CONSERVING THE RURAL LANDSCAPE OF THE TEXAS HILL COUNTRY:

A PLACE IDENTITY-BASED APPROACH

A Dissertation

by

PO-HSIN LAI

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

December 2007

Major Subject: Recreation, Park & Tourism Sciences

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Approved by:

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ABSTRACT

Conserving the Rural Landscape of the Texas Hill Country: A Place Identity-Based Approach. (December, 2007)

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Landscape change induced by population growth and urban development is impacting the ecosystem goods and services provided by open space, which is essential to supporting many urban and rural populations. Conserving open space cannot be attained without obtaining public support especially in a state like Texas where most open space is privately owned. This dissertation was aimed at exploring the role of place identity as an intrinsic incentive for landowner involvement in conserving open space threatened by landscape change. Four objectives addressed in this research include: 1) defining place identity and identifying its underlying dimensions; 2) developing and refining a place-identity scale; 3) developing and testing a conceptual framework to explain the relationships among commitment, place identity, behavior/behavioral intention to manifest place identity, and perception of landscape change; and 4) drawing implications for open space conservation. Identity theory and identity control theory were applied to conceptualize place identity and develope structural models for hypothesis testing. Place identity was defined as comprising meanings that individuals ascribe to a place through their interaction with that place and become defining elements of their self-identity. Both qualitative and quantitative methods were used in this research. Results from semi-structured interviews with a convenience sample of landowners in the Texas Hill Country were used to develop the place-identity scale. Survey data from randomly selected Hill Country landowners were used in confirmatory factor analysis, mean and covariance structure analysis, and invariance testing based on

the covariance structure to test and refine measures, to compare differences between landowner groups, and to test hypotheses. Findings suggested that identity theory and identity control theory provided valuable insight to place identity in the face of change. Results also supported a model of place identity comprised of cognitive and affective dimensions, and identified variations among individuals in their affective place-identity. Moreover, findings indicated that both dimensions exhibited different effects on identity-related behavior/behavioral intention under the influence of landscape change. Implications were provided for engaging landowners in open space conservation. This dissertation addresses several research gaps, and also raises questions important in understanding and applying place identity to promoting conservation.

DEDICATION

To my parents, Bin Lai & Shu-Chu Wu,
for their indulgence of my willfulness

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Five and half years have been a long time for me. I would have never imagined that I could stay in one place for such a long time without losing focus on this research. I have discovered and developed a personality and passion for research during these years. I would never have become who I am without the support and encouragement from many faculty members and friends. I have become a more independent researcher under the guidance of my advisor, Dr. Shafer. I am greatly thankful for his patience and support. I am also indebted to my committee members, Drs. Gerard Kyle, Sanjay K. Nepal, Jane Sell, and Urs Kreuter, for their valuable and insightful feedback on my dissertation. My gratitude goes especially to Dr. Urs Kreuter for his assisting me in locating funding for my research and Dr. Joseph O'Leary for his support to relieving my pressing need for funding to commence this project before the agency grant was approved.

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I would also like to thank the Texas Parks and Wildlife Department and the Hill Country Conservancy for their funding support for this research, and the landowners and many others who have helped and inspired me to complete this dissertation.

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CHAPTER I
INTRODUCTION

1.1. LAND FRAGMENTATION IN THE TEXAS HILL COUNTRY

Open space when broadly defined may include natural, agricultural, cultural, and recreational landscapes[1] in both urban and rural areas (Erickson, 2006; Gobster, Stewart, & Bengston, 2004; Hollis & Fulton, 2002). Continuous open space plays a critical role in providing ecosystem services (e.g., wildlife habitat, natural amenities, flood control, water and soil conservation, and recreation opportunities) and sustaining agriculture-based economics. However, the amount and quality of open space is declining in many parts of the United States (Alig, Kline, & Lichtenstein, 2004; Dwyer & Childs, 2004). The growing demands for amenities, better living quality and community services, less expensive land, and other benefits provided by rural landscapes have led to the conversion of much open space for development (Geoghegan, 2002; Shumway & Otterstrom, 2001). With the increasing demand for rural land and associated increase in rural land prices, landowners have a growing incentive to sell part or all of their land for development instead of retaining it for the provision of ecosystem services and agricultural production (Bastian et al., 2002; Hellerstein et al., 2002). A consequence of this process is that privately owned open space is being subdivided and thereby becoming fragmented.

Fragmentation is a spatial process of land transformation defined as "the breaking up of a habitat or land type into smaller parcels… similar to the dictionary sense of breaking an object into pieces" (Forman, 1995, p. 408). Functionally, fragmentation "spatially segments those entities that belong together in order to function optimally" (Carsjens & van Lier, 2002, p. 79). Urban development and expansion has become a major agent of human-induced changes that fragment the rural landscape and

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This dissertation follows the style of the *Journal of Environmental Psychology*.

[1] Landscape is defined as "a mosaic where the mix of local ecosystems or land uses is repeated in similar form over a kilometers-wide area… Within a landscape several attributes tend to be similar and repeated across the whole area, including geologic land forms, soil types, vegetation types, local faunas, natural disturbance regimes, land uses, and human aggregation patterns" (Forman, 1995, p. 13).

intervene with the optimal functioning of private open space that supports a variety of ecosystem goods and services (Czech, Krausman, & Devers, 2000; Ewing et al., 2005; Hellerstein et al., 2002; Miller & Hobbs, 2002). Fragmentation of private agricultural lands as a form of open space may lead to the area of continuous land becoming too small to be economically viable for agricultural practices (Wilkins et al., 2003a). At the same time, habitat for wildlife (Collinge, 1996; Ewing et al., 2005), and environmental conditions of wetlands and watersheds on agricultural lands, and agriculture/nature-based recreation opportunities (American Farmland Trust, 2006; Wagner & Kreuter, 2004) are also likely to be adversely impacted. Moreover, the expansion of the urban population into the rural landscape is likely to increase conflicts between farmers/ranchers and non-farmers/non-ranchers, property taxes of rural land, and air pollution that damages crops (Heffernan & Elder, 1987; Liffmann, Huntsinger, & Forero, 2000; Lisansky & Clark, 1987; Lockeretz, 1987).

Texas as the 2nd largest state in the U.S. is facing the problem of fragmentation due to the declining agricultural economy and the growing demand for rural amenities (Wilkins et al., 2003a). Between 1997 and 2002, approximately 4.1 million acres of farms and ranches were converted to non-agricultural land uses in the state (NRCS, 2006). Land fragmentation due to population growth and urban development is especially significant in the region of the Hill Country. Compared to other eco-regions in Texas, the Hill Country, located predominantly in the Edwards Plateau, ranked second in the loss of farmlands between 1992 and 2001 (Wilkins et al., 2003b). The 2005 Land and Water Resources Conservation and Recreation Plan developed by the Texas Parks and Wildlife Department (TPWD) has identified population growth and land fragmentation as two of the major factors threatening the biodiversity and hydrology of this region (TPWD, 2005).

The Hill Country is a vernacular term for a region that encompasses 25 counties in the central part of Texas (Fig. 1). The vegetation of the area is dominated by juniper-oak and mesquite-oak savanna. A large portion of the Hill Country supports livestock, exotic game animals, and native wildlife of the area, including endangered

species such as the Texas blind salamander, San Marcos salamander, black-capped vireo, and golden-cheeked warbler (TPWD, 2005). The region is dominated by a karst topography created from the dissolution of limestone substrate and shallow soils on plateaus and hills, and deeper soils on plains and valleys (Griffith et al., 2004). Eight counties in the region are designated as the contributing and recharge zones of the Edwards Aquifer, a crucial water source for a population of more than 1.7 millions living in the San Antonio area (EAA, 2006).

