.

Validity in psychometrics is always a matter of degree. With respect to the broad construct of place attachment, prior research generally supports the interpretation of place attachment as a positive connection or emotional bond between a person and a place. A more subtle validity question is whether the two dimensions of place attachment, dependence and place identity, constitute distinct forms of attachment. In the statistical analysis conducted here, the two dimensions clearly separated into two factors (i.e., were not highly generalizable), as the theoretical literature has proposed (Brown 1987). In addition, the confirmatory factor analysis reported in Table 1, which draws on data from a wide range of geographic contexts, provides strong evidence of the two-factor structure of place attachment. Despite being statistically distinct factors, previous studies show that the two dimensions are nevertheless moderately correlated (see Williams et al. 1995). Taken together these findings support the interpretation that place dependence and place identity constitute distinct dimensions of a single general construct of place attachment.

Table 6. Generalizability coefficients for place identity and place dependence across items with areas fixed.

No. of items	Place identity	Place dependence
1	0.670	0.518
2	0.802	0.687
3	0.859	0.767
4	0.890	0.815
6	0.924	0.869
10	0.953	0.916

A second measurement issue is the internal consistency or reliability of the individual items. The generalizability results show that both dimensions are highly generalizable across items with relatively small item variance components. The place dependence results, however, do show somewhat larger variance due to items, which is most likely attributable to the one negatively worded dependence item. In terms of future studies employing place attachment scales, the relationship between the number of items and scale reliabilities (reported in Table 6) shows that good reliabilities can be achieved with as view as four items in each scale (alpha 0.89 and 0.82 respectively for place identity and place dependence). These results further suggest that there is very little improvement in generalizability (reliability) by increasing the number of items beyond five or six.

Both item reliability and factor structure have been examined and demonstrated in previous studies. A measurement issue unique to this study is the sensitivity of the place attachment scales for measuring attachments to different places. To be useful place attachment should not be something one feels toward all places one knows and experiences, but rather should differentiate how one feels about various places. The separate variance components analyses conducted for each dimension (Table 5) provides strong evidence that both place attachment dimensions differentiate the strength of individual attachments across the set of places. In both cases, subject by area interactions were quite large relative to the other facets and interactions studied, which suggests that the scales can differentiate attachments to different areas.

Another aspect construct validity is demonstrated by observing the expected theoretical relationships to other variables. As with previous studies, the results presented here show that place attachment is associated with past experience and familiarity (Table 3). Future place attachment studies should look at relationships to other variables that might be expected to correlate or not correlate with place attachment, including social and demographic variables such as age, sex, political participation, and willingness to pay. Studies have reported on some relationships including findings that place attachment is associated with higher sensitivity to resource impacts (Young et al. 1991), more environmentally responsible behavior (Vaske and Kobrin 2001), and a perceived lack of substitutes (Williams et al. 1992a).

The data collected in this study have several limitations. Perhaps the most critical and pertinent is the sample size of the Colorado data used in the confirmatory factor analyses. This study attempted to address any sample size limitations by comparing the Colorado findings with data from several previous studies that employed sample sizes from 369 to 2005. As reported in Table 1, the highly similar factor structures across studies lend confidence to the observed two-factor structure.

A general limitation of previous on-site place attachment studies is the relatively low variance and high scores observed on attachment. This problem is likely to be a function of "on-site" sample bias, meaning that in a cross-sectional survey of visitors to an area, one is much more likely to sample frequent, long-staying, and presumably more attached visitors than the opposite. Such problems potentially attenuate observed correlations, which would distort the reliability and validity findings. The Colorado data offer a remedy to this by examining place attachment for several places among a sample of potential (as opposed to on-site) visitors.

A final limitation of research on place attachment as conceptualized here is whether other dimensions of attachment exist that have not yet been addressed in theory or empirical research. For example, Nanistova (1998) developed some evidence of four additional factors of place attachment in her study of the attachment to birthplace felt by people who had been forced to migrate: place rootedness, traditionalism, nostalgia, and loss of place. Future research on place attachment might address these additional dimensions, test place attachment across a wider range of places and contexts (including attachment to communities and regional landscapes), and evaluate alternative response formats to enhance the sensitivity of the scales. More research is also needed to advance the social-psychological understanding of the attachment process, the factors that influence the formation of attachments, and how these attachments influence attitudes toward land management policies and participation in the planning process.

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