



Examining the direct and indirect effects of environmental change and place attachment on land management decisions in the Hill Country of Texas, USA

Po-Hsin Lai^{a,*}, Urs P. Kreuter^b

^a Newcastle Business School, The University of Newcastle, University Drive, Callaghan, NSW 2308, Australia

^b Department of Ecosystem Science and Management, Texas A&M University, 2138 TAMU, College Station, TX 77843, USA

ARTICLE INFO

Article history:

Received 2 June 2011

Received in revised form 27 October 2011

Accepted 11 November 2011

Available online 15 December 2011

Keywords:

Urbanization

Evaluation of change

Rural land management

Moderation

Latent variable scores

ABSTRACT

Urbanization has increasingly encroached upon many rural landscapes. The increased demand for development, and associated increase in land prices and property taxes has forced many rural landowners to subdivide or sell their property and led to adverse impacts on important ecosystem functions supported by rural landscapes. However, there has been limited research on how, in the face of such changes, landowners' attachment to their property may affect their intention to retain their property, and effort invested to sustain important ecosystem features and enhance their land management capacity. Our study examined how landowners' evaluation of change interacted with three dimensions of place attachment (place functions/features, place emotion/identity, and social bonding) to influence their intention to retain their rural property and engage in property-protective behaviors. The study was conducted with a sample of landowners whose properties in the Texas Hill Country were impacted by urbanization from the nearby metropolitan area. Model testing was conducted based on latent variable scores. The results revealed that evaluation of urbanization-related change primarily interacted with respondents' place emotion/identity to influence their intention to retain their property. Additionally, evaluation of change and place attachment also directly influenced intention and behaviors pertaining to respondents' property. Our research suggests the need to focus on landowners' attachment to their rural property as a mechanism for promoting ecologically sound land management. Moreover, the needs to understand how landowners perceive urbanization, inform them of potential impacts, and provide resources to enhance their environmental skills to cope with such changes are also recommended.

© 2011 Elsevier B.V. All rights reserved.

1. Introduction

Environmental change induced by accelerated urbanization is increasingly impacting rural communities adjacent to growing metropolitan areas in many parts of the world (Bohnet & Pert, 2010; Gobster, Stewart, & Bengston, 2004; Yu & Ng, 2007). Urbanization involves “a complex process that is characterized by the transformation of landscapes formed by rural life styles into urban ones” (Antrop, 2000, p. 257). In the United States, urbanization has encroached upon much of the nation's rural landscape (Brown, Johnson, Loveland, & Theobald, 2005). Such land use shifts have frequently led to a decline in the agricultural production, wildlife habitat, and quality of scenic areas. Additionally, these shifts have introduced changes to disturbance regimes (e.g., periodic fire), biochemical cycles, and other ecological processes (Dale, Archer, Chang, & Ojima, 2005). Urbanization and associated environmental

changes impact not only the biophysical environment but also shape “the concepts and visions people have about their environment, as well as their traditions, values and goals” (Antrop, 2000, p. 258). Such changes may interfere with people's connection to the environment, and lead to psychological consequences such as feelings of loss, grief, anxiety, alienation, and nostalgia (Fried, 2000; Milligan, 2003).

Relationships with the environment tied to specific geographic locations have been suggested as a driving force for resource management decisions, and environmental or place-specific intention and behavior (Cross, Keske, Lacy, Hoag, & Bastian, 2011; Devine-Wright & Howes, 2010; Manzo & Perkins, 2006). At the same time, individuals may not be constantly conscious about their attachment to their home or familiar place until valued physical, functional, social, and cultural features of the place are threatened by factors such as environmental changes (Brown & Perkins, 1992; Devine-Wright, 2009). However, less is understood about how environmental changes influence landowners' attachment to their rural property and, subsequently, their decisions to engage in activities to maintain this psychological connection as well as the essential environmental qualities and features of the property.

* Corresponding author. Tel.: +61 2 4921 6787; fax: +61 2 4921 6911.

E-mail addresses: po-hsin.lai@newcastle.edu.au (P.-H. Lai), urs@tamu.edu (U.P. Kreuter).

This understanding can help shed light on the consequences of such changes for rural communities and environmental health in rapidly changing rural areas. It may also facilitate the development of strategies to more effectively target landowners and encourage their participation in management decisions that help them cope with rapid environmental changes. To address this knowledge gap, we conducted a survey of landowners in three counties in the Hill Country of central Texas. The study focuses on the concept of place attachment and examines how, in the face of change, it affects rural landowners' intention to retain their property and to engage in activities that maintain the ecological health and important features of it.

The Hill Country is a primarily rural region in central Texas that encompasses 25 counties which are characterized by karst topography created from the dissolution of limestone substrate, shallow soils on uplands and deeper soils on plains and valleys (Griffith et al., 2004). Twelve counties in the region are designated as the contributing and recharge zones of the Edwards Aquifer, a crucial water source for a population of almost two million people in South Central Texas (EAA, 2010). The vegetation of the region is dominated by juniper-oak and mesquite-oak savanna. A large portion of the region supports livestock as well as exotic and native wildlife, including several endangered reptile and bird species (TPWD, 2005).

While anthropogenically induced environmental change has shaped the physical and socio-economic landscape of the Hill Country for hundreds of years, recent rapid population growth in Texas and the elevated demand for rural land with scenic beauty, natural recreation amenities, and wildlife habitat have accelerated such changes during the past few decades (Wilkins et al., 2003). Land subdivision has been most prominent in places adjacent to urban areas, especially Austin and San Antonio, and along major transportation routes, such as the interstate highway I-35. The population in this region increased by 40% between 1990 and 2000 with 47.7% and 21.6% growth in the Austin-Round Rock and San Antonio areas, respectively (U.S. Census Bureau, 2006). Urbanization in the region also contributed to the rise in the value of land and, therefore, property taxes, which has further encouraged the subdivision of large contiguous rural lands into smaller properties that are economically nonviable for traditional farming and ranching (Wilkins et al., 2003).

2. Place attachment and environmental change

Environmental research has increasingly adopted the concept of place attachment in part to address the critique that much of the early research in this field of study employed abstract constructs (e.g., global environmental attitudes, values, worldviews) that frequently ignore the contextual relevance of the place where related decisions are made, attitudes formed, and behaviors manifested (Bonaiuto, Carrus, Martorella, & Bonnes, 2002; Kaltenborn & Williams, 2002). Another reason contributing to the rise of this research is the growing concern about increasingly prevalent anthropogenic or natural environmental changes that may undermine individuals' psychological wellbeing, self and cultural identity, community ties, and social life embedded in specific geographic locations (Fried, 2000; Manzo & Perkins, 2006). Although place attachment has been defined variously, two elements in its conceptualization have been commonly shared, including the multifaceted and dynamic nature of this form of person–place relationship.

