A comparative analysis of predictors of sense of place dimensions: Attachment to, dependence on, and identification with lakeshore properties

Bradley S. Jorgensen a,*, Richard C. Stedman b

a Australian Research Center for Water in Society, CSIRO Land and Water, Private Bag 5, Wembley, WA 6913, Australia
b Department of Agricultural Economics and Rural Sociology, The Pennsylvania State University, University Park, PA, USA

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Abstract

Sense of place can be conceived as a multidimensional construct representing beliefs, emotions and behavioural commitments concerning a particular geographic setting. This view, grounded in attitude theory, can better reveal complex relationships between the experience of a place and attributes of that place than approaches that do not differentiate cognitive, affective and conative domains. Shoreline property owners (N = 290) in northern Wisconsin were surveyed about their sense of place for their lakeshore properties. A predictive model comprising owners’ age, length of ownership, participation in recreational activities, days spent on the property, extent of property development, and perceptions of environmental features, was employed to explain the variation in dimensions of sense of place. In general, the results supported a multidimensional approach to sense of place in a context where there were moderate to high correlations among the three place dimensions. Perceptions of environmental features were the biggest predictors of place dimensions, with owners’ perceptions of lake importance varying in explanatory power across place dimensions.

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1. Introduction

There are many concepts in the social sciences that seek to describe some aspect of human–environment relationships. A cursory review by Low and Altman (1992) listed a range of concepts with various mixes of cognitive, affective and conative (i.e. behavioural) facets. Place attachment (Altman and Low, 1992), place identity (Proshansky, 1978; Proshansky et al., 1983), and place dependence (Stokols and Shumaker, 1981) are constructs that most often appear in the environmental psychology literature. In fact, Shamai (1991) has argued that these place concepts and others can be included under the umbrella term ‘sense of place’.

In this paper, we explore the production of multiple dimensions of sense of place. In doing so, we attempt to bring a measure of clarity to a relatively chaotic literature. Despite calls for the inclusion of sense of place in resource management (e.g. Williams and Stewart, 1998), the disorganisation that has characterised much of the sense of place literature has been a barrier to its effective integration with ongoing concerns (Stedman, 2003a). We believe that knowing how dimensions of sense of place are produced and organised, they can surely be more effectively targeted in environmental management.

The objective of this paper is to present a multidimensional conception of sense of place, comprising cognitive, affective and conative domains of human–environment relationships. The validity and utility of this multidimensional approach is demonstrated theoretically with reference to attitude theory, and shown empirically by utilising path modelling techniques. Specifically, we test for differences in the predictive relationships involving the sense of place dimensions and a common suite of explanatory variables as a means to highlight the need to recognize the multidimensional nature of the subjective experience of places.

2. Literature review

2.1. The multidimensionality of sense of place

Subjective experience of places is an integrated, multidimensional phenomenon (Canter, 1991; Low and Altman, 1992).
There are a number of somewhat similar place variables referred to in the literature as well as some variation in the definitions of the same place concepts (e.g. place attachment). Jorgensen and Stedman (2001, see also Stedman, 2002) noted that these concepts can be organised within a general framework of attitude structure that incorporates cognitive, affective and conative responses to spatial settings. In this view, concepts in the sense of place literature such as place identity (Proshansky et al., 1983), place attachment (Moore and Graefe, 1994; Riley, 1992), and place dependence (Stokols and Shumaker, 1981) can be viewed as primarily cognitive, affective and conative variables, respectively.

This diversity within and among place variables has been recognised in earlier place research (Altman and Low, 1992; Bonnes and Secchiaroli, 1995; Giuliani and Feldman, 1993). Giuliani and Feldman identified the diversity of place attachment definitions as an important challenge to further progress in the field. In their view, it would be “useful to tighten up on the definition of place attachment while considering it in the broad framework of the multiple affective, cognitive, and behavioural relationships between people and socio-physical environment” (p. 273).

Similarly, Low and Altman (1992) considered the range of place attachment definitions in the literature and noted that one consistently defining aspect of the concept was its emotional quality. However, they did not overemphasise this quality, but pointed to others in the field who had argued that place attachment also includes cognition and behaviour: “That is, an interplay of affect and emotions, knowledge and beliefs, and behaviours and actions in reference to place” (p. 5).

When thought of in these terms, sense of place can be viewed as a general attitude toward a spatial setting, and a complex psychosocial structure that organises self-referent beliefs, emotions, and behavioural commitments (Jorgensen and Stedman, 2001). We thus seek to anchor sense of place in attitude theory. A number of studies have adopted the view that evaluative judgments can be expressed in cognitive, affective, and behavioural domains (e.g. Bagozzi, 1978; Bagozzi et al., 1979; Breckler, 1984; Katz and Stotland, 1959; Ostrom, 1969; Rosenberg and Hovland, 1960).

Highlighting the cognitive (e.g. beliefs and perceptions), affective (e.g. emotions and feelings), and conative (e.g. behavioural intentions and commitments) domains is important when place researchers wish to identify linkages between sense of place and particular behaviours. For example, attitude research distinguishes between instrumentally and consummatory behaviours. The former are driven by attitudes that have a strong cognitive basis and refer to behaviours that are a means to an end. The latter, consummatory behaviours, are motivated by attitudes that are predominantly emotional in content and are performed for their own sake, enjoyment or interest (Millar and Tesser, 1989; 1992; Tesser et al., 1995; Wilson et al., 1989). Put simply, attitudes toward some objects may be based more on cognition, while attitudes toward other objects may be more affect-based. These differences have consequences for attitude–behaviour relationships and attitude formation.