Landscape change has been an inherent process shaping land uses and socio-economic structure of this region since the first European settlement. However, land use change and land fragmentation have accelerated during the past few decades due to rapid population growth and demands for rural lands that provide natural amenities for recreation, wildlife habitat, and scenic beauty (Wilkins et al., 2003a). Land subdivision has been most prominent in places proximate to urban areas, especially Austin and San Antonio, and along associated major highways, including I-35 and US-290. The population in the metropolitan areas of Austin-Round Rock and San Antonio between 1990 and 2000 had increased 47.7% and 21.6% respectively (U.S. Census Bureau, 2006).

As the demands for open space and associated amenities continue to grow, the increasing scarcity of these features becomes more significant. Nationwide, public concern about open space conservation is indicated by a growing number of communities voting for open space referenda (Myers, 1999; Nelson, Uwasu, & Polasky, 2007), government interventions, including financial support and regulations (Geoghegan, 2002; Hellerstein et al., 2002), and non-governmental involvement (Merenlender et al., 2004) to protect related features. Since open space in the Texas Hill Country is largely owned by private entities in the forms of farmlands and ranchlands, conserving open space in the region cannot succeed without landowner involvement. The following subsection describes that many of the resource problems associated with private open space in the Hill Country can be attributed to common-pool resource problems. How place identity may serve as an incentive to encourage private landowner

participation in common-pool resources on their properties are also discussed.

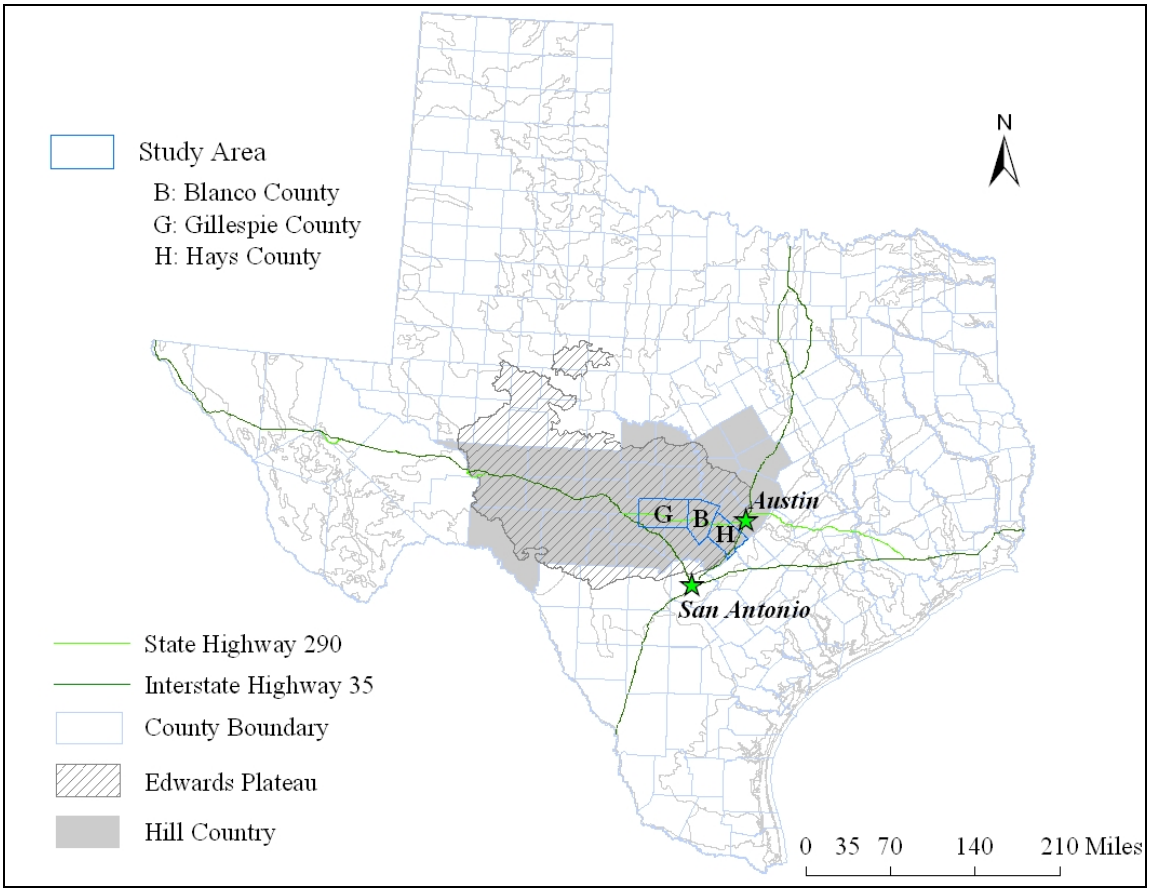

Fig. 1. Texas Hill Country

1.2. PLACE IDENTITY AS AN INTRINSIC INCENTIVE FOR COMMON-POOL RESOURCES CONSERVATION ON PRIVATE OPEN SPACE

Many of the ecosystem goods and services supported by private open space, such as a ranchland or farmland, are common-pool resources. A common-pool resource is "a natural or man-made resource from which it is difficult to exclude or limit users once the resource is provided, and one person's consumption of resource units makes those units

unavailable to others" (Ostrom, 1999, p. 497). Non-protected wildlife species that move from one property to another are common-pool resources. Consumption of the species due to hunting, contagious diseases, or lack of suitable habitat on a property reduce the overall populations available for others to enjoy through activities such as wildlife watching, enjoyment of the ecosystem maintained by healthy wildlife pollution, or hunting. Groundwater is another example of common-pool resources that is costly to restrict consumption. When the discharge rate exceeds the recharge rate, groundwater becomes a common-pool resource that is depletable from overconsumption. The rapid increase of the population in the Hill Country has turned the groundwater resource into a depletable common-pool resource. The ability of a private land to absorb wastes provides another illustration. Population growth increases the amount of waste, such as CO_2, discharged to the air that can be assimilated by the vegetation on private lands. However, each private land has only limited capacity for waste absorption. When population growth is not controlled, increase in the production of CO_2 is inevitable. An extra unit production of CO_2 decreases the overall ability of the land to assimilate the polluted air into the ecosystem.

Common-pool resource problems frequently involve decision-making that is referred to as social dilemma. According to Dawes (1980), two components are essential for a social dilemma situation. First, when adopting a socially defecting choice (e.g., everyone produces as much pollution as he/she wants), each individual receives a higher payoff from the decision compared to adopting a socially cooperative choice (e.g., each can only produce as much pollution as regulated) for a short period. The second component is that all individuals will receive more benefits from a socially cooperative decision than if all adopt a defecting decision. Social dilemmas of resource use occur when decisions about resource consumption are made to maximize individual short-term utility that is in conflict with how the same resource may benefit others in the same group (Ostrom, 1998). Collectively, these decisions may lead to overconsumption of the resource (Dawes & Messick, 2000; De Cremer & Van Vugt, 1999). Partly due to this reason, resource decisions motivated by self-interest are sometimes portrayed as a factor

that has adverse influence on the quality of common-pool resources (Becker, 2006; Biel & Garling, 1995; Clark, 1995; Hardin, 1968; Lux, 2003). However, there are also voices arguing for the need for self-interest to sustain desirable acts, such as the acts that will contribute to common-pool resource conservation, since most decisions in our daily lives involve balancing self-related costs and benefits (Mansbridge, 1990a; Perloff, 1987; Rothschild, 1999). Moreover, it is suggested, when not narrowly defined, self-interest does play an important role in encouraging and sustaining environmentally responsible behaviors (De Young, 2000; Kaplan, 2000). Rational choice theory, one of the most applied theories to understanding self-interested behaviors, provides a theoretical basis to define the scope of self-interest.

Rational choice theory views utility maximization for the self as an important determinant for one's decision about whether to act or which action to take (Ostrom, 2003). Different models of rational choice can be identified. Complete rationality represents only one of the rationality models and defines utility narrowly as maximization of benefits from the act entirely for the self. Much of the tragedy in the commons has been predicted primarily based on this model (Dietz, Dolŝak, Ostrom, & Stern, 2002). However, Dietz et al. (2002) have argued that this scenario is less likely to happen since social mechanisms, such as communication, trust, anticipation of future interactions, and the ability to establish agreements/rules for resource use, also influence individuals' resource decisions. Moreover, the utility of a resource decision to an individual is also likely to result from value bases other than self-interest.