At least three dimensions have been used to conceptualize place attachment, including place identity, place dependence, and social bonding (Hammit, Backlund, & Bixler, 2006; Kyle, Graefe, & Manning, 2005; Williams & Vaske, 2003). Most research in this area

has agreed that central to the conceptualization of place attachment is the emotion and feelings individuals attribute to a specific location (Fried, 2000; Low & Altman, 1992; Scannell & Gifford, 2010). Repeated interactions with a place may facilitate development of emotional ties that provide an anchor for individuals to cultivate a sense of self, self-esteem, and belonging (Milligan, 2003; Williams & Vaske, 2003). While some view place identity to be comprised of both self-identity and emotions derived from person–place interactions (Cross et al., 2011; Kyle et al., 2005; Williams & Vaske, 2003), others regard place-based identity and emotions to be separate constructs (Halpenny, 2010; Scannell & Gifford, 2010). The second dimension, place dependence or the functional dimension of place attachment, refers to the utility and physical features of a place that satisfy subsistence, recreation, self-enhancement, and/or religious needs (Stokols & Shumaker, 1981; Williams & Vaske, 2003). Social bonding represents another dimension of place attachment resulting from meaningful interactions with family, friends, neighbors, and colleagues bounded by a place (Hammit et al., 2006; Hidalgo & Hernández, 2001; Kyle et al., 2005). These dimensions of place attachment are not mutually exclusive; the development or decline of one dimension is highly dependent on the remaining dimensions (Hammit et al., 2006; Kyle et al., 2005).

Although stability in place attachment helps maintain a sense of security and familiarity by knowing that the benefits of the place can be continuously enjoyed, person–place relationships do not remain static (Low & Altman, 1992). The dimensions of place attachment are likely to change as people progress through different life stages and the places with which they are attached undergo various changes (Brown & Perkins, 1992; Proshansky, Fabian, & Kaminoff, 1983). Meanwhile, not all place changes are necessarily undesirable. Place attachment may, in fact, be strengthened by changes that are well planned and actively pursued in order to maintain personal or community distinctiveness, a sense of continuity between past and present, positive self or group evaluations, and capabilities to carry out desired activities or to meet the goal of everyday life (Manzo, 2003; Twigger-Ross & Uzzell, 1996). On the other hand, changes that interfere with emotional, functional, and social ties to a place may lead to various psychological effects when insufficient resources are available for a person to adjust to or cope with changes (Fried, 2000; Hay, 1998; Proshansky et al., 1983). As described previously, landowners in some parts of the Texas Hill Country are facing increased environmental and socio-economic changes resulting from urbanization. Landowners who do not have sufficient financial support, knowledge or management capacity to adapt to these changes may become increasingly distressed and ultimately forced to sell their land.

Devine-Wright (2009) argued that individuals faced with changes are likely to go through multiple stages that involve becoming aware of place changes, interpreting the changes, and evaluating associated consequences. If perceived place changes are interpreted to be disturbing and may lead to adverse impacts on the place, then decisions may be made to reject or accept the changes, and actions may be adopted to cope with them. Breakwell's Identity Process Theory (IPT) provides a theoretical explanation for responses to environmental changes that may threaten the part of self-identity derived from person–place interactions (Breakwell, 1986; Twigger-Ross, Bonaiuto, & Breakwell, 2003). Concurrent with research in place (e.g., Greider & Garkovich, 1994; Proshansky et al., 1983), IPT views place and place meanings, including personal memories of interactions afforded by a place and associated place features, and social memories embedded in interpersonal relations tied to specific locations, as important sources of identity. The theory suggests that the structure of identity is not static; it may change via psychological processes guided by four identity principles, including continuity, distinctiveness, self-efficacy, and self-esteem, which “define desirable states for the structure



Fig. 1. Map of the study area in the Texas Hill Country.

of identity" (Twigger-Ross et al., 2003, p. 209). Continuity refers to person–place relationships that create coherence and continuity in self-identity over time and across situations; distinctiveness involves a sense of personal uniqueness derived from associations with specific qualities and features of the place; self-efficacy refers to feelings of capacity to perform and complete tasks in the place; and self-esteem relates to positive self-evaluation arising from associations with the place.

Changes that interrupt the four identity principles and associated psychological processes are deemed aversive and threatening to the integrity of an identity that is central to individuals. Coping strategies, defined by Breakwell (1986) as encompassing thoughts or actions, may then be motivated to remove or alleviate the impacts of the changes when it is costly and undesirable to modify or abandon the threatened identity. Although IPT focuses on changes that pose threats to a salient identity, it may be expanded to suggest that changes that conform to the identity principles and create desirable states conducive to the maintenance or manifestation of the identity may be welcomed and actively pursued (Twigger-Ross & Uzzell, 1996).

The concept of attachment alludes to the desire to maintain proximity to the object of attachment (Giuliani, 2003; Hidalgo & Hernández, 2001), and empirical research revealed that place attachment frequently elevates commitment to a valued place or engagement in place-protective behaviors (Halpenny, 2010; Walker & Ryan, 2008). An intention to remain close to a valued place or to take action to protect its essential qualities that support a salient identity can be viewed as a social expression of the identity (Breakwell, 1986). For many rural landowners, their property provides a setting where their self-identity is enriched by the development of emotional bonds and meaningful social relations, and where opportunities for self-expression and fulfillment of various physiological and psychological needs are met. Attached landowners may have strong intentions to remain close to their property and be motivated to engage in place-protective behaviors to maintain

their relationship with the property. Such intentions and behaviors may also be influenced by environmental changes in the surrounding area that elevate the difficulty of maintaining and managing a property.

Our study examined landowners' evaluations of the impacts of urbanization-related environmental changes on their property as a moderator, a variable that influences the direction and/or strength of the relation between an independent and a dependent variable (Baron & Kenny, 1986). Specifically, we tested two hypotheses: (1) landowner intention to retain ownership of their property (i.e., place intention) and to engage in behaviors to protect it (i.e., place engagement) are positively predicted by the dimensions of place attachment; and (2) evaluation of environmental change moderated the relationships between the dimensions of place attachment, and place intention and place engagement.