Affective and cognitive response systems can be regarded as separate systems that interact in complex ways (e.g. Kempf, 1999; Lavine et al., 1998; van der Pligt et al., 1998). The affective and cognitive bases may have different patterns of correlations with other variables of interest, such as those variables that planners may use to understand an individual’s sense of place and the implications these relationships may have for the public’s acceptance of management strategies aimed at addressing particular environmental problems existing in that place. By understanding the cognitive, affective and conative structure of sense of place, researchers are better placed to explore the potential for complexity in the concept. This is particularly important when this complexity bears on the development and evaluation of communication and/or behaviour change strategies.

Informed by these multidimensional views of human–environment relationships, Jorgensen and Stedman (2001) explored the cognitive, affective and conative structure of sense of place in their survey of shoreline property owners in northern Wisconsin. Based on a number of models of attitude structure, sense of place was conceived as a multidimensional summary evaluation comprising place-specific beliefs (place identity), emotions (place attachment) and behavioural commitments (place dependence). Consistent with previous writings, place identity was conceived as representing beliefs that the self was defined in relation to one’s lakeshore property. Place attachment was defined in terms of positive feelings about one’s property, while place dependence concerned the behavioural advantage of one’s lake property relative to other settings (i.e. the extent to which a place facilitates the achievement of important behavioural goals). The results supported multidimensionality in sense of place, but also provided strong evidence for a considerable amount of common variation across measured place constructs: while some variation was unique to each place construct, there was a large degree of overlap among the constructs at the empirical level. Moreover, the empirical evidence suggested that sense of place (when conceived as a general attitude toward a place) was marginally more affect-based than either conative- or cognitive-based. These results are generally consistent with research in social psychology that has demonstrated some discriminant validity among the cognitive, affective, and conative components of attitude (e.g. Bagozzi, 1978; Bagozzi et al., 1979; Breckler, 1984).

2.2. Evidence of multidimensionality of sense of place

The multidimensionality of sense of place can be demonstrated by showing that theoretically important descriptions of the concept show a significant degree of independence. For example, Jorgensen and Stedman (2001) demonstrated that identity-based beliefs about a place, positive emotions associated with a place, and behavioural commitments toward a place, were not completely interchangeable variables. The potential for varying amounts of equivalence and independence among measured place constructs highlights the need to investigate similarities and differences in their relationships.
with predictor variables. That is, multidimensionality might be further elaborated by observing variations in the relationships between each place dimension and relevant predictors.

The objective of this study is to extend earlier research by Jorgensen and Stedman (2001) that showed common and unique variation in cognitive, affective, and conative, sense of place dimensions. We intend to accomplish this by examining patterns of similarities and differences across relationships involving the three place dimensions (i.e. place identity, place attachment and place dependence) and a set of common predictors. A null hypothesis would suggest that there is no significant difference among the relationships involving different place constructs and their predictors. This would indicate, for example, that factors that affect emotional ties to a place (i.e. place attachment) are also likely to have implications for cognitive and behavioural relationships (i.e. place identity and place dependence, respectively). In this instance, discriminating between cognitive, affective and conative aspects of sense of place would not bring anything new to the analysis than what might be learned from traditional approaches. High consistency among cognitive, affective and conative components will obviously reduce any differences in the relationships with predictor variables.

Evidence of consistencies, however, is also of theoretical and practical importance in place research. Research suggests that attitudes that demonstrate affective–cognitive consistency are more persistent, resistant to change, and consequential for behaviour (Millar and Tesser, 1989). Identifying the range of conditions associated with consistency (and inconsistency) is in-keeping with claims in the sense of place literature that “Attachment to places is a multifaceted phenomenon, which probably attains somewhat different structure in different situations” (Kaltenborn, 1997, p. 182). Canter (1991) also remarks on the need to understand the processes involved in integrating place beliefs, feelings, and behaviours. By looking at the stability of predictive relationships across place dimensions, researchers can identify key variables implicated in the process of integration.

In summary, differences between place attachment, dependence, and identity in their relationships to a common suite of predictor variables, would highlight the need to recognize the multidimensional nature of the subjective experience of places. Variations in the environment that affect some types of behaviours (e.g. instrumental behaviours) may not affect emotional bonds for particular individuals and groups. Likewise, particular aspects of places that are enjoyed may not be central to beliefs about identity.

2.3. Sense of place predictors

Given the discussion above, it is worthwhile ascertaining how place-relevant affective, cognitive and conative variables might be differently influenced by variables theorised to predict sense of place. It is this possibility that we seek to test in this paper. However, sense of place theory and research itself provides little, if any, guidance on the specific mechanisms by which these potential variations may occur. For example, researchers often employ measures of place variables that do not, on the face of it, distinguish between the three components (e.g. ‘I am very attached to this place’ and ‘This place is very special to me’). The task of developing measures that reliably and validly reflect attitude components is a difficult one (see, for example, Crites et al., 1994).

Place research has identified the age or position within the life course of an individual as a predictor of sense of place dimensions (Cuba and Hummon, 1993). Moreover, there is some evidence to suggest that younger individuals think about places differently than their older counterparts. Individuals below the age of 30 may be more likely to think in terms of informal social groups while older individuals might emphasise geographical places (American Association of Retired Persons, 1997) or the immediate home setting rather than the broader local environment and community (Rowles and Watkins, 1993). In fact, a relatively large stream of place research has been dedicated to understanding human–environment relationships at different stages of the life-course (e.g. Beazley, 2000; Kontos, 1998; Mowl et al., 2000; Rowles, 1987; Rubinstein and Parmelee, 1992).

Length of residence in a place has also been hypothesised as a potential predictor of place variables. That is, independent of the age of a person, individuals who have resided longer in a place are more likely to have developed significant relationships with other residents as well as with physical attributes of the place. This position is held by many place theorists such as Tuan (1977); Relph (1976), but contrasts with empirical research conducted by Stedman (2002), who found no effect of length of residence on attachment.