Scholars have suggested that two value bases in addition to self-interest or egoism (Stern, Dietz, & Kalof, 1993), including the value derived from a concern for others (i.e., altruism) and concern for non-human beings (i.e., biospherism), may also exert influences on one's evaluation of the utility of engaging in an environmental act (Stern, 2000). For example, a decision to vote for a referendum that will allocate funding to conserve open space may be motivated by self-interest to sustain natural amenities enjoyed by the individual but also the moral satisfaction derived from knowing that the decision will benefit the society and the ecological community. Likewise, an

environmental behavior motivated by self-interest to conserve open space features that support one's self-identity may also enhance common-pool resources that benefit others. The utility generated by self-interested, altruistic, or biospheric behaviors does not have to exclude one another. However, individuals' value systems are relatively stable. Changing the value bases to support the environment as suggested by much of the environmental research (Dietz, Fitzgerald, & Shwom, 2005) may be viewed as a long-term goal to help alleviate the environmental problems. At the same time, many environmental issues need immediate solutions. Persuading individuals to engage in environmental behaviors that are consistent with their self-interest may be attained more quickly.

Schultz (2001) has stated that "objects (e.g., plants, animals, other people) are valued because of the degree to which they are included within an individual's cognitive representation of self" (p. 336). Places can be viewed as an object to which one attributes values and meanings, which in turn helps define his/her self-identity. Place identity, therefore, represents one of the self-interested incentives derived from one's value basis ingrained in his/her self-identity. Place identity as an intrinsic incentive may encourage individuals to become involved in conserving the common-pool resources on their property that are part of the meanings that comprise their self-identity. However, research to explore the construct of place identity and its motivating effects on conserving resources that are threatened by landscape change has not been sufficiently theorized and empirically examined (Rogan, O'Connor, & Horwitz, 2005; Twigger-Ross, Bonaiuto, & Breakwell, 2003). The concept of place identity has been explored in geography, sociology, anthropology, and environmental psychology (Low & Altman, 1992). Place identity has been defined and examined in various ways depending on the paradigmatic approaches underlying different research programs (Patterson & Williams, 2005). From the symbolic interactionist approach, place identity can be viewed as comprising the symbols and meanings that an individual ascribes to a physical setting (Cuba & Hummon, 1993) and become the defining elements of self-identity (Proshansky, Fabian, & Kaminoff, 1983). Following the same line, landowners' place identity that is

embedded in their property can be viewed as comprising the meanings derived from their interactions with the socio-economic and biophysical environment on the property. These meanings are subsequently integrated into their self-identity to guide decision-making that may have positive or negative implications to self-identity (Burke, 1991b; Stryker, 1980). A decision to subdivide a ranch for residential development will change an identity originally centered around a lifestyle of taking care of the land to the one completely detached from the meanings associated with a working ranch. On the other hand, a decision to dedicate the land to a conservation easement (i.e., a legal agreement by landowners to restrict development on their land) will ensure that the important meanings constituting the identity will be permanently protected from development.

However, a theoretical explanation of how landscape change impacts individuals' associations with the place they value, which may in turn affect place-related behaviors, has not been well understood and empirically tested (Davenport & Anderson, 2005; Fried, 2000; Rogan, O'Connor, & Horwitz, 2005; Sharpe & Ewert, 2000). More specifically, there is a lack of research aimed at examining private landowners' decision of farmland and ranchland conservation to maintain their place identity in the face of land fragmentation. Identity theory (McCall & Simmons, 1978; Stryker, 1980, 1987) and identity control (Burke, 1991a, 1991b, 2004) theory based in social psychology were used to provide the theoretical bases to explain the motivating effect of place identity on behavior and how this relationship may be influenced by landscape change.

1.3. IDENTITY THEORY AND IDENTITY CONTROL THEORY

Place identity has been conceptualized as self-related meanings derived from the physical environment in human geography (Relph, 1976), environmental psychology (Proshansky, Fabian, Kaminoff, 1983; Twigger-Ross, Bonaiuto, & Breakwell, 2003), and sociology (Cuba & Hummon, 1993; Greider & Garkovish, 1994). The symbolic interactionist approach of identity theory defines an identity as being comprised of meanings that characterize an individual as a unique person, an occupant of different

social roles, or members of various groups (Burke & Tully, 1977). A basic premise of symbolic interactionism is that meanings of self, others, and non-living objects in a social interaction provide cues for an individual's response to the stimuli from the interaction (Stryker & Statham, 1985). In other words, meanings of self and the physical environment that may become part of the defining components of one's self-identity are the underlying force for behavior. Specifically, identity theory suggests that commitment predicts identity salience which in turn predicts behavior (Stryker, 1980, 1987).

Commitment is embedded in individuals' social structure and defined as "the degree to which the person's relationships to specified sets of others depends on his or her being a particular kind of person" (Stryker & Serpe, 1982, p. 207). An individual's commitment to a certain identity is related to the extent of social relationships that are connected to the identity and the importance of these relationships to the person. Identity salience is referred to as the level of importance of an identity to the individual as reflected in the probability of the identity being enacted and valued in a certain situation and across situation (Burke, 1991b; McCall & Simmons, 1978; Stryker, 1987). An identity is manifested through the time and effort invested in behaviors to maintain it. Based on identity theory, a landowner who is connected to a wide social network connected to his property and values this social network is more likely to see his identity associated with his property important. As a consequence, he is more likely to invest more time and effort to maintain this identity.

By defining self based on meanings, identity theory provides a theoretical basis to integrate the place-identity research from various disciplines that also views meanings as the essential elements for place identity. It also provides a theoretical explanation for the motivating effect of place identity on behavior to maintain the identity. However, it does not theorize the dynamics among commitment, identity salience, and behavior when relationships among these constructs are interrupted by an external force such as change in the physical environment. On the other hand, identity control theory (Burke, 1991a, 1991b, 2004) has specified how self-meanings are maintained or modified as a consequence of interruption from the external environment and the behavioral

consequences of the interruption. Identity control theory suggests that individuals constantly monitor and adjust the differences between the self-meanings that are ideal to them (i.e., ideal self-meanings) and the self-meanings that are reflected from how others react to them (i.e., perceived self-meanings). In the context of place identity, an individual's identity may also be reflected from the physical environment. Homes and private spaces where individuals can exercise their freedom to manipulate these places are examples of self-meanings reflected in the physical environment. Changes in the physical environment or changes in how others react to a certain identity create discrepancy between ideal self-meanings and perceived self-meanings. When the discrepancy continues to grow, it may create the discomfort of psychological distress and anxiety. In order to reduce the psychological discomfort, individuals are motivated to reduce the discrepancy. The discrepancy may be reduced by changing the perceived self-meanings by restoring the physical environment or reverting how others reacting to the identity. Individuals may also change the ideal self-meanings to accommodate perceived self-meanings.

Meanings that constitute landowners' place identity of their property encompass an array of attributes ranging from the biophysical features on the property (e.g., wildlife, vegetation, topography) and the functions supported by the property (e.g., economic, social activities) to the emotional feelings that landowners ascribe to the property (e.g., attachment, rootedness) (Canter, 1977; Proshansky, 1978; Relph, 1976). Loss or modification of the meanings important to landowners' place identity due to development and fragmentation may lead to negative psychological consequences. When landowners strongly identify with their property, the identity becomes a motivating force for decisions that help prevent the important attributes that consist of the identity from being changed. Decisions may be made in favor of managing the lands for agricultural production and maintaining its natural amenities when these features are important to landowners' place identity.