3. Methods

3.1. Study area and data collection

Our study area encompassed three counties west of Austin in the Hill Country, including Hays, Blanco, and Gillespie, which have experienced land subdivision and ownership changes to varying degrees (Fig. 1). Between 1990 and 2000, the population in Hays, Blanco, and Gillespie grew by 48.7%, 41.0%, and 21.0%, respectively, and the number of housing units increased by 41.2%, 28.6%, and 19.8% in each respective county (U.S. Census Bureau, 2006). The three counties are characterized primarily by ranch or farmland. However, between 1997 and 2007 the proportion of such land dropped in Hays (68.8–54.3%) and Gillespie (100.0–96.2%) but increased slightly in Blanco (83.8–86.9%) (USDA, National Agricultural Statistics Service, 2009). Meanwhile, the number of rural properties increased by 39.2%, 43.9%, and 26.7% in Hays, Blanco, and Gillespie, respectively, indicating an increase in land fragmentation and smaller average property sizes in all three

Table 1
Means, factor loadings, and reliability estimates of place attachment items.

Items ^a	Mean (SD)	Factor loading (t-value)
Place functions/features (PF)		
PF1: The natural environment makes the property special	6.67 (0.81)	.58 (–)
PF2: There are places on the property that are special to me (e.g. a spot along a creek/on a hill top, or an old house)	6.39 (1.10)	.62 (10.66)
PF3: The property provides the opportunity to work on the land	6.21 (1.29)	.59 (10.25)
PF4: The property provides a quality living environment	6.49 (1.00)	.75 (11.94)
PF5: The property is a great place to enjoy the outdoors	6.73 (0.61)	.64 (10.80)
Composite reliability		.77
AVE		.41
Place emotion/identity (PE)		
PE1: I feel at home when I'm here	6.58 (0.89)	.79 (–)
PE2: I feel the property has become a part of me	6.39 (1.06)	.90 (21.67)
PE3: I feel spiritually connected to the property	5.92 (1.46)	.75 (17.80)
PE4: The property doesn't mean much to me ^b	6.64 (1.01)	.58 (13.21)
Composite reliability		.85
AVE		.62
Social bonding (SB)		
SB1: I enjoy having people visit me on the property	6.12 (1.33)	.71 (–)
SB2: I enjoy the friendship with neighbors	5.58 (1.49)	.62 (9.20)
Composite reliability		.62
AVE		.62

^a Items measured based on a 7-point scale where 1 represented “strongly disagree,” 4, “neutral,” and 7, “strongly agree.”

^b The item was reverse coded.

counties. The strong demand for rural properties was reflected by the increase in average per acre market value of 46.5% in Hays, 106.9% in Blanco, and 103.8% in Gillespie.

A sampling frame was created by combining property tax records obtained from County Appraisal Offices in the study area. Properties less than 10 acres were excluded because of their limited contribution to ecosystem management at the landscape level. A random sample of 1080 properties was drawn from the sampling frame for a mail survey that was administered over a two month period in 2007 to owners who shared the management responsibility of the selected properties using a slight modification of the multiple-contact procedures presented by Dillman (2000). This included a pre-survey letter, an initial survey questionnaire, a reminder card, a second survey questionnaire and a final reminder card. Local Extension and Natural Resources Conservation Service personnel were informed of the study and a poster aimed at raising landowners' awareness about the study was sent to them prior to commencing the survey to encourage landowner participation. A short version of the survey that comprised the measurement items of place attachment and questions related to socio-demographic information was sent to 150 landowners randomly selected from those who did not respond to the full survey to examine non-response biases.

3.2. Measurements

A major strength of place research is in its incorporation of the contextual elements underlying the psychological and behavioral constructs to be examined. Our study involved scale development processes to integrate the essential elements of the person–place relationship contextualized in the properties of Hill Country landowners and guided by the previously cited dimensional structure of place attachment. Place meaning has been suggested as the essential component that facilitates a contextual understanding of person–place relationships (Relph, 1976; Tuan, 1977). Semi-structured interviews were conducted with a convenience sample of 14 landowners in our study area to gain an understanding of the meanings landowners ascribed to their property. Thematic analysis of the responses revealed three major themes of place meanings: place features and associated functions, emotion and identity, and social bonding. These themes closely corresponded to the three place attachment dimensions reviewed earlier, i.e., place dependence, place identity, and social bonding. Place meanings that

were repeatedly revealed by interviewees or were representative of meanings pertaining to private properties in our study area were selected to establish the scale of place attachment. The initial list of measurement items was reduced following the procedures of scale development (Netemeyer, Bearden, & Sharma, 2003). Only the items retained in the final model testing are reported (Table 1).

The items relating to the *functions and features* of landowners' property were initially organized into two separate dimensions but they were later combined to form the first dimension, place functions/features, due to the lack of discriminant validity. This dimension was measured using 3 items pertaining to the functions and 2 items describing the features that supported these functions. The functional items included the opportunity to work on the land, a quality living environment, and a great place to enjoy the outdoors, while the property features included the natural environment and special places on the property. Meanings pertaining to *emotional expressions and a sense of self* derived from being associated with the property were initially used to form two separate dimensions that were subsequently merged due to the lack of evidence to support discriminant validity. Four items used to measure this dimension included the feeling of being at home, meaningfulness of the property, and the extent to which the property became integrated into respondents' self-identity and enhanced their spiritual connection to it. The third dimension, *social bonding*, was measured using 2 items that described meanings of respondents' property as a social place where people visited and friendships were formed with neighbors. Survey participants were asked to indicate their level of agreement or disagreement with each measurement item.

Additionally, measurement items were developed for respondents' intention to remain close to their property (*place intention*) and behavioral engagement in property management (*place engagement*) (Table 2). Place intention was quantified by asking survey participants to indicate the likelihood that they would keep or sell the property during the next five years. Two elements of place engagement were identified from the pre-survey interviews including practices commonly adopted to maintain important ecosystem features of the property and enhancement of land management capacity. The first element, *land practices*, included 4 items relating to the management of critical ecosystem features, including water, native and invasive plants, and wildlife. The second element, *management capacity*, was quantified using 2 questions about the effort invested in attending public hearings

Table 2
Means, factor loadings, and reliability estimates of place intention and place engagement items.