Physical attributes of places were identified by Proshansky et al. (1983) as important influences on an individual’s self-concept. In the lake regions of northern Wisconsin, where we have undertaken research, physical attributes include property characteristics (e.g. the level of development) as well as lake attributes such as lake size. Stedman (2003b) found that characteristics of the physical environment exerted direct effects on sense of place as well as indirect effects through symbolic place meanings.

Environmental attitudes may also influence place relationships (Vorkinn and Riese, 2001) as can perceptions of the place (Stedman, 2003b). For example, individuals’ attitudes toward hydropower development plans in Norway were significantly associated with attachment to areas likely to be affected by the proposal, even after controlling for gender, age, household income, and attachment to the entire municipality in which the development was to be undertaken. Stedman (2003b) found that property owner perceptions of lakes in northern Wisconsin as ‘social places’ and ‘places of escape’ positively influenced sense of place.

The variables outlined above have some basis in past place research, and offer a potential set of explanatory sources of sense of place variance. More specific discussion of these predictors is offered in the following section in which their measurement is described and an explanatory model of sense of place is offered.
3. Method

3.1. Sampling

Eight lakes in Vilas County, northern Wisconsin, USA, were selected for study because of their relevance to the National Science Foundation’s Long Term Ecological Research project at the University of Wisconsin, Madison (see Jorgensen et al., 2005). The eight lakes included in the study were Big Muskeg Lake, Diamond, High, Plum, Razorback, Sparkling, Trout, and Witches. Questionnaires were mailed to 743 households located within a mile of the shoreline of each lake. Shoreline owners were identified from responses to a direct question in the questionnaire.

3.2. Questionnaire

The questionnaire included sections comprising questions about environmental quality, environmental values and behaviours with respect to riparian forest and in-lake woody habitat distribution, recreational behaviours, perceptions of lakeshore development, attitudes toward the lakes and properties (including the sense of place items) and demographic characteristics. Reminder postcards and replacement questionnaires were sent to householders who had not replied to the initial mailing in an effort to maximise the response rate (Heberlein and Baumgartner, 1978). Using a three-step mailing process (full mailing, postcard reminder, follow-up full mailing), we achieved a 65% response rate after accounting for undeliverable surveys and deceased owners. Seventy-one percent (N = 314) of these respondents were shoreline owners and their questionnaires were retained for further analysis.

The three place constructs were measured with 12 self-report items (see Table 1) based on earlier work by Williams and Roggenbuck (1989); Burdge and Ludtke (1972). The items were rated on 5-point Likert response scales ranging from ‘strongly disagree’ to ‘strongly agree’ and interspersed among items concerning the lakes in the region. A ‘don’t know’ option was available to respondents to take into account non-attitudes that might otherwise reduce the reliability and validity of measurement (Schuman and Presser, 1981).

A number of potential place predictor variables were included in the questionnaire such as the age of the property owner and the year the property was acquired. Moreover, a characteristic of the physical environment—the extent of development on the property—was measured with a checklist comprising built property characteristics that included the following options: dock, developed beach, grassed shoreline, cabin, winterised house, detached garage, detached boathouse, shore wall, and landscaping. Responses to these options were summed to form a property development index, with higher scores indicating a greater number of developed property characteristics.

Other predictor variables concerned the number of days that the respondent spent at his or her property in the previous year (a proxy for residential versus non-residential owner status), and the recreational activities undertaken in and around the lakes (measured with a checklist comprising 18 activities). Also included were a range of items rated on 5-point Likert scales that were summed and averaged to form attitude scales (see Table 1 for a description of the scale items). These scales included owners’ attitudes toward shoreline housing natural vegetation on their properties and the importance of the lake to their perception of their properties. Like the place scales, items

<table>
<thead>
<tr>
<th>Factor (Scale α)</th>
<th>Item label</th>
<th>Item description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place identity (α = 0.76)</td>
<td>IDENTIT1</td>
<td>Everything about my lake property is a reflection of me</td>
</tr>
<tr>
<td></td>
<td>IDENTIT2</td>
<td>My lake property says very little about who I am</td>
</tr>
<tr>
<td></td>
<td>IDENTIT3</td>
<td>I feel that I can really be myself at my lake property</td>
</tr>
<tr>
<td></td>
<td>IDENTIT4</td>
<td>My lake property reflects the type of person I am</td>
</tr>
<tr>
<td>Place attachment (α = 0.87)</td>
<td>ATTACH1</td>
<td>I feel relaxed when I’m at my lake property</td>
</tr>
<tr>
<td></td>
<td>ATTACH2</td>
<td>I feel happiest when I’m at my lake property</td>
</tr>
<tr>
<td></td>
<td>ATTACH3</td>
<td>My lake property is my favorite place to be</td>
</tr>
<tr>
<td></td>
<td>ATTACH4</td>
<td>I really miss my lake property when I’m away from it for too long</td>
</tr>
<tr>
<td>Place dependence (α = 0.78)</td>
<td>DEPEND1</td>
<td>My lake property is the best place for doing the things that I enjoy most</td>
</tr>
<tr>
<td></td>
<td>DEPEND2</td>
<td>For doing the things that I enjoy most, no other place can compare to my lake property</td>
</tr>
<tr>
<td></td>
<td>DEPEND3</td>
<td>My lake property is not a good place to do the things I most like to do</td>
</tr>
<tr>
<td></td>
<td>DEPEND4</td>
<td>As far as I am concerned, there are better places to be than at my lake property</td>
</tr>
<tr>
<td>Shoreline housing (α = 0.90)</td>
<td>SHOUSE1</td>
<td>Too many houses on the lakeshore will harm wildlife habitat</td>
</tr>
<tr>
<td></td>
<td>SHOUSE2</td>
<td>Too many houses on the lakeshore will harm ‘northwoods feeling’ of the lake</td>
</tr>
<tr>
<td></td>
<td>SHOUSE3</td>
<td>Too many houses on the lakeshore will decrease the quality of the water in the lake</td>
</tr>
<tr>
<td></td>
<td>SHOUSE4</td>
<td>Too many houses on the lakeshore will make the lake less scenic</td>
</tr>
<tr>
<td>Natural vegetation (α = 0.80)</td>
<td>NATURAL1</td>
<td>I like to keep my property as natural as possible</td>
</tr>
<tr>
<td></td>
<td>NATURAL2</td>
<td>I don’t like to disturb the natural vegetation on my lake property</td>
</tr>
<tr>
<td></td>
<td>NATURAL3</td>
<td>I like to have a lot of natural vegetation on my lake property</td>
</tr>
<tr>
<td>Lake importance (α = 0.75)</td>
<td>LAKEIMP1</td>
<td>The lake is the most important reason for being at my property</td>
</tr>
<tr>
<td></td>
<td>LAKEIMP2</td>
<td>Being near the water is the best thing about my lake property</td>
</tr>
<tr>
<td></td>
<td>LAKEIMP3</td>
<td>My property would still mean a lot to me even if it were not near the lake</td>
</tr>
</tbody>
</table>
were summed and averaged across the number of items in the scale. High scores on the place scales are consistent with stronger sense of place. High scores on the attitude variables were associated with positive evaluations of retaining native vegetation on the property, more importance attributed to the lake, and more negative attitudes toward shoreline development on the lake.