1.4. STUDY PURPOSE AND OBJECTIVES

The purpose of the dissertation research is both theoretical and practical. Theoretically, although there has been considerable discussion on place identity especially in the environmental psychology literature, criticisms have been leveled due to the lack of a conceptually clear and unambiguous definition (Devine-Wright & Lyons, 1997; Hidalgo & Hernández, 2001; Krupat, 1983; Lalli, 1992). At the same time, the place-identity research, mostly in the environmental psychology literature, has also been criticized as providing insufficient theoretical underpinnings for mechanisms underlying the motivating function of place identity for behavior (Korpela, 1989; Sarbin, 1983; Twigger-Ross, Bonaiuto, & Breakwell, 2003). Moreover, as indicated earlier, there is a lack of theoretical framework to quantitatively examine the relationship between place identity and behavior to preserve or change the identity under the pressure of environmental change (Davenport & Anderson, 2005; Rogan, O'Connor, & Horwitz, 2005). In addition to addressing the needs to advance the theoretical development of place identity, this research was also aimed at empirically testing the theoretical frameworks of place identity. At the same time, practical implications drawn from the research would identify mechanisms to help promote private landowners' engagement in open space conservation in the Texas Hill Country. Specifically, four objectives were to be achieved:

Objective 1: To define place identity and identify its underlying dimensions (Chapter II).

Objective 2: To develop and refine a place-identity scale (Chapter III).

Objective 3: To develop and test a conceptual framework that explains the relationships among commitment, place identity, behavior/behavioral intention to preserve or change the identity, and perception of landscape change (Chapter IV).

Objective 4: To draw implications from the study findings to promote open space conservation and identify future research needs (Chapter III, Chapter IV, and Chapter V).

1.5. ORGANIZATION OF THE DISSERTATION

The remaining chapters are organized in a way to present the development of the research in a chronicle order. Chapter I provides an overview of the need for the research, and brief description of the theoretical bases and objectives underpinning the research. Chapters II to IV are each presented in the format of a journal article[2] to address different yet interconnected research objectives. Detailed explanations of the theoretical underpinnings for the frameworks proposed and examined in Chapters II, III, and IV are provided in each of these chapters.

Chapter II presents the preliminary step of the dissertation to address Objective 1. The chapter starts by defining place identity based on identity theory. A conceptual framework that represents the dimensionality of the concept was developed by reviewing the place literature primarily from environmental psychology and human geography. The conceptual framework was empirically examined adopting a qualitative approach to understanding landowners' place identity that was embedded in their property in the Texas Hill Country. Identity control theory was also used to explain how place identity might evolve over time and its motivating effects on behaviors that might help landowners preserve their place identity from being changed by landscape change in the area. Data are presented based on the interview results from traditional landowners and non-traditional landowners. These two landowner groups were distinct in the size of the property they owned, their personal and family history associated with the property, and their economic dependence on the property. Summary and discussions are provided at the end of the chapter.

Objective 2 is addressed in Chapter III. The chapter starts with reviewing the qualitative and quantitative research on sense of place, place attachment, place dependence, and place identity that examined the dimensionality of these place concepts. Then the conceptual framework of the place-identity dimensions theorized in the symbolic interactionist-based identity theory and the place literature is presented. Description is then provided to explain the methods to empirically test the

[2] The format of the chapters follows the Journal of Environmental Psychology.

dimensionality framework and comparisons of the proposed framework with three alternative models that were suggested in related research. At the same time, tests to examine if differences of the dimensions of place identity existed between traditional and non-traditional landowners are described. Quantitative testing using covariance structure analysis was conducted on a sample of landowners who were randomly selected from the Hill Country landowner population. Discussions and conclusions based on the findings and the study limitations are provided at the end of the chapter.

Chapter IV is organized in a way to address Objective 3. The research need of understanding the utility of place identity as an internal incentive for private landowners' engagement in open space conservation is first presented. Then research that examined the function of place identity as a motivation for certain behaviors is reviewed followed by the illustration of the theoretical underpinnings drawing from identity theory and identity control theory for the place identity-behavior associations and the influences of landscape change on these associations. Two structural models are hypothesized based on this theoretical framework to examine the relationships among commitment, dimensions of place identity, and behavior/behavioral intention to preserve or change place identity. The structural models were tested on the same group of landowners as described in Chapter III using covariance structure analysis. Discussions, study limitations, future research needs, and implications for open space resource conservation are provided.

The final chapter concludes the dissertation by first summarizing the overall findings of the qualitative study and quantitative model testing followed by presenting the general implications for open space conservation. Future research needs that focus on how place identity may help landowners build resilience and encourages collect actions to conserve the commonly valued open space features are suggested.

CHAPTER II
EXPLORING LANDOWNERS' PLACE IDENTITY IN THE TEXAS HILL COUNTRY: A QUALITATIVE APPROACH

2.1. INTRODUCTION

Research has been conducted to explore factors that motivate landowner participation in government sponsored programs or self-implemented practices for sustainable natural resource management. Studies have suggested that identity and attachment associated with farmlands or ranchlands may play an important role in landowner decisions to practice natural resource conservation on their property (Liffmann, Huntsinger, & Forero, 2000; Ryan, Erickson, & De Young, 2003; Sanders et al., 2004).

Place identity may motivate landowners to engage in land management to conserve important features of their property as manifestation of their self-identity. At the same time, landowner decisions to manage the land may also be influenced by external forces. Landscape change driven by population growth and urban development can adversely impact the natural and socio-economic features that hold the meanings that landowners value on their property (American Farmland Trust, 2006; Collinge, 1996; Gobster & Rickenbach, 2004; Liffmann, Huntsinger, & Forero, 2000). Threats induced by landscape change to property features and meanings that landowners ascribe to these features may motivate them to adopt management practices aimed at conserving these features. However, a theoretical understanding of how landscape change impacts the meanings that individuals ascribe to the place they value has not received much attention in the place research (Davenport & Anderson, 2005; Rogan, O'Connor, & Horwitz, 2005; Sharpe & Ewert, 2000). Nor is the relationship between the changing people-place relationship and the behaviors to cope with the changes clearly understood (Fried, 2000). More specifically, little is known about the relationship between private landowners' decisions to manage their land in a way to maintain an identity that is embedded in the integrity of their property and the impact of landscape change on this identity.

The purpose of the study was to address these research gaps and employ identity theory (McCall & Simmons, 1978; Stryker, 1980, 1987) and identity control theory (Burke, 1991b, 2004) as the theoretical bases to conceptualize place identity. Furthermore, these theories were used to explain why landscape change might become a motivating force for resource conservation when it threatens significant natural resources that are important to one's identity. The impacts of landscape change on place identity were then examined in the Texas Hill Country where the change appears to be affecting many landowners. Landowners' responses to landscape change in an effort to preserve or change their place identity were also explored.

2.2. LITERATURE REVIEW

2.2.1. A Symbolic Interactionist Interpretation of Place Identity

Conceptualization of the human-environment relationship based on the meanings derived from the physical environment has been discussed in geography (Relph, 1976; Tuan, 1977), sociology (Cuba & Hummon, 1993; Greider & Garkovish, 1994; Milligan, 1998), anthropology (Basso, 1988; Low, 1992), and environmental psychology (Bonaiuto, Carrus, Martorella, & Bonnes, 2002; Saegert & Winkel, 1990; Stokols, 1990; Twigger-Ross, Bonaiuto, & Breakwell, 2003). Among these discussions is the research by Bonaiuto, Breakwell, and Cano (1996), Cuba and Hummon (1993), Hull, Lam, and Vigo (1994), and Relph (1976) who used the meaning-based approach to examining the concept of place identity. According to Cuba and Hummon (1993), place identity is "an interpretation of self that uses environmental meanings to symbolize or situate identity" (pp. 112). Identity theory (McCall & Simmons, 1978; Stryker, 1980, 1987), derived from the symbolic interactionist tradition, provides a theoretical explanation for the meaning-based approach to conceptualizing place identity.