Items	Mean (SD)	Factor loading (t-value)
Place intention (PI)^a		
INT1: Keeping the property in family	6.08 (1.68)	.80 (-)
INT2: Selling the property	2.07 (1.83)	.80 (10.83)
Composite reliability		.78
AVE		.64
Place engagement 1-land practices (LP)^b		
LP1: Maintaining water quality	5.33 (1.86)	.68 (-)
LP2: Controlling invasive plants (including noxious weeds and brush)	5.48 (1.72)	.65 (12.26)
LP3: Enhancing native plant communities	4.40 (1.92)	.76 (13.78)
LP4: Maintaining native wildlife populations	5.47 (1.81)	.71 (13.17)
Composite reliability		.79
AVE		.49
Place engagement 2-management capacity (MC)^b		
MC1: Attending public hearings regarding new development in the area to have my voice heard	3.06 (2.06)	.81 (-)
MC2: Attending workshops or seminars to enhance my land management ability	3.34 (2.12)	.80 (11.89)
Composite reliability		.79
AVE		.65

^a Items measured based on a 7-point scale where 1 represented "strongly unlikely," 4, "neutral," and 7, "strongly likely."

^b Items measured based on a 7-point scale where 1 represented "no effort," 4, "some effort," and 7, "a lot of effort."

and landowner workshops/seminars to improve land management ability and exercise some control over regional development. Respondents were asked to indicate the amount of effort that was invested in these two elements of place engagement activities during the past 5 years.

The scale measuring respondents' *evaluation of environmental change* was comprised of 6 items (Table 3). Respondents were asked the extent to which the development in the surrounding area during the past 5 years changed the features on their property, including wildlife, plants, water, soil, air, and scenic quality.

3.3. Testing for moderation

The effect of a moderator (MO) on the relation between an independent variable (IV) and a dependent variable (DV) can be illustrated using the following equation (Jöreskog, 2000):

$$DV = a + \gamma_1 IV + \gamma_2 MO + \gamma_3 (IV \times MO) + e$$

where $IV \times MO$ represents the interaction or indirect effect and e is the error term. Three models were formed to test the hypotheses that examined the direct and indirect effects of place attachment and evaluation of change on place intention and place engagement. In Model 1, three dimensions of place attachment as independent latent variables and evaluation of change as a latent moderator directly influenced the dependent latent variable (i.e., *place intention*). Moreover, evaluation of change interacted with the dimensions of place attachment to influence place intention. In the other two models, a latent dependent variable (i.e., *land practices* in Model 2 and *management capacity* in Model 3) was predicted by the three dimensions of place attachment, evaluation of change,

Table 3
Means, factor loadings, and reliability estimates of evaluation of environmental change items.

Items ^a	Mean (SD)	Factor loading (t-value)
EC1: Native wildlife	3.88 (1.53)	.82 (-)
EC2: Native plants	4.10 (1.22)	.86 (22.92)
EC3: Water quality	3.78 (1.30)	.81 (20.90)
EC4: Soil stability	4.10 (1.10)	.79 (20.31)
EC5: Air quality	3.80 (1.15)	.77 (19.62)
EC6: Scenic quality	3.52 (1.54)	.77 (19.51)
Composite reliability		.92
AVE		.65

^a Items measured based on a 7-point scale where 1 represented "much worse," 4, "no change," and 7, "much better."

and the interactions between them. LISREL Version 8.80 was used for model testing based on the latent variable score approach. This approach is recommended for its strength in avoiding errors that can easily result from the complicated procedures required by other approaches (Jöreskog, 2000; Schumacker & Lomax, 2004).

4. Results

4.1. Sample profile

No significant difference was found between respondents ($N=504$, 47% of survey participants) and non-respondents ($N=32$, 6% of non-respondents) of the full questionnaire with respect to socio-demographic backgrounds and responses to the place-attachment questions. Overall, respondents were primarily male (70.8%) and averaged 61.5 years ($SD=11.4$) of age. Most of them were highly educated (more than 80% with at least some college education) and relatively wealthy (53.3% with annual household income equal to or more than \$80,000). On average, they owned 218.2 acres ($SD=340.4$) of land and had the property in family for 41.2 years ($SD=40.5$). A significant portion of respondents (27.8%) acquired their property during the past 10 years. Moreover, more than half of respondents (55.5%) used the property as their primary residence and had lived there for 19.0 years ($SD=18.0$). Less than half of them (44.7%) depended on their property as a source of income to varying degrees.

4.2. Place attachment

On average, respondents assigned a high level of importance to all of the items measuring the three dimensions of place attachment. The level of attachment ranged from 6.21 (PF3) to 6.73 (PF5) for place functions/features, 5.92 (PA3) to 6.64 (PA4) for place emotion/identity, and 5.58 (SB2) to 6.12 (SB1) for social bonding (Table 1). Confirmatory factor analysis (CFA) was applied to examine the factorial structure of place attachment. The factorial structure of a tested construct is considered to obtain a reasonable fit when the root mean square error of approximation ($RMSEA \leq .08$ (Byrne & Stewart, 2006), the comparative fit index ($CFI \geq .95$, and the standardized root mean square residual ($SRMR \leq .08$ (Hu & Bentler, 1999). The results of CFA supported the three-dimensional structure of place attachment ($\chi^2 = 149.38$, $df=41$, $RMSEA = .073$, $CFI = .95$, $SRMR = .042$). Moreover, all items significantly loaded on their intended factor ($t \geq 1.96$). Internal consistency was measured by composite reliability and average

variance extracted estimate (AVE). Composite reliability is similar to the coefficient alpha and a value of no less than .60 is deemed to be acceptable (Bagozzi & Yi, 1988). AVE estimates the amount of variance explained by the items of a scale in relation to measurement error and a value close to .50 (>.45) is considered to be reasonable for a newly developed scale (Netemeyer et al., 2003). All three place-attachment dimensions (*place functions/features*, *place emotion/identity*, and *social bonding*) fell within the acceptable range of the two reliability measures except for place functions/features (AVE = .41).

4.3. Place intention and place engagement

Table 2 shows the means, reliability estimates, and factor loadings of place intention and two place engagement latent variables. In general, respondents expressed a strong intention to keep their property in their family (INT1 = 6.08) and low intention to sell the property in the near future (INT2 = 2.07). Both items significantly loaded on *place intention* and estimates of reliability suggested adequate internal consistency.

With regard to *place engagement* in *land practices* respondents invested at least some effort (i.e., value >4) in maintaining water quality (LP1 = 5.33), controlling invasive plants (LP2 = 5.48), enhancing native plants (LP3 = 4.40), and maintaining native wildlife populations (LP4 = 5.47) on their property. By contrast, less effort (i.e., value <4) was devoted to activities aiming at building *land management capacity*, including attending public hearings (MC1 = 3.06) and landowner workshops or seminars (MC1 = 3.34). Reliability estimates of both place engagement scales were reasonable and all the items loaded significantly on their intended factor.