The unidimensionality of all the scales in Table 1 was tested by factor analysing each set of scale items using the principal axis method provided in SPSS (Release 10.0.5). In each case, only a single factor could be extracted with explained variances ranging from 58.40% (place identity) to 77.06% (shoreline housing). Item loadings across the analyses ranged from 0.54 (LAKEIMP3) to 0.94 (IDENTITY1). The scale reliabilities (Cronbach’s alpha) ranged from 0.75 (lake importance) to 0.90 (shoreline housing).

3.3. Theoretical model: testing the equality of relationships between the predictors and place dimensions

Fig. 1 shows a model which includes the variables that are hypothesised to have either direct or indirect effects on the three place dimensions. The independent variables on the far left of the figure do not directly affect the place dimensions, but are assumed to influence sense of place through three mediator variables. Mediator variables that do not affect sense of place cannot carry indirect effects of the independent variables (Baron and Kenny, 1986).

We hypothesised that respondents who were older, had owned their properties for a relatively long time, had lower levels of property development, had spent relatively more days at their properties in the previous year, and engaged in a wider range of recreational activities in and around their respective lakes, were likely to hold more negative attitudes toward shoreline development, more positive attitudes toward retaining native vegetation on their properties, and attribute more importance to their lakes as sources of enjoyment. Furthermore, we assumed that higher levels of place dependence, attachment and identity would be associated with negative shoreline development attitudes, positive attitudes toward retaining native flora on their properties, and more lake importance.

Testing the relationships between the set of predictors and correlated dependent variables in the model was performed using path analysis. The model in Fig. 1 specifies the relationships of interest as well as correlations among the residual variances ($\zeta_{ij}$) and correlations among the predictor variables ($\phi_{ij}$). Moreover, in this model, the path coefficients ($\gamma_{ij}$) for each predictor can be compared across equations involving different dependent variables. For example, the relationship between shoreline development attitudes and place identity can be statistically compared with the relationship between the same predictor and place attachment and/or place dependence. This is done by holding equal the relationships involving the attitude and comparing the resulting goodness-of-fit chi-square with the chi-square of a model in which the same relationships are free to vary across dependent variables. If fixing the coefficients to be equal increases the chi-square statistic (i.e. reduces goodness-of-fit) by a significant amount, then the relationships cannot be said to be equal across dependent variables.

4. Results

4.1. Descriptive statistics and correlations

Property owners in the sample were predominantly male (79.2%) residing in households earning more than $35,000 (70.5%). Respondents averaged about 58 years of age, had on average owned their current property for 18 years, and had...
spent an average of 152 days at their property during the previous year. Approximately, half of the sample was engaged in full-time employment while 39.5% were retired. Following listwise deletion of missing data and ‘don’t know’ responses, 290 valid cases remained. The means and standard deviations revealed that the distributions for the place scales, and the scales measuring attitudes toward native flora and shoreline housing, were negatively skewed (see Table 2).

Correlations among the predictor variables were low to moderate in size (see Table 3). The highest correlation existed between the ages of the respondents and the year they acquired their properties, indicating that older respondents attained their properties earlier than younger owners. Interestingly, owners who reported higher levels of property development considered the lake as central to their perception of their properties, and had more negative attitudes toward retaining natural vegetation on their properties. Furthermore, older property owners, and owners who spent relatively more time at their properties in the previous year, were more likely to regard the lake as important when thinking about their properties. Finally, beliefs about the consequences of shoreline development were more strongly related to attitudes toward the management of property flora than to lake importance.

Correlations among the sense of place variables were moderate to high. The correlations were equal to 0.74 (ATTACH and DEPEND), 0.68 (ATTACH and IDENTITY), and 0.58 (DEPEND and IDENTITY), which were marginally lower than in previous research in which measurement error was taken into account (see Jorgensen and Stedman, 2001). The correlations between the independent variables and each of the place dimensions were less than an absolute value of 0.16. The only significant correlations occurred for PROPDEV and DEPEND (r = 0.16, p < .01) and for PROPDEV and ATTACH (r = 0.14, p < .05). However, stronger but low to moderate correlations were observed for SHOUSE, NAT-FLORA and LAKEIMP with DEPEND (0.21, 0.41 and 0.26), ATTACH (0.18, 0.45 and 0.30) and IDENTITY (0.28, 0.47 and 0.50), respectively. Nearly all of these correlations were significant at .001, except the correlation between SHOUSE and ATTACH which was significant at the 1% level.