According to McCall and Simmons (1978), one of the contributions of symbolic interactionism lies in that it connects the physical world (i.e., a neutral, objective world) to the symbolic world (i.e., a subjective, meaning-laden world). Symbolic interactionism provides a useful framework to understand the process of how meanings are created and

ascribed to the neutral and objective world. The environment in which we live and interact with others is a symbolic environment where symbols and meanings of the symbols are subjectively interpreted (Stryker, 1980). Based on this perspective, "(T)hings, ideas, relationships between and among things and ideas can all be symbolized and enter the experience of human actors as objects. Whatever their ontological status in the 'natural world', such objects constitute social reality" (Stryker & Statham, 1985, p. 321). At the same time, the creation of social reality in an interaction also depends on the social and cultural backgrounds of the social actors involved in the interaction and the factors that may affect the process of the interaction. An important premise of symbolic interactionism lies in that behaviors of participants in a social interaction are guided by the meanings they ascribe to the objects, including the self, others, and non-living features, in the interaction (Stryker & Statham, 1985). Individuals would lose the guidance to organize and plan for their actions in the situation without these meanings (McCall & Simmons, 1978; Stryker & Statham, 1985). In other words, individuals need to define and give meanings to themselves, others, and non-living objects upon their entering an interaction to decide how to respond to the stimuli from the interaction.

Self as one of the objects to be defined in an interaction is conceptualized as comprising multiple identities organized in a hierarchical order according to the salience of the identities or the probability of the identity being expressed in the interaction (McCall & Simmons, 1978; Stryker, 1980). An identity, following symbolic interactionism, is defined as comprising a set of meanings that describe an individual as a person, role occupant, or group member in an interaction (Burke & Tully, 1977). One of the basic assumptions of symbolic interactionism is that meanings of the objects in an interaction are not static but negotiable (Stryker & Statham, 1985). Meanings pertaining to self and identity are, therefore, continuously shaped during the socialization process (Stryker, 1987). Self-meanings may evolve over time as a consequence of individuals' interactions with the physical and social environment.

Since the major concern of symbolic interactionists is with interpersonal

interactions and the social aspect of interactions (Stryker & Statham, 1985; Wells & Stryker, 1988), meanings of the physical environment in the development of self-identity have not been emphasized in the identity research that follows this paradigm. However, the physical environment is not only the backdrop for social interactions as Ittleson (1973) put it, "one cannot be a subject of an environment, one can only be a participant. The very distinction between self and nonself breaks down: the environment surrounds, enfolds, engulfs, and no thing and no one can be isolated and identified as standing outside of, and apart from, it" (p. 12-13).

Likewise, Relph (1976) has indicated that for each individual there exists a deep association between him/her and a place which becomes "a vital source of both individual and cultural identity and security, a point of departure from which we orient ourselves in the world" (p. 43). He further suggested that the physical characteristics, activities, and spiritual elements of places are ingredients of individuals' place identity. The identity of a place, although not likely to be part of an individual's self-identity when he/she first encounters a place, may nonetheless be assimilated into one's self-identity after dwelling in the place for a period of time. In other words, the "identities of places" may be integrated into one's "place identity." This has extended the symbolic interactionist approach to defining self-identity based only on the social world of human interactions to including also the physical world.

Similarly, the role of place in cultivating individuals' self-identity has been widely recognized (Devine-Wright & Lyons, 1997; Greider & Garkovish, 1994; Korpela, 1989; Milligan, 2003; Proshansky, Fabian, & Kaminoff, 1983; Relph, 1976). Place is generally conceptualized as comprising the meanings that individuals or societies ascribe to a geographical location (Canter, 1977; Low & Altman, 1992; Relph, 1976; Tuan, 1974). Research has also suggested that meanings of place may be integrated into one's self-identity (Gustafson, 2001; Korpela, 1989; Rowles, 1983). In the current study, identity theory provides the theoretical underpinning to conceptualize place identity that views meanings as the defining elements of place identity. The role of salience of place identity in guiding behavior in an interactive setting as suggested in identity theory is

adopted to explain why salience of place identity may motivate behavior. At the same time, the study extends the scope of interactions beyond interpersonal interactions as emphasized by identity theory to include individuals' interactions with the physical environment. Identity control theory was adopted to explain why salience place-identity may motivate behavior to preserve the identity when changes that may threaten the important components of the identity is perceived.

Based on this theoretical approach, place identity is conceived of as meanings that an individual ascribes to a place through his/her interaction in and with the socio-economic and biophysical environment in the place and become the defining characteristics of his/her self-identity. The meanings that people attribute to a place and that may subsequently be integrated into their place identity are rich and complex. Research on place identity and place meanings provides insight into the questions of "what are the meanings that help define individuals' self-identity that is embedded in a specific geographic location?"

2.2.2. Dimensionality of Place Identity

Meanings have been viewed as an essential component that defines place and distinguishes meaningful place from meaningless space (Brandenburg & Carroll, 1995; Low & Altman, 1992; Stedman, 2003b; Tuan, 1977). Exploration of meanings that individuals attributed to places primarily have adopted a qualitative approach and categorized meanings based on their structural, functional, affective, and temporal qualities of places.

2.2.2.1. Structural, Functional, and Affective Dimensions of Place Meanings

The first approach to categorize place meanings is based on the tangibility and spatial organizations or the structural dimension of place meanings. The structural dimension of place meanings may include the physical or ecological features of a recreational, natural, or built setting (Canter, 1977; Davenport & Anderson, 2005; Eisenhauer, Krannich, & Blahna, 2000; Hull, Lam, & Vigo, 1994; Kaltenborn, 1997;

Relph, 1976; Schroeder, 1996). Structure, services, architecture, work environment, and spatial properties attributed to home (Sixsmith, 1995), and physical characteristics of a favorite place (Korpela, 1989) also represent the structural aspect of place meanings.

Place meanings can also be grouped based on various functions or activities supported by places. The ecological, social, economic, or recreational meanings of places that support individuals' daily functioning or facilitate achieving their goal are functions of places in a natural/recreational setting (Bricker & Kerstetter, 2002; Davenport & Anderson, 2005; Eisenhauer, Krannich, & Blahna, 2000; Mitchell, Carrol, & McLaughlin, 1993; Schroeder, 1996; Williams & Patterson, 1999), built environment (Canter, 1977; Hull, Lam, & Vigo, 1994; Sixsmith, 1995; Twigger-Ross & Uzzell, 1996), or favorite places (Korpela, 1989). At the same time, some places provide individuals a harbor where they can cultivate a sense of protection, control, and restoration from stressful encounters (Gustafson, 2001; Hull, Lam, & Vigo, 1994; Kaplan & Kaplan, 1989; Korpela, 1989; Korpela & Hartig, 1996; Manzo, 2005; Sixsmith, 1995; Twigger-Ross & Uzzell, 1996).

There are also place meanings that are less tangible and not necessarily attributable to any function. These are the meanings that Relph (1976) termed as "spirit of place," "sense of place," or "genius of place." According to Relph, the spiritual aspect of places represents the affective feelings and spiritual connections individuals associate with places that can only be experienced in a holistic and indivisible sense. The affective and spiritual aspect of place meanings are exemplified by feelings such as attachment, pride, self-esteem, excitement, reflection, spirituality, and belongingness (Gustafson, 2001; Hull, Lam, & Vigo, 1994; Korpela, 1989; Manzo, 2005; Mitchell, Carrol, & McLaughlin, 1993; Twigger-Ross & Uzzell, 1996; Williams & Patterson, 1999). It is also demonstrated by individuals' expressions of self-identity or group-identity (e.g., family, community, region, nation) as anchored in or developed through living in places (Davenport & Anderson, 2005; Gustafson, 2001; Manzo, 2005; Proshansky, 1978; Rowles, 1983; Twigger-Ross & Uzzell, 1996; Williams & Patterson, 1999). Scenic or aesthetic meanings inherent to an ecosystem or a natural setting are another form of

emotional expressions of place meanings (Bricker & Kerstetter, 2002; Schroeder, 1996; Williams & Patterson, 1999).