4.4. Evaluation of change

On average, respondents perceived scenic quality (EC6 = 3.52) to be the most degraded feature impacted by changes in the surrounding area followed by water quality (EC3 = 3.78), air quality (EC5 = 3.80), and native wildlife (EC1 = 3.88) (Table 3), while changes to native plants (EC2 = 4.10) and soil stability (EC4 = 4.10) were perceived to be minimal. Good internal reliability and factor loadings were obtained for this latent variable.

4.5. Model testing

Before the hypothesized models were tested, the combined measurement portion of each model was tested to further confirm the relationship of the measurement items to their respective latent variables (Netemeyer et al., 2003). Goodness of fit indices revealed that the measurement portions of Models 1–3 fit the data well (Table 4).

Table 5 shows the non-standardized regression coefficients of the significant paths entered in the final model testing. The effects of place attachment and evaluation of change on place intention were examined in Model 1. *Place emotion/identity* ($B = .96, p < .001$) as the only place-attachment dimension and *evaluation of change*

Table 5 Regression coefficients for each of the hypothesized models^a.

	B (S.E.)	R ²
Model 1		
<i>Direct effect</i>		
Place emotion/identity → place intention	.96 (.07)***	Place intention: 29.7%
Evaluation of change → place intention	.15 (.04)***	
<i>Interaction effect</i>		
Place emotion/identity × evaluation of change → place intention	-.27 (.07)***	
Model 2		
<i>Direct effect</i>		
Place functions/features → land practices	1.01 (.14)***	Land practices: 29.4%
Social bonding → land practices	.19 (.07)**	
Evaluation of change → land practices	.17 (.04)***	
Model 3		
<i>Direct effect</i>		
Social bonding → management capacity	.38 (.09)***	Management capacity: 12.5%
Place emotion/identity → management capacity	.37 (.12)**	
Evaluation of change → management capacity	.12 (.06)*	

^a Only significant regression paths were included in the final model testing (Schumacker & Lomax, 2004).

* $p < .05$.
 ** $p < .01$.
 *** $p < .001$.

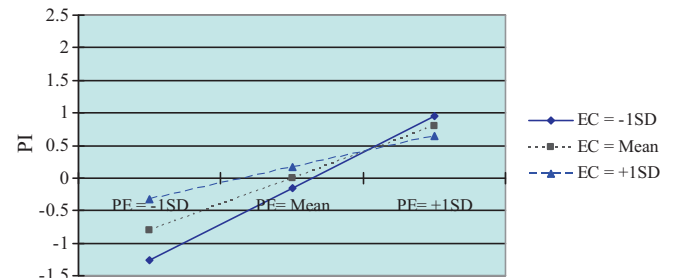


Fig. 2. Plot of the indirect effect of place emotion/identity (PE) and evaluation of change (EC) on place intention (PI).

($B = .15, p < .001$) significantly contributed to respondents' intention to retain their property. Moreover, these two latent variables interacted with each other to influence *place intention* ($B = -.27, p < .001$). The indirect effect was plotted to provide more insight into the nature of the interaction. As shown in Fig. 2, regardless of how changes were evaluated, place emotion/identity always had a positive effect on place intention. However, the magnitude of the effect was contingent on how changes were evaluated. Specifically, those who reported a level of place emotion/identity one standard

Table 4 Fit indices for each of the three measurement models.

	df	χ^2	RMSEA (90% CI)	CFI	SRMR
Model 1 (Scales included in testing: Place attachment, evaluation of change, place intention)	142	268.32	.042 (.034–.050)	.98	.034
Model 2 (Scales included in testing: Place attachment, evaluation of change, land practices)	179	355.02	.044 (.038–.051)	.98	.036
Model 3 (Scales included in testing: Place attachment, evaluation of change, management capacity)	142	280.13	.045 (.037–.052)	.98	.036

deviation lower than the average ($PE = -1$ SD) and also evaluated changes in their property to be negative ($EC = -1$ SD) had weaker intention to retain their land than those who evaluated changes to be at the average level ($EC = \text{Mean}$) or positive ($EC = +1$ SD). By contrast, respondents who ascribed a higher value to place emotional/identity ($PE = +1$ SD) but evaluated environmental changes to be negative ($EC = -1$ SD) reported stronger intention to retain their land than those who either perceived average ($EC = \text{Mean}$) or positive ($EC = +1$ SD) changes. Overall, place emotion/identity, evaluation of change, and their interaction term accounted for 29.7% of the variance in place intention.

For Model 2, in which the effects of place attachment, *evaluation of change*, and their interactions on land practices were tested, two dimensions of *place attachment* and *evaluation of change* directly contributed to *land practices*. A higher level of importance ascribed to place functions/features ($B = 1.01, p < .001$) and social bonding ($B = .19, p = .003$) led to a higher level of effort invested in land practices to maintain water, plants, and wildlife on respondents' property. Moreover, positive evaluations of change to respondents' property were likely to lead to more effort invested in land practices than when changes were evaluated to be negative ($B = 0.17, p < .001$). No interaction between place attachment and evaluation of change was identified. Place functions/features, social bonding, and evaluation of change together accounted for 29.4% of the variance in land practices.

The second place engagement variable, *management capacity*, was directly predicted by two place attachment dimensions, including *social bonding* ($B = .38, p < .001$) and *place emotion/identity* ($B = .37, p = .003$), as well as *evaluation of change* ($B = .12, p = .028$) (Model 3). None of the interaction terms generated a significant effect on management capacity. Overall, 12.5% of the variance in this place engagement variable was explained by Model 3.

5. Discussion

Urbanization has increasingly encroached upon many rural landscapes encouraging many landowners to subdivide and sell part or all of their rural property. In turn, this has led to land use and land cover changes, and adverse impacts on important ecosystem functions supported by these landscapes. However, minimal research has been conducted to understand how, in the face of such changes, landowners' attachment to their rural property may motivate them to retain ownership of their property, and invest in activities that sustain important ecosystem features and enhance their land management capacity. In our study we tested two hypotheses to address this research gap using a sample of rural landowners in three counties in the Texas Hill Country.

Past research suggested that meanings or sentiment ascribed to a place is cultivated through direct and/or indirect interactions with the place over a period of time (Hay, 1998). The long history of family association and personal interaction with the property of our respondents might have contributed to the high level of importance they ascribed to the three dimensions of place attachment (i.e., place functions/features, place emotion/identity, and social bonding). Urbanization in the area could impact their place attachment and, in turn, drive their intention and behavior in relation to it. Drawing upon Breakwell's Identity Process Theory (IPT), three models were tested to examine the direct and indirect effects of place attachment and evaluation of change on intention to sell/retain the property, and behavioral engagement in land management practices and building of management capacity. In the following the effects of place attachment on place intention and place engagement are first discussed followed by the effects of evaluation of change.