To examine patterns of similarities and differences across relationships involving a set of common predictors of different place dimensions, the model in Fig. 1 was estimated using the robust maximum likelihood method in LISREL 8.70 (Jöreskog et al., 2001). In the first estimation stage, all path coefficients, error covariances and intercepts were not constrained to be equal across equations, but were allowed to vary. This first model was associated with a minimum fit function chi-square value 27.21 with 15 degrees of freedom, which was significant at the 5% level and indicated that the model-based variance–covariance matrix was significantly different from the sample matrix. The Comparative Fit Index (CFI, Bentler, 1990) had a value of 1.00 suggesting that the model fitted better than a baseline independence model. Based on the average Standardised Root Mean Square Residual (0.04), the discrepancy between the sample variance–covariance matrix and the fitted matrix was small. Finally, the Root Mean Square Error of Approximation (RMSEA; Steiger, 1990), which takes into account the error of approximation in the population as well as the model degrees of freedom, had a point value of 0.00, which was less than the cut-off value of 0.06 recommended in the literature (Hu and Bentler, 1995). In addition, the mediator variables accounted for 21, 24 and 41% of the variance in place dependence, attachment and identity, respectively. Furthermore, 1% of the variance in shoreline development attitudes, 5% of the variance in native vegetation attitudes, and 20% of lake importance was predicted by the independent variables.

An examination of the modification indices suggested that adding a path from development level to both dependence and attachment would significantly improve model fit. As a general
rule, post hoc adjustments in the model testing process should only be undertaken when they make theoretical sense. In this case, it is plausible that development level might directly affect the place variables because the model may not include all potential mediators. Moreover, since our goal was to illustrate the potential for differences in the relationships between place variables and their predictors rather than to test the adequacy of a generalisable model, the additional paths were included and the model was re-estimated (see Table 4). The fit of this second model was significantly better than the first model with a chi-square of 10.98 with 13 degrees of freedom ($p = 0.61$). The RMSEA was 0, the CFI was equal to 1, and the standardised RMR was 0.02. Finally, the mediator variables accounted for 24, 27 and 41% of the variance in place dependence, attachment and identity, respectively. The variance of the mediators which was accounted for by the independent variables did not differ to the original model.

The results showed that attitudes toward native flora (NATFLORA) and lake importance (LAKEIMPO) were the most consistent predictors of the place dimensions, although the former was the largest predictor in most cases. One exception was for place identity which was best predicted by lake importance. Older owners were more likely to regard the lake as an important aspect of their relationship with their property. The standardised coefficients given in Table 4 show that the coefficient for AGE was equal to 0.13, which was considerably smaller than the coefficients for DEVLEVEL ($\beta = 0.34$) and TOTALDAY ($\beta = -0.27$).

As noted earlier, the amount of development on the property influenced dependence and attachment independent of the effects of the mediator variables (see Table 4). Higher levels of dependence and attachment were associated with more property development. However, there were also significant indirect effects by which the independent variables influenced place dimensions via the mediator variables (see Table 5). Of note is that development level did not significantly influence any of the place dimensions through its significant effects on lake importance and attitudes toward native vegetation on the property. Moreover, while development level directly affected attachment and dependence, it had no effect (direct or indirect) on identity.

The number of days property owners had spent at their lakeshore homes in the previous year did have mediated effects on the place variables. Interestingly, more days spent at the property significantly decreased attachment and identity by decreasing the importance of the lake in their experience of their properties. In fact, the indirect effect on identity is nearly twice as large as the indirect effect on attachment.

The age of the owner had a weak, indirect effect on place identity that operated through perceptions of lake importance. Older owners were more likely to regard the lake as an important aspect of their relationship with their property. The standardised coefficients given in Table 4 show that the coefficient for AGE was equal to 0.13, which was considerably smaller than the coefficients for DEVLEVEL ($\beta = 0.34$) and TOTALDAY ($\beta = -0.27$).

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### Table 4
Parameter estimates for Model 2 ($N = 290$)

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Mediator variables</th>
<th>Place variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SHOUSE NATFLORA LAKEIMPO</td>
<td>DEPEND ATTACH IDENTITY</td>
</tr>
<tr>
<td>CONSTANT</td>
<td>4.23*** 3.81*** 2.96***</td>
<td>1.28** 1.86*** 1.19***</td>
</tr>
<tr>
<td>AGE</td>
<td>0.00 (0.04) 0.01 (0.12) 0.01* (0.13)</td>
<td>0.00 (0.00) 0.01* (0.04) 0.01* (0.07)</td>
</tr>
<tr>
<td>YEARACQ</td>
<td>-0.00 (-0.01) 0.00 (0.00) -0.00 (-0.01)</td>
<td>0.00 (0.02) 0.03 (0.12) 0.02 (0.07)</td>
</tr>
<tr>
<td>NUMBREC</td>
<td>0.00 (0.02) 0.03 (0.12) 0.02 (0.07)</td>
<td>0.04 (-0.09) -0.06* (-0.16) 0.16*** (0.34)</td>
</tr>
<tr>
<td>DEVLEVEL</td>
<td>-0.04 (-0.06) -0.00 (-0.10) -0.00*** (-0.27)</td>
<td>0.08*** (0.19) 0.06*** (0.17)</td>
</tr>
<tr>
<td>DAYSPROP</td>
<td>-0.00 (-0.06) -0.00 (-0.10) -0.00*** (-0.27)</td>
<td>0.10 (0.10) 0.04 (0.04) 0.09* (0.11)</td>
</tr>
<tr>
<td>SHOUSE</td>
<td>NATURAL</td>
<td>0.41*** (0.39) 0.40*** (0.45) 0.31*** (0.36)</td>
</tr>
<tr>
<td></td>
<td>LAKEIMPO</td>
<td>0.09 (0.10) 0.08 (0.10) 0.29*** (0.41)</td>
</tr>
<tr>
<td>$\beta$</td>
<td>0.53*** (0.99) 0.47*** (0.95) 0.55*** (0.80)</td>
<td>0.42*** (0.76) 0.29*** (0.73) 0.21*** (0.59)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.01 0.05 0.20</td>
<td>0.24 0.27 0.41</td>
</tr>
</tbody>
</table>