2.2.2.2. Temporal Dimension of Place Meanings

Place and place meanings do not remain unchanged. Relph (1976) stated that time "is usually a part of our experiences of places, for these experiences must be bound up with flux or continuity. And places themselves are the present expressions of past experiences and events and hopes for the future" (p. 33). Proshansky (1978) suggested that individuals and the physical environments where they are situated are likely to change, which in turn affects the meanings with which their place identity is enriched. Likewise, from the perspective of identity control theory[3] (Burke, 1991b, 2004), meanings that define an identity do not remain static.

Individuals constantly compare their perceptions of self-meanings as reflected from the social setting (i.e., perceived self-meanings) with the ideal self-meanings they hold for themselves (i.e., identity standards). Ideal self-meanings are used as standards to evaluate if perceived self-meanings are different from or congruent with the ones that individuals hold for themselves. According to identity control theory, identity is a continuous process of self-verification and self-adjustment to keep the discrepancy between one's perceived self-meanings and identity standard small (Burke, 1991a, 1991b, 2004). When discrepancy is small, self-adjustment is likely to be automatic and unselfconscious. Large discrepancy between the two sets of meanings may create distress or anxiety and bring the discrepancy under conscious control (Mandler, 1982). Under this condition, the individual is likely motivated to adopt strategies to reduce the discrepancy and, therefore, the psychological discomfort. Individuals may initiate behaviors to change the social setting and therefore to bring the perceived self-meanings closer to their own identity standards. If the effort to change the setting does not generate desirable outcomes and discrepancy remains, individuals may modify their identity standards to correspond to what they perceive from the external environment.

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[3] Identity control theory was developed primarily from identity theory (Stryker, 1980, 1987) and interruption theory (Mandler, 1982).

Place meanings describing a sense of continuity or a sense of change are the qualities of places that can be mapped onto a continuum of time. Knowing that a familiar place and its structural components will sustain its functions to support the needs for survival, pleasure seeking, social interactions, remaining connected to the past, and securing the expectations for the future renders a sense of continuity (Fried, 2000; Hull, Lam, & Vigo, 1994; Korpela, 1989; Manzo, 2005; Milligan, 1998; Proshansky, Fabian, & Kaminoff, 1983; Twigger-Ross & Uzzell, 1996). Consistent with identity control theory, the place research also revealed that a sense of continuity in a place is frequently unselfconscious until the place is threatened by changes in the environment (Feldman, 1990; Hull, Lam, & Vigo, 1994; Relph, 1976; Williams & Stewart, 1998). That place meanings evolve and develop over time in responding to changes in the environment or individuals themselves has also been empirically examined by Gustafson (2001), Hay (1998), and Schroeder (1996) in different contexts.

2.3. CONCEPTUAL FRAMEWORK

Landscape change induced by urban development and population growth may adversely affect the biophysical features and functions of landowners' property, which in turn transforms landowners' perceived self-meanings that are anchored in the property. As the discrepancy between the perceived and ideal self-meanings that comprise their place identity continues to grow and become perceivable, psychological distress is likely to occur if the identity is highly salient according to identity theory and identity control theory. Landscape change represents an interruption that interferes with the continuity of landowners' property identity by shaping the meanings they ascribe to their property. It may cause landowners to modify their property identity to accommodate the change by modifying the ideal meanings consisting of the identity. On the other hand, for landowners who strongly identify with their property and refuse to give up any meaning constituting the identity, such change may provoke a higher level of distress, which in turn motivates actions to minimize the adverse effects of the change on the identity.

In the current study, meanings that comprise place identity were viewed as

categorizable into three dimensions, including structural, functional, and affective. The structural dimension of place identity consisted of the meanings related to the biophysical features (e.g., wildlife, vegetation, topography) on landowners' property. Activities (e.g., agricultural practices, social activities, recreation) and ecological functions supported by the property were referred to as the functional dimension. Meanings associated with the emotions (e.g., attachment, rootedness, identity) that landowners attributed to the property belonged to the affective dimension. Change and continuity of the three dimensions over time as a consequence of landscape change consist of the temporal dimension of place meanings. This conceptual framework can be illustrated using a triangular prism (Fig. 2). The three sides of each triangular base represent the structural, functional, and affective dimension, respectively. Meanings that comprise the structural, functional, and affective dimensions evolve over time and form the dimension of time. This framework served to guide three research questions: 1) What are the meanings that comprise the structural, functional, and affective dimensions of landowners' place identity? 2) How are these dimensions impacted by landscape change? That is, how are the structural, functional, and affective dimensions evolved as a consequence of impacts from landscape change? 3) How do landowners respond to landscape change that generates externally induced threats to the meanings important to their property identity? As mentioned earlier, place literature has reported that direct experiences through time in places are necessary for one to develop a deeper association with places (Hay, 1998; Relph, 1976). At the same time, natural resource literature has shown that long-term residents and newcomers frequently have different attitudes and behaviors toward resource management (Green et al., 1996; Jones, Fly, Talley, & Cordell, 2003; Nelson, 1999; Raedeke, Charles, & Rikoon, 2001; Reading, Clark, & Kellert, 1994). The three research questions were examined on long-time and relatively new landowners in the Texas Hill Country where landscape change is impacting the integrity of the rural landscape of the area.

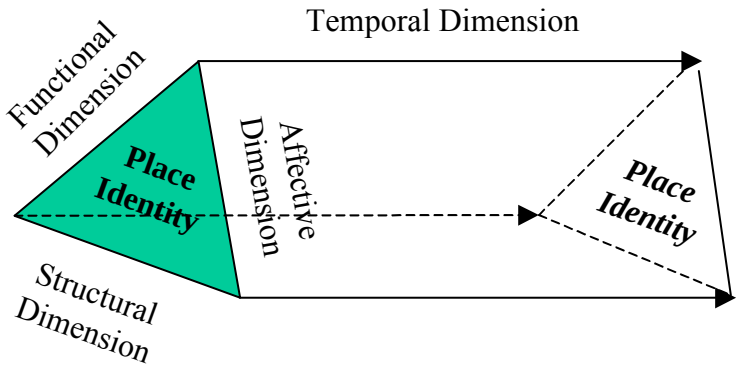

Fig. 2. Conceptual framework of place identity

2.4. METHODS

2.4.1. Study Area

The Texas Hill Country, as defined by the Texas Parks and Wildlife Department, occupies most of the Edwards Plateau to the east, and encompasses twenty-five counties and the state capital, Austin (TPWD, 2007). The Edward Plateau was uplifted from an ancient ocean dating back to 100 million years ago and is primarily comprised of limestone rock. The eastern and southeastern portion of the plateau where the Hill Country is located is highly dissected with steep canyons, narrow divides, and high gradient streams (Riskind & Diamond, 1989). Due to the topographic characteristics, springs are important water features and sources for cities located at the edge of the area. Diverse soil types were developed from the hilly landscape and different parent material. Climatically, the area is situated in the transition zone between humid and semi-humid climates (TSHA, 2007). Variations in all these ecological factors have contributed to the diverse and unique biological community in this area (TPWD, 2005). Vegetation-wide, the Edwards Plateau is dominated by juniper-oak savanna and mesquite-oak savanna and has the highest number of endemic species than the other ecological regions in Texas.

The geological feature of limestone of the area renders it the most important ecological region for herpetological and invertebrate species. At the same time, the diverse vegetation in the area used to support free-roaming grazing animals, such as bison and antelope, prior to European settlement in the area.