Analyses of the models revealed that the three place attachment dimensions influenced place intention and place engagement in different ways. Consistent with the argument that the emotional bond to a place manifests itself in the desire to stay close to the place (Giuliani, 2003; Hidalgo & Hernández, 2001), place emotion/identity was found to be the only place-attachment dimension to significantly contribute to place intention (Model 1). Respondents' desire to retain ownership of their property was strengthened when they had developed an emotional bond and identity tied to the property that continually supported and enriched this aspect of their place attachment. These findings corroborated other research in the context of rural private properties (Grubbström, 2011; Liffmann, Huntsinger, & Forero, 2000).

The testing of Model 2 revealed that respondents' engagement in land practices was positively predicted by two place attachment dimensions, including place functions/features and social bonding. By engaging in actions to reduce invasive plants, and to enhance native plants, wildlife populations, and water quality, the respondents' properties became more resilient to changes that could adversely impact its natural environment and special places. In addition, such activities functioned to support the opportunity to work, a quality living environment, enjoyment of the outdoors, and interactions with family members, friends, and neighbors. The positive effects of landscape features, place dependence, and social bonding on conservation or land protective behaviors have previously also been documented (Kyle, Theodori, Absher, & Jun, 2010; Lokocz, Ryan, & Sadler, 2011; Walker & Ryan, 2008).

Enhancing management capacity by expressing concerns about development and attending landowner workshops/seminars represents another way for landowners to cope with changes. Model 3 showed that respondents were more likely to engage in related behaviors when they placed a high value on place emotion/identity and social bonding. Different from land management practices, enhancing management capacity required respondents to devote extra effort in addition to routine land practices to maintain property features and functions. Respondents' commitment to preserving their emotional tie, maintaining/expressing their identity, and continuing their social connection supported by their property was identified as a driving force of this engagement. Moreover, the social relations bounded by their property might have encouraged this form of place engagement as it frequently required interactions and collaboration with other landowners in the area.

The role of evaluation of change was revealed in its direct effects on place intention (Model 1), land practices (Model 2), and management capacity (Model 3), and indirect effect on place intention (Model 1). From the perspective of Breakwell's IPT, positive changes in our study area might have created an environment compatible with the four identity principles and conducive to the maintenance and manifestation of the part of respondents' self-identity and emotions embedded in their property. In turn, positive changes could reinforce respondents' intention to keep the property, and to engage in supportive land management practices and capacity building. Meanwhile, environmental changes that were viewed negatively could adversely impact property features and functions that support the coherence and distinctiveness principles of respondents' place emotion/identity. Moreover, negative changes could hinder their ability to carry out everyday responsibilities (e.g., maintain natural resource quality, practice economic subsistence activities, and fulfill the role of a farmer/rancher or land steward) and, therefore, to derive positive self-evaluation from effectively fulfilling such responsibilities. As revealed in the findings, when place emotion/identity was low, negative evaluations of change seemed to further discourage respondents' intention to retain the property. However, for many of our respondents whose place emotion/identity was high, negative changes strengthened their resolve to retain property ownership. As expressed by a

landowner interviewed prior to the survey, urbanization made him “*more committed to protecting the natural value on this property.*”

Two possible factors might explain why evaluation of change only interacted with place emotion/identity to influence place intention. First, the three distinct and yet interrelated dimensions of place attachment possibly possess different tolerance thresholds to changes. On average, environmental changes in our study area were evaluated to be mild. Therefore, it is possible that only a small amount of change is needed to disrupt the part of self-identity captured in place emotion/identity and, in turn, to affect intention to resist or accommodate changes. A higher level of change might be needed for place functions/features and social bonding to significantly affect the intention to retain the property possibly because respondents could relatively easily cope with unwanted changes that impacted these two place attachment dimensions. For example, they could engage in different activities that still satisfied their need for working on the land and enjoying the outdoors on their property. For some landowners social bonding could be maintained by forming new relations with newcomers while for others this dimension could become less significant to their place attachment as nearby properties continued to be subdivided and/or sold and social relations became difficult to maintain. A second possible explanation is that changes might impact primarily place emotion/identity rather than place functions/features and social bonding. Although place functions/features and social bonding are regarded as sources of identity, they may serve as predictors of self-identity rather than an integral part of self-identity. This is in part supported by research showing that place dependence predicts place identity (e.g., Halpenny, 2010).

Several implications emerge from the findings of our study. First, changes induced by urbanization are gradual and may not be easily perceived in the early stages until they reach a threshold level. As reported earlier, although a significant portion of our study area has experienced substantial environmental and socio-economic changes, respondents' evaluation of change was close to neutral. Whether subjective evaluations of change corresponded to the actual changes and whether there were perceptual differences between landowners who differed in their historical associations with their properties and the area (e.g., long-term landowners vs. newcomers) remain to be determined. However, if subjective evaluations by a particular group of landowner did not reflect the impacts of actual changes, then mechanisms targeting this landowner group may be designed to raise their awareness about the potential impacts of actual changes driven by urbanization on their property and their attachment to it. Furthermore, such mechanisms could target landowners located in areas that are in the early stages of urbanization or that may be affected by urbanization in the near future.

In addition, educational or other landowner programs aimed at enhancing rural land management should explicitly address landowners' need to remain attached to their land and their community. For example, the promotion of landowner involvement in ecosystem management should emphasize the benefits of applying appropriate management practices to help sustain the property features and functions (place functions/features), and opportunities for social interactions (social bonding) that have been part of their lifestyle for a long time. An example of such a program is the Edwards Plateau Prescribed Burning Association (EPPBA), which was established to promote collective management actions by neighboring landowners to support or enhance ecosystem functions in the Texas Hill country (Kreuter, Woodard, Taylor, & Teague, 2008; Taylor, 2005). Without sufficient effort invested in these land practices, the ecosystem features/functions used to support agricultural and recreational activities are likely to be adversely impacted, which can lead to accelerated land sales and the demise of the social network that landowners value.