$^a$ Figures in parentheses are standardised coefficients.

### Table 5
Indirect effects of independent variables on place variables in Model 2 ($N = 290$)

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Place variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DEPEND ATTACH IDENTITY</td>
</tr>
<tr>
<td>AGE</td>
<td>0.00 (0.06) 0.00 (0.07) 0.00* (0.10)</td>
</tr>
<tr>
<td>YEARACQ</td>
<td>-0.00 (0.00) -0.00 (0.00) 0.00 (0.00)</td>
</tr>
<tr>
<td>NUMBREC</td>
<td>0.01 (0.05) 0.01 (0.06) 0.01 (0.07)</td>
</tr>
<tr>
<td>DEVLEVEL</td>
<td>-0.02 (-0.04) -0.01 (-0.04) 0.02 (0.07)</td>
</tr>
<tr>
<td>DAYSPROP</td>
<td>-0.00 (-0.07) -0.00* (-0.08) -0.00*** (-0.15)</td>
</tr>
</tbody>
</table>

$^a$ Figures in parentheses are standardised coefficients.
The standardised coefficients in Table 5 revealed that there were similar, but not statistically significant indirect effects of age on both attachment and dependence. Therefore, the indirect effects of age are perhaps best not considered exclusive to the identity variable, despite the statistical significance of the coefficient relative to the coefficients for attachment and dependence.

Finally, Tables 4 and 5 illustrate that only lake importance proved to mediate effects on any of the place dimensions. This is understandable given that the other hypothesised mediators were not well predicted by any of the independent variables. The largest effect operating through lake importance was the negative influence on place identity due to the number of days owners spent at their properties in the previous year.

The results indicated that there was significant covariation among the disturbance terms for each regression on the three place constructs after accounting for the predictor variables. Thus, there are potentially other common predictors of the place constructs that are not included in the model. The covariance was equal to 0.22 (t = 9.78, p < .001) among the residual variances of ATTACH and DEPEND, and equal to 0.12 for IDENTITY and DEPEND (t = 6.56, p < .001) and IDENTITY and ATTACH (t = 7.06, p < .001).

The error covariances among the mediator variables were also significantly different to zero. The covariance between the errors of SHOUSE and NATFLORA was 0.14 (t = 4.10, p < .001); between SHOUSE and LAKEIMPO it was 0.10 (t = 3.13, p < .001); and, between LAKEIMPO and NATFLORA the error covariance was 0.12 (t = 3.90, p < .001). These statistics suggest the possibility of additional variables not included in the model.

The results in Table 4 indicated that the variable that varied most in its relationship with the place dimensions was lake importance. This variable was also the one that was best explained by the exogenous predictors in the model. For these reasons, a third model (Model 3) was estimated with the inclusion of equality constraints on all three coefficients in the regressions of the place dimensions on lake importance (see Table 6). This model tested the hypothesis that the effects of lake importance on the place dimensions were not significantly different to one another. However, the hypothesis was rejected as the model did not fit the data as well as Model 2 did. The difference in chi-square statistics of the two models was 28.71 with two degrees of freedom, which was significant at p < .001. Therefore, the effects of lake importance on one or more of the three place dimensions were significantly different, as was suggested from the information presented in Table 4 for Model 2.

To identify differences between pairs of coefficients for lake importance, the relevant coefficients were statistically compared (e.g. comparing the effect of lake importance on dependence with its effect on attachment). Model 4 tested the equality of the coefficients for dependence and attachment; Model 5 compared dependence and identity; and, Model 6 compared the equality of attachment and identity. Therefore, in each model, only two lake importance coefficients were constrained to be equal, with the third coefficient being free to vary. These models were compared with Model 2 to see if they resulted in a significant decrease in model fit (see Table 6).

The results indicated that the fit of Model 4 was not significantly different to that of Model 2. In other words, the effect of lake importance on dependence was not significantly different to its effect on attachment since the equality constraint did not significantly decrease model fit compared with Model 2 in which the parameters were free to vary. However, the effect of lake importance on identity was significantly different to its effect on both dependence (Model 5) and attachment (Model 6). Models 5 and 6 had significantly worse model fit compared with Model 2 indicating that their respective equality constraints could not be supported by the data. As reflected in the parameter estimates for Model 2 (refer to Table 4) lake importance had a significantly larger effect on identity than it did on either dependence or attachment. Moreover, variation in lake importance did not significantly account for variance in either attachment or dependence.

5. Discussion

The preceding analyses indicated good predictive validity for some of the independent variables and mediators that were regressed on the three place dimensions. Importantly, some of these variables had different relationships with the place dimensions, while the effects of other variables were not significantly different across the place dimensions. The following discussion offers some reflection on these differences and consistencies for each predictor variable and place dimension.