The ecological and geological nature of the area has facilitated the prevalence of the ranching industry since the first settlement of the Europeans in the mid 1800s. The grassland-dominated ecosystem was gradually shifted to a brushland due to the introduction of intensive grazing by domestic livestock and change in fire regime (Riskind & Diamond, 1988; TPWD, 2007). The diverse plant community used to inhabit the area was gradually eradicated due to the expansion of some brush and invasive species. More recently, the ranching-based agricultural landscape and large tracts of rangelands that used to be the hallmark of this area are diminishing as a consequence of rapid population growth and conversion of native rangeland to other types of land use. Landscape change is particularly significant in places proximate to fast growing urban areas, such as the metropolitan areas of Austin-Round Rock and San Antonio. Both areas have experienced 47.7% and 21.6% population growth respectively between 1990 and 2000 (U.S. Census Bureau, 2006). According to Wilkins et al. (2003b), the Edwards Plateau is one of the most threatened ecoregions in Texas where fragmentation of large land ownerships has occurred in the past decade. Between 1992 and 2001, more than one hundred thousand acres of farms and ranches in this region were converted to other non-agricultural uses. The same study also shows that the market value of rural agricultural lands in this region has the second highest increase when compared to the other ecological regions in Texas predominantly due to their non-agricultural values (i.e. recreation, wildlife, and scenic beauty). Rapid land subdivision occurring in this area not only threatens the agricultural activities but also habitats for endangered black-capped vireos, golden-cheeked warblers, and other native wildlife. Fragmentation and development also impairs the hydrological function of the area to recharge the Edwards Aquifer. The Edwards Aquifer is located at the southern edge of the Hill Country and a major water source for the agricultural, industrial, recreational, and domestic needs of

almost two million residents in south central Texas (EAA, 2006).

2.4.2. Sampling and Data Collection

The snowball sampling method was applied to recruit study informants who had undertaken agricultural and natural resource management practices on their property in the Hill Country. Contact information for the first few informants were acquired from the personnel of a local land trust and nature tourism organization, and county extension offices. These informants were then asked to identify other landowners for interviews. Through this process, 12 landowners were contacted and interviewed in 2004 and 2005.

Informants lived on their property on a daily basis and exhibited a range of characteristics. They were categorized into traditional (N = 7) and non-traditional landowners (N = 5). The traditional landowners had farmed or ranched on their property with an average size of more than 2,500 acres and had owned the property for more than one generation. Most had hunting operations and some had recreation or tourism businesses (e.g., wildlife watching, B&B, agritourism) on their property. The non-traditional landowners were first generation landowners and owned property averaging about 100 acres in size. None of them operated recreation or tourism businesses at the time when the interviews were conducted

Interviews were semi-structured and guided by the research questions mentioned earlier (Table 1). Informants were first asked to describe their property, including the history of, the biophysical features and activities they practiced on the property, and the social relationships associated with the property. They were encouraged to further describe what the property was like in the past and to describe “what does it mean to you to live on this property?” Informants were then asked if they had perceived any change in the surrounding area since they owned the property, how the change, if any, had affected them and the property, and what they had done to cope with the change. Interviews lasted from 60 to 210 minutes and were tape recorded and transcribed verbatim. Whenever possible, interviews were conducted on the informants’ properties to gain a contextual understanding of the narratives they ascribed to their property.

Table 1

Semi-structured interview questions

What are the meanings that comprise the structural, functional, and affective dimensions of landowners' property identity?
1. Please tell me a little about your ranch. How long has it been in your family? How large is it? What sort of things do you do here? Do you live on your ranch on a daily basis?
2. What does it mean to you to live on your ranch? What do you like about or you don't like about living on this ranch?
How are the structural, functional, and affective dimensions evolved as a consequence of impacts from landscape change?
1. Is development in the Austin area influencing your ranch? Can you tell me how the development influences the ranch?
2. Does being a rancher or a landowner mean the same thing to you if you were no longer able to do the things that you used to do?
How do landowners respond to landscape change that generates externally induced threats to the meanings important to their property identity?
1. Do you plan to keep the property as it is?
2. What have you done or what will you do to keep the ranch staying the same in the future (Answered "yes" to Question a)?
3. What changes do you plan to make on the ranch (Answered "no" to Question a)?
4. Is there any obstacle for you to keep the ranch unchanged?

2.4.3. Data Analyses

To help understand the meanings comprising the dimensions and how they were impacted by landscape change over time, the transcribed interviews pertaining to the meanings informants ascribed to their property were categorized into the structural, functional, and affective dimensions. Meanings of the three dimensions that were impacted by environmental change in the area were identified and discussed in terms of their temporal quality to address the second research question. Finally, the third research question was examined by identifying the acts or strategies that landowners had taken or

were considering to take to cope with changes.

2.5. RESULTS AND DISCUSSIONS

The results are organized to present the study findings in the sequence to address the three research questions. Meanings that constituted informants' place identity are first described followed by an examination of how informants' place identity was impacted by landscape change and how they responded to changes.

2.5.1. Meanings of Place Identity with a Private Property

2.5.1.1. Structural and Functional Dimensions

Meanings categorized into the structural and functional dimensions are described in the same subsection because these two dimensions were found to be highly dependent on each other as revealed in the interview data. Table 2 and Table 3 show the structural and functional meanings identified from the interviews. Elements of the structural dimension of place meanings identified by informants encompassed a wide range of biological and physical attributes that were charged primarily with positive feelings (Table 2). All informants (N = 12) identified native or endangered wildlife and plants, the hydrological features of creek, river, lake, and spring, and the topographic features of hills, valleys, river divides, and canyons that constituted the structural meanings of their property. Many of them also indicated the spatial features of proximity of the property to or isolation from major transportation routes or cities (N = 4 for non-traditional and 5 for traditional landowners). Other less frequently identified structural meanings were geological attributes of limestone, caverns, rocks, granite, soil (N = 3 for non-traditional and 4 for traditional landowners), size of the property as the only remained large tract in the area (N = 2 for traditional landowners), meteorological characteristics (e.g., mild weather, low humidity) (N = 1 for non-traditional and 2 for traditional landowners), and air quality (N = 1 for non-traditional and traditional landowners). In addition to the natural attributes, informants (N = 1 for non-traditional and 6 for traditional landowners) also identified manmade features, such as old houses, rock walls, fences, wagon trails,

and relics of Native American Indians, that connoted with historical meanings of the property.

Table 2

Structural meanings of informants' property

Structural meanings	Frequency	
	Non-Traditional Landowners	Traditional Landowners
Positive meanings		
Native wildlife and vegetation	5	7
Water features	5	7
Topographic features	5	7
Distance from major cities or transportation routes	4	5
Built environment of historical connotations	1	6
Geological features	3	4
Property size	0	2
Meteorological features	1	2
Air quality	1	1
Negative meanings		
Invasive or aggressive animals and other negative qualities (lack of permanent running water, harsh weather condition, shallow and alkaline soil, downhills, grand sand, invasive species)	2	3

The different themes of structural and functional meanings frequently emerged simultaneously when informants described their property. The structural meanings were often evaluated positively because of the functions and activities supported by the biophysical features of the property (Table 3). The natural attributes of the property provided all the informants (N = 12) a variety of opportunities to enjoy the outdoors (e.g., nature watching, photography, hunting, gardening, or simply working on the land). At the same time, owning a property provided informants (N = 12) a platform to display their self-identity through working on the land as a land steward, landscape architect, craftsman, farmer, or an independent rancher. Through different land practices, self-identity was expressed and a sense of self-fulfillment was attained as illustrated by this traditional landowner.

> I achieve a great deal of satisfaction by taking care of it (the property)…My philosophy about my place is that if I can take care of the land no matter that will foster and encourage healthy plant growth, then I can harvest that plant growth with grazing animals.

For both groups (N = 12), the property supported the social function of spending time and doing activities with their family and friends. Connecting all the traditional landowners (N = 7) and some of the non-traditional landowners (N = 2) to what had happened on the property was another function supported by their property. Informants identified their family history, personal experiences, Native American Indians and their interactions with the early settlers, and previous owners as part of the meanings associated with the property. The functional meanings of environmental past were expressed along with the structural components of manmade features that connoted with the function of the property as a warehouse where history and personal experiences were cumulated.