While attached landowners are more likely to be committed to their property when faced with negative changes, they are also likely to experience some degree of psychological distress due to these changes. As one of our informants put it: “*it [attachment to his family land] is not necessarily always such a good thing. Sometimes when it becomes necessary or unavoidable, when a family loses a place like this, it can be devastating. It could truly destabilize the whole family just as much as a major death in a family.*” Without sufficient knowledge, environmental skills, and other support, the psychological consequences of negative changes on attached landowners can be substantial. In Texas, various technical support programs (e.g., Master Naturalist), and workshops/seminars that cover relevant topics (e.g., wildlife habitat management and restoration, prescribed burning, water conservation, and ecology), and natural resource management consultation services are available to improve rural land management. In addition, landowners can apply for federal or state funds through various cost-sharing programs to help offset the expense of applying certain land improvement practices (e.g., Kreuter, Tays, & Conner, 2004; Kreuter et al., 2005). These resources provide opportunities for landowners to enhance their environmental skills by better understanding their property, learning various land management and conservation options, and developing the competence to choose and to implement the options that best suit their unique aspirations and objectives.

Additionally, landowners' ability to respond to undesirable changes can be fortified by participating in events (e.g., public hearings) to express their concerns about potential threats that new development can impose on their property and the surrounding area. Our findings suggest that the promotion of landowner participation in these activities will need to make explicit the benefits from such activities to sustain their place emotion/identity and social bonding in the face of change. At the same time, in their responses to open-ended questions, some of our survey respondents expressed their opinion that newly immigrated landowners were the primary cause of the deteriorating environmental quality in the region. Improving interactions and forging collaboration between this group of landowners and newcomers is, therefore, imperative to keep social bonding remained as a driver for property protection. Landowner associations, such as the previously mentioned EPPBA, have a critical role to play in this regard.

Some limitations of our study and future research directions are highlighted. Our place-attachment scale was developed to reflect the contextual elements of this psychological entity tied to landowners' interactions with their Hill Country properties. However, this approach has compromised the internal consistency of place functions/features revealed in its AVE estimate. The insufficient reliability of this dimension may have resulted from a lack of unequivocal interpretation of the measurement items especially between old-timers and newcomers who might vary significantly with regard to the meanings they ascribed to their property. Second, landowners' decisions about property ownership and management actions may also be influenced by their attachment to the community or region in which their property is located. Urbanization impacts the environment at a larger spatial scale than individual landowner properties. How attachment to a place at a spatial scale beyond one's property affects related decisions presents a direction for future research. In addition, although IPT was employed as the theoretical guidance for explaining the effects of evaluation of change, how environmental changes influenced the operations of identify principles was not directly tested. Future research may need to incorporate the impacts of change on identity principles to provide a more direct explanation for the relationship between change and the impacted place attachment. Finally, landowner attachment to their property is dynamic. When the amount of change reaches a threshold beyond which it becomes

too onerous to maintain a property and a strong attachment to the property becomes a burden, any effort to promote sound ecosystem management to landowners is less likely to gain an effective outcome. Longitudinal research designs will help provide a better understanding of the dynamics of environmental changes and place attachment.