The most influential variables with respect to sense of place were the level of property development, the number of days spent on the property, attitudes toward shoreline development, attitude toward retaining native vegetation on the property, and the importance attributed to the lake by property owners. However, in most cases, the greater proportion of the variation in the place variables was due to the mediator variables rather than the indirect effects of the independent variables. The exception to this was the effect on identity of number of days spent at the property, which operated by decreasing lake importance. This might indicate that one’s own lake is less important with respect to identity for resident owners who have a more well-rounded experience of place, including greater opportunity to explore other lakes, pursue other recreational

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1 For example, the model does not include variables that specifically address the social relationships in the setting (see, for example, Pretty et al., 2003).

### Table 6
Comparisons between Model 2 and models with equality constraints (N=290)

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$ (df)</th>
<th>$\chi^2_0$ (df)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 2</td>
<td>10.98(13)</td>
<td></td>
</tr>
<tr>
<td>Model 3</td>
<td>39.69(15)</td>
<td>28.71(2)***</td>
</tr>
<tr>
<td>Model 4</td>
<td>28.06(14)</td>
<td>17.08(1)***</td>
</tr>
<tr>
<td>Model 5</td>
<td>38.45(14)</td>
<td>27.55(1)***</td>
</tr>
</tbody>
</table>

***p < .001.
activities, have more social relationships, and participate more fully in their local community than do individuals spending less time on their properties.\footnote{We acknowledge an anonymous reviewer for this insight.}

The period of time that owners had owned their properties, and the number of recreational activities that owners engaged in, did not have any significant influence in the model.\footnote{It is possible that total activities is too general a measure and that specific activities or clusters of activities (e.g. water-based recreation) would be more influential. However, exploratory correlations involving the specific recreational activities did not reveal systematic patterns that supported this possibility, nor did Stedman (2002) uncover variation across activity types.}

Moreover, owners’ age had only a small degree of influence in the model with older respondents attributing more importance to the lake. Owners’ age also had a weak, positive effect on identity that operated through lake importance. Readers should note that the population we sampled is relatively narrow with respect to age range, and it is plausible that this variable may be more important in understanding sense of place in populations that have more age variance.

The most consistent predictor of sense of place was property owners’ attitudes to retaining native vegetation on their properties, with all three place dimensions being positively associated with this variable. Therefore, attitudes toward retaining native vegetation on the property seem to be a factor that is associated with the integration of place identity, attachment and dependence for this sample of property owners.

Furthermore, negative (positive) attitudes toward native vegetation retention were significantly associated with higher (lower) levels of property development. Recall also that owners of highly developed properties were more likely to consider their lake as central to their perception of their properties. For these owners, the presence of native vegetation is not a highly valued aspect of their lake property. This is most likely due to the belief among some property owners that native vegetation on the shoreline impedes recreational activities (e.g. boating), presents a hazard (e.g. swimming and boat navigation), and/or obscures lake views (Jorgensen et al., 2005). Notwithstanding, our model does not account well for variations in attitudes toward retaining native vegetation. Therefore, it is not possible from our results to identify additional personal or behavioural factors that might impede or facilitate vegetation retention.

Property owners’ attitude toward the amount of shoreline development on their respective lakes was a relatively weak predictor of sense of place. Moreover, it did not carry the effects of any of the independent variables to a significant extent. This is an interesting result apart from the fact that owners’ sense of place is only marginally based on their attitudes toward shoreline development. Of perhaps, greater significance is the conclusion that owners’ shoreline development attitudes bear little relationship to the amount of development on their own properties. Therefore, communication strategies aimed at convincing owners that there is either too much shoreline housing development or room for more development are unlikely to be effective if they require owners to consider the extent of development on their own properties.\footnote{An anonymous reviewer noted that there may be a lack of correspondence between individuals’ general attitude toward shoreline development and specific property behaviours. In this sense, communication strategies to facilitate proenvironmental behaviours may not need to focus on the development level of people’s own properties, but on their general attitude toward development on the lake. This possibility might be pursued in future research.}

Similarly, owners may be unlikely to curtail their own property development simply through the recognition of high levels of shoreline development on their respective lakes. It is also important to consider that the current level of shoreline development on one’s property cannot be completely attributed to the owner’s attitude, as (for example) one may purchase a property with more existing development than they might choose to pursue had they been starting with a completely undeveloped property. Finally, it is also very likely that owners regard housing development in terms of the number of houses on the lake rather than as the extent of development on their own property. In this sense, owners might support either more houses with less property development or fewer houses having extensive property development.\footnote{Like attitudes toward property vegetation, lake importance was a large predictor, but only where place identity was concerned. The behavioural exclusivity of the properties, and owners’ feelings of attachment toward them, was not grounded in perceptions that the lakes were fundamental to owners’ experience of their properties. Rather, the greater the importance owners attributed to their respective lakes in their experience of their properties, the more owners believed that their properties were important to their self-concept. Of course, the model does not rule out the possibility that owners who identified more with their properties came to see the lake as an important object of identification.}

One possible explanation for the different effect of lake importance on the three place dimensions lies in environmental worldviews that incorporate a transpersonal notion of the ‘ecological self’ (e.g. Fox, 1990; Naess, 1988; see Bragg, 1996 for a recent discussion). It is plausible that some property owners conceived an interconnectedness between themselves, their properties and the surrounding lakes. Individuals who identified strongly with their properties may have extended this identification to also include the lake. Syme et al. (2002), for example, found that the more morally responsible their participants felt toward the environment the larger the geographic area these participants reported having an affinity with (i.e. whole suburbs rather than either a single house or street).