Table 3

Functional meanings of informants' property

Functional meanings	Frequency	
	Non-Traditional Landowners	Traditional Landowners
Positive meanings		
Providing opportunities to enjoy the outdoors and nature	5	7
Affording self-expression	5	7
Supporting social activities with friends and family members	5	7
Connecting to the past	2	7
Supporting economic activities	0	7
Protection from being impacted by development, protecting a family heritage	1	6
Providing a sense of solitude and being away	3	5
Maintaining a way of life	0	5
Supporting research and education	2	3
Affording the convenience of easy accessing the city benefits	3	3
Affording spiritual renewing/self-enhancement	0	4
Supporting a healthy environment to live	2	0
Providing a sense of ownership/independence	1	2
Contributing to the water source of the area	0	4
Preserving open space in the area	0	2
Negative meanings		
Economic dysfunction	0	5

To traditional landowners (N = 7), the property meant an economic means of ranching, farming, hunting, or nature tourism. They also recognized that these economic activities would not be sustained without a healthy plant community and wildlife population, and sufficient water supply, which in turn were influenced by the hydrological and topographic attributes of the land. This is exemplified by this traditional landowner.

> (B)ecause of the moderate rainfall, there is not much water visible. But that's the most important single feature to this land itself. Get back in the canyons where several places, the springs, where the water comes out. If you watch really closely, you will see small animals. Along the creek, the soil is deeper. You get more variety of plant growth in that deeper soil. And that provides more diverse system for birds, for livestock, and wildlife. A good feature of the land is when it starts raining, it reproduces.

Although some of the non-traditional landowners (N = 3) expressed the intention or interest to provide open access for nature-based tourism or education in the future, two of them indicated the reason for operating tourism or education programs was not economic but to share nature and their environmental practices with others.

Most traditional landowners (N = 6) and only 1 non-traditional landowners indicated that their property and its topographical features protected them and the property as family heritage from being impacted by the surrounding development. The topographic features of the property also provide a sense of solitude for many of the informants (N = 3 for non-traditional and 5 for traditional landowners). These two functions are illustrated in the following two excerpts first by a traditional landowner and second by a non-traditional landowner..

> When you get out here, especially when you get down in the creeks and low elevation on the ranch, you feel like you're far far away… The ranch is protected around the edges by ridgelines, high elevations, so it's like the ranch is in a bowl. It's kind of the ranch is protected the way is just by the landscape.

> If I describe the land, probably the main reason we come out here is to get away from the city in a sense. Looking for a piece of land, I would like for something that gets me away from the roads. And this valley is away from the roads.

The function of the property to support a way of life was expressed only by traditional landowners (N = 5). This traditional landowner described his ranch with an emotional tone and stated that his ranch

> has a peaceful and natural aspect to it that seems to still be connected somewhat to a different way of life that probably mostly long gone but was much more common a century ago in this area. And it carries romantic and historic connotations within. That kind of becomes part of our heritage and causes us to feel like it's a special place.

Some informants (N = 2 for non-traditional and 3 for traditional landowners) indicated their property also served the function for research and education. For example, some of them had biologists visiting the property to study plants and wildlife, and the ecosystems that supported specific biological communities. Some opened their properties for educational opportunities for members of certain organizations to study the birds or plants on their property.

The location of informants' property provided the convenience for easy access to the major cities and transportation routes in the area (N = 3 for non-traditional and traditional landowners, respectively). This had enhanced their enjoyment of being out in the country without losing the benefits and services provided by big cities (e.g., medical services, entertainment, and less transportation time to the working place).

Moreover, to traditional landowners (N = 4), being on the ranch also meant relaxing, spiritual renewing and self-improving.

> I spend my own time on the ranch. And there are places where I relax and places that I go to reflect. …Spending time in nature can be very useful in self-growth, self-improvement, and self-development.

Other less frequently identified functions that benefited the informants included providing a healthy living environment for non-traditional landowners (N = 2) and a sense of ownership/independence for some in both groups (N = 1 for non-traditional and 2 for traditional landowners). In addition to the functions that benefited the informants, traditional landowners also indicated their property benefited a larger community and contributed to water (N = 4) and open space (N = 2) conservation in the local area.

Empirical evidence showing the structural and functional aspects of place meanings being integrated into one's self-identity has also been reported by Hull, Lam, and Vigo (1994), Gustafson (2001), and Davenport and Anderson (2005). The functional aspect of place meanings has also been revealed in the research of environmental psychology, and recreation and natural resource management frequently conceptualized as place dependence (Bricker & Kerstetter, 2000; Kyle, Graefe, & Manning, 2005; Stokols & Shumaker, 1981; Williams & Vaske, 2003).

Meanings associated with the biophysical features on informants' property were not always positively evaluated. Some of the natural features were assigned negative values by informants (N = 2 for non-traditional and 5 for traditional landowners) (Table 2). For example, the topographic features of steep slopes were described to be a main cause for flooding, soil erosion, and problems associated with water conservation. The absence of running water and permanent water features were reasons for the lack of diverse biological communities. At the same time, not all the functions had fully satisfied informants' needs. For example, traditional landowners (N = 5) indicated a growing difficulty to support ranching, farming, or hunting as an economic tool on their property.

> There are very few landowners even large landowners that live strictly out of ranching incomes. Because really it takes probably 5 or 6 thousands acres if you try to make a living on ranching. …with the way the ranches have been divided over the years, it makes it more important to have other income.

Another traditional landowner had been earning income from a job outside of his ranch. He explained that

> (T)o be honest, if ranching is more profitable, I'd probably be ranching. But the actual net profit for ranching compared to what you can make the salary position with benefits, it's very difficult to make that as your primary financial.

2.5.1.2. Affective Dimension

Traditional and non-traditional landowners had more in common in the way they interpreted the structural and functional meanings of their property than the way they were emotionally connected to it (Table 4). The theme of emotional meanings most frequently shared by both groups (N = 4 for non-traditional and 6 for traditional landowners) was the expressions of the scenic beauty of the property. Some of them associated the scenic quality of their property with the structural and functional meanings of the property as exemplified by this traditional landowner.

> It's a very beautiful part of the state. It's characterized by very open oak-grass savanna. Main feature of the ranch is Barton Creek, a large creek running through the property and flowing to downtown Austin. Barton Creek joins the Colorado River in Barton Springs in the downtown Austin where people can swim.

In addition to the scenic beauty, the primary reason contributing to non-traditional landowners' affective feelings about their property was their attachment to the natural environment on the property (N = 3) using the following excerpt as an example.

> Having this property out here makes me feel much more connected to the earth and to nature than I think I could ever feel if I lived in a subdivision in a city.

Table 4

Affective meanings of informants' property

Affective Meanings	Frequency	
	Non-Traditional Landowners	Traditional Landowners
Scenic beauty	4	6
Connection to the natural environment	3	0
Lack of deep meaning	1	0
Rootedness/Family heritage	1	7
Identity	0	3

Beyond the connection with the natural environment and scenic beauty of the property, non-traditional landowners rarely displayed strong emotional feelings about their property other than the feeling of home (N = 1). Lack of deep meaning was in fact expressed by a non-traditional landowner who moved to the area three years ago.

> I guess there is no deep meaning to it. We enjoy being in the country…But as far as having any philosophical meanings, there isn't really anything more.

On the other hand, most traditional landowners conveyed deep emotions that were ingrained in the histories associated with their land. That direct involvement in and long-term associations with a physical environment cultivate an affective connection with the environment has also been suggested in the place literature (e.g., Hay ,1998; Lalli, 1992; Milligan, 2003; Tuan, 1977). The second major theme distinguishing traditional from non-traditional landowners was that only traditional landowners expressed a sense of rootedness and family heritage associated with the property (N = 1 for non-traditional and 7 for traditional landowners). On the other hand, the function of the property to connect traditional landowners to the past, and accumulate memories and experiences from directly interacting with the property seemed to enhance their

emotional feelings about the property. Family history and experiences with the family seemed to enhance traditional landowners' connection with the land by strengthening a sense of rootedness as illustrated by these two informants.

> This place has been many things to me because this is where my roots are. I told you how long my family has been here. And I know how hard five generations of people have worked to make it a livable place.

> To me, it's