References

- Antrop, M. (2000). Changing patterns in the urbanized countryside of Western Europe. *Landscape Ecology*, 15(3), 257–270.
- Bagozzi, R., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science*, 16(1), 74–94.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173–1182.
- Bohnet, I. C., & Pert, P. L. (2010). Patterns, drivers and impacts of urban growth: A study from Cairns, Queensland, Australia from 1952 to 2031. *Landscape and Urban Planning*, 97(4), 239–248.
- Bonaiuto, M., Carrus, G., Martorella, H., & Bonnes, M. (2002). Local identity processes and environmental attitudes in land use changes: The case of natural protected areas. *Journal of Economic Psychology*, 23(5), 631–653.
- Breakwell, G. M. (1986). *Coping with threatened identity*. London: Methuen.
- Brown, B. B., & Perkins, D. D. (1992). Disruptions in place attachment. In I. Altman, & S. M. Low (Eds.), *Place attachment* (pp. 279–304). New York, NY: Plenum Press.
- Brown, D. G., Johnson, K. M., Loveland, T. R., & Theobald, D. M. (2005). Rural land-use trends in the conterminous United States, 1950–2000. *Ecological Applications*, 15(6), 1851–1863.
- Byrne, B. M., & Stewart, S. M. (2006). Teacher's corner: The MACS approach to testing for multigroup invariance of a second-order structure: A walk through the process. *Structural Equation Modeling*, 13(2), 287–321.
- Cross, J. E., Keske, C. M., Lacy, M. G., Hoag, D. L. K., & Bastian, C. T. (2011). Adoption of conservation easements among agricultural landowners in Colorado and Wyoming: The role of economic dependence and sense of place. *Landscape and Urban Planning*, 101(1), 75–83.
- Dale, V., Archer, S., Chang, M., & Ojima, D. (2005). Ecological impacts and mitigation strategies for rural land management. *Ecological Applications*, 15(6), 1879–1892.
- Devine-Wright, P. (2009). Rethinking NIMBYism: The role of place attachment and place identity in explaining place-protective action. *Journal of Community & Applied Social Psychology*, 19(6), 426–441.
- Devine-Wright, P., & Howes, Y. (2010). Disruption to place attachment and the protection of restorative environments: A wind energy case study. *Journal of Environmental Psychology*, 30(3), 271–280.
- Dillman, D. (2000). *Mail and Internet surveys: The total design method*. New York, NY: Wiley.
- Edwards Aquifer Authority (EAA). (2010). *Discover the Edwards aquifer: An explorer's guide*. San Antonio, TX: Edwards Aquifer Authority.
- Fried, M. (2000). Continuities and discontinuities of place. *Journal of Environmental Psychology*, 20(3), 193–205.
- Giuliani, M. V. (2003). Theory of attachment and place attachment. In M. Bonnes, T. Lee, & M. Bonaiuto (Eds.), *Psychological theories for environmental issues* (pp. 137–179). Burlington, VT: Ashgate.
- Gobster, P. H., Stewart, S. I., & Bengston, D. N. (2004). The social aspects of landscape change: Protecting open space under the pressure of development. *Landscape and Urban Planning*, 69(2–3), 149–151.
- Greider, T., & Garkovich, L. (1994). Landscapes: The social construction of nature and the environment. *Rural Sociology*, 59(1), 1–24.
- Griffith, G. E., Bryce, S. A., Omernik, J. M., Comstock, J. A., Rogers, A. C., Harrison, B., et al., (2004). *Ecoregions of Texas (map scale 1:2,500,000)*. Retrieved from http://www.epa.gov/wed/pages/ecoregions/tx_eco.htm.
- Grubbström, A. (2011). Emotional bonds as obstacles to land sale: Attitudes to land among local and absentee landowners in Northwest Estonia. *Landscape and Urban Planning*, 99(1), 31–39.
- Halpenny, E. A. (2010). Pro-environmental behaviours and park visitors: The effect of place attachment. *Journal of Environmental Psychology*, 30(4), 409–421.
- Hammit, W. E., Backlund, E. A., & Bixler, R. D. (2006). Place bonding for recreation places: Conceptual and empirical development. *Leisure Studies*, 25(1), 17–41.
- Hay, R. (1998). Sense of place in development context. *Journal of Environmental Psychology*, 18(1), 5–29.
- Hidalgo, M. C., & Hernández, B. (2001). Place attachment: Conceptual and empirical questions. *Journal of Environmental Psychology*, 21(3), 273–281.
- Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6(1), 1–55.
- Jöreskog, K. G., (2000). *Latent variable scores and their uses*. Retrieved from <http://www.ssicentral.com/lisrel/techdocs/lvscores.pdf>.
- Kaltenborn, B. P., & Williams, D. R. (2002). The meaning of place: Attachments to Femundsmarka National Park. *Norwegian Journal of Geography*, 56, 189–198.
- Kreuter, U. P., Tays, M. R., & Conner, J. R. (2004). Landowner willingness to participate in a Texas brush reduction program. *Rangeland Ecology & Management*, 57(3), 230–237.
- Kreuter, U. P., Amestoy, H. E., Kothmann, M. M., Ueckert, D. N., McGinty, W. A., & Cummings, S. R. (2005). The use of brush management methods: A Texas landowner survey. *Rangeland Ecology & Management*, 58(3), 284–291.
- Kreuter, U. P., Woodard, J. B., Taylor, C. A., Jr., & Teague, W. R. (2008). Perceptions of Texas landowners regarding fire and its use. *Rangeland Ecology & Management*, 61(4), 456–464.
- Kyle, G. T., Theodor, G. L., Absher, J. D., & Jun, J. (2010). The influence of home and community attachment on firewise behavior. *Society & Natural Resources*, 23(11), 1075–1092.
- Kyle, G., Graefe, A., & Manning, R. (2005). Testing the dimensionality of place attachment in recreational settings. *Environment and Behavior*, 37(2), 153–177.
- Liffmann, R. H., Huntsinger, L., & Forero, L. C. (2000). To ranch or not to ranch: Home on the urban range? *Journal of Range Management*, 53(4), 362–370.
- Lokocz, E., Ryan, R. L., & Sadler, A. J. (2011). Motivations for land protection and stewardship: Exploring place attachment and rural landscape character in Massachusetts. *Landscape and Urban Planning*, 99(2), 65–76.
- Low, S. M., & Altman, I. (1992). Place attachment: A conceptual inquiry. In I. Altman, & S. M. Low (Eds.), *Place attachment* (pp. 1–12). New York, NY: Plenum Press.
- Manzo, L. C. (2003). Beyond house and haven: toward a revisioning of emotional relationships with places. *Journal of Environmental Psychology*, 23(1), 47–61.
- Manzo, L. C., & Perkins, D. D. (2006). Finding common ground: The importance of place attachment to community participation and planning. *Journal of Planning Literature*, 20(4), 335–350.
- Milligan, M. J. (2003). Displacement and identity discontinuity: The role of nostalgia in establishing new identity categories. *Symbolic Interaction*, 26(3), 381–403.
- Netemeyer, R. G., Bearden, W. O., & Sharma, S. (2003). *Scaling procedures: Issues and applications*. Thousand Oaks, CA: Sage.
- Proshansky, H. M., Fabian, A. K., & Kaminoff, R. (1983). Place-identity: Physical world socialization of the self. *Journal of Environmental Psychology*, 3(1), 57–83.
- Relph, E. (1976). *Place and placeless*. London: Pion.
- Scannell, L., & Gifford, R. (2010). Defining place attachment: A tripartite organizing framework. *Journal of Environmental Psychology*, 30(1), 1–10.
- Schumacker, R. E., & Lomax, R. G. (2004). *A beginner's guide to structural equation modeling*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Stokols, D., & Shumaker, S. A. (1981). People and places: A transactional view of settings. In J. Harvey (Ed.), *Cognition, social behavior, and the environment* (pp. 441–488). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Taylor, C. A., Jr. (2005). Prescribed burning cooperatives: Empowering and equipping ranchers to manage rangelands. *Rangelands*, 27, 18–23.
- Texas Parks and Wildlife Department (TPWD). (2005). *2005 Land and water resources conservation and recreation plan*. Austin, TX: Texas Parks and Wildlife Department.
- Tuan, Y. (1977). *Space and place: The perspective of experience*. Minneapolis, MN: University of Minnesota Press.
- Twigger-Ross, C. L., & Uzzell, D. L. (1996). Place and identity processes. *Journal of Environmental Psychology*, 16(3), 205–220.
- Twigger-Ross, C. L., Bonaiuto, M., & Breakwell, G. (2003). Identity theories and environmental psychology. In M. Bonnes, T. Lee, & T. Bonaiuto M (Eds.), *Psychological theories for environmental issues* (pp. 203–234). Burlington, VT: Ashgate.
- U.S. Census Bureau. (2006). *Population in metropolitan and micropolitan statistical areas in alphabetical order and numerical and percent change for the United States and Puerto Rico: 1990 and 2000*. Retrieved from <http://www.census.gov/population/cen2000/phc-t29/tab01a.xls>.
- USDA, National Agricultural Statistics Service. 2009. *2007 Census of agriculture*. Retrieved from http://www.agcensus.usda.gov/Publications/2007/Full-Report/Volume_1_Chapter_2_County_Level/Texas/st48_2_008_008.pdf.
- Walker, A. J., & Ryan, R. L. (2008). Place attachment and landscape preservation in rural New England: A Maine case study. *Landscape and Urban Planning*, 86(2), 141–152.
- Wilkins, N., Brown, R. D., Conner, R. J., Engle, J., Gilliland, C., Hays, A., et al. (2003). *Fragmenting lands: Changing land ownership in Texas*. College Station, TX: Agricultural Communications, The Texas A&M University System.
- Williams, D. R., & Vaske, J. J. (2003). The measurement of place attachment: Validity and generalizability of a psychometric approach. *Forest Science*, 49(6), 830–840.
- Yu, X. J., & Ng, C. N. (2007). Spatial and temporal dynamics of urban sprawl along two urban-rural transects: A case study of Guangzhou, China. *Landscape and Urban Planning*, 79(1), 96–109.