The finding that owners who attributed greater importance to the lake also reported stronger place identity compared with either attachment or dependence is consistent with transpersonal accounts of the identification process with respect to the natural environment. According to Naess (1988), the process of identification with the non-human world is fundamentally cognitive rather than purely emotional. This is not to ignore the substantial correlations among place concepts indicating that cognitive, affective and behavioural place domains are
overlapping to a significant extent in our study. Rather, it suggests that a relationship with the natural world beyond one’s private property is most clearly represented in beliefs about the self-compared with emotional bonds and behavioural preferences.

Evidence against a transpersonal account of the varying effect of lake importance on place identity lies in an examination of the predictors of lake importance and the indirect effects it carried in the model. There was a significant, positive relationship between development level and both lake importance and native vegetation attitudes. That is, owners who attributed greater importance to the lake also had more developed properties and more negative attitudes toward retaining native vegetation. This would seem to discount an explanation based on an ecological self since it could be argued that owners’ appreciation of their lakes seemed to occur at the expense of the environmental values of their properties. This selective appreciation of nature suggests that property development occurs at the expense of natural lakeshore vegetation and serves the purpose of increasing the lake vista to the property outlook as well as improving access to the lake. Therefore, the stronger relationship between lake importance and place identity compared with the other place dimensions might be explained by the role of the lakes in fulfilling anthropocentric and instrumental ends that are important to an individual’s self-concept (e.g., property values, social status, specific recreation activities, etc.). In other words, owners who attributed the most importance to the lake and identified it most strongly with their properties are those individuals whose properties are geared to lifestyles that make use of the lake.

This second explanation is difficult to sustain in light of the indirect effects analysis. While development level did structure perceptions of lake importance and attitudes toward retaining native vegetation on the property in the model, these effects did not contribute to the effect of these mediator variables on sense of place and on identity in particular. Put simply, there were no significant direct or indirect relationships between development level and place identity. Rather, owners having relatively more property development were more likely to be attached to, and behaviourally dependent upon, their properties independent of their own views on lake importance and native vegetation.

To summarise, all three place dimensions were best predicted by owners’ attitudes toward retaining native vegetation on their properties. Efforts to retain native vegetation on lakes are likely to gain some ascendancy among owners in our sample. However, further research might ascertain whether property owners share common conceptions of both ‘native vegetation’ and ‘sustainable levels of vegetation’. Second, extent of development on individual lakeshore properties was associated with perceptions of greater lake importance and (independently) higher levels of place dependence and attachment, but not place identity. Property development simply did not have a linear relationship with place identity in our sample. Rather, attitudes toward shoreline housing (i.e., whole lake development) were more predictive of property identity than was individual property development. Finally, place identity in our sample was much more a function of owners’ perceptions of lake importance than were either attachment or dependence.

The above insights highlight why it is worthwhile conceiving of sense of place as a multidimensional construct comprising cognitive, affective and behavioural components. Such an approach allows a more complex view of place by allowing the potential for both consistencies and inconsistencies involving the place-based beliefs, feelings and behaviours of individuals and groups. When concepts are multidimensional but treated as unidimensional, relationships with important variables may be obscured when these relationships are not uniform across their multidimensional structure. For example, the significance of the lakes would be under-rated if sense of place was conceived of in purely emotional and/or behavioural terms, or confounded with the affective and/or behavioural domains. According to our data, the lakes have an important influence on the way that shoreline owners integrate their properties into their self-concepts. In-lake management issues (e.g., management of coarse woody habitat; boating regulations; fishing restrictions, etc.) and strategies are likely to be of particular interest to shoreline owners who identify strongly with their lakeshore properties. This interest would be expected to be most prevalent among owners who have relatively more extensive property development and non-resident owners (i.e., owners whose permanent residence is outside the region) who spend relatively less time per year at their properties than do resident owners.

Furthermore, the ‘interplay’ among these dimensions that was suggested by Low and Altman (1992) has implications for how people come to understand and experience various places. Some individuals and groups may experience disparate and conflicting psychological responses, while others might demonstrate consistency among the place components. Given this, specific behaviours that might be desirable from an environmental planning perspective may have different relationships with sense of place depending upon whether the variable is primarily affective (attachment), cognitive (identity) or conative (dependence). As has been the case in attitude research, the effectiveness of a behaviour change strategy may depend upon both the type of behaviour and whether sense of place is more affect-based than cognition-based in the context in which it is studied. The variation in predictive patterns noted above further supports the view that sense of place is best conceived as a multidimensional construct involving affective, cognitive, and conative components. Notwithstanding the preceding discussion, readers should note a number of limitations in our data. Our study concerns a relatively specific population and our sample is too small to support useful inter-group and between-lake comparisons to further elaborate an understanding of sense of place. Moreover, our set of predictors did not include other potentially explanatory variables such as those that describe property owners’ interpersonal relationships, community characteristics, and physical characteristics of the lakes. Despite this, the model was reasonably explanatory of owners’ sense of place.
6. Conclusions

In conclusion, the value of a multidimensional approach to sense of place is likely to be appreciated in contexts in which between group conflict exists over a particular place. Regressions between groups might reveal differences in participant and property characteristics as well as in the meaning of the place for each group. However, in such instances, we would reiterate views put forward in Jorgensen and Stedman (2001) and begun by Stedman (2002) that future research reflect the domains of attitude more closely (i.e. a general evaluation of the place, beliefs and feelings about the place, behavioural intentions associated with the place, the strength of the attitude toward the place, and the behaviours that occur there). We would also suggest that spatial aspects of sense of place (e.g. Cuba and Hummon, 1993; Syme et al., 2002) be represented in place research so as to account for variation in the geographic areas and the specific environmental features that individuals and groups identify with, are attached to, and hold a behavioural preference for. In this way, a more comprehensive understanding of places might be attained than if one were to operationalise sense of place as it has been described in the literature.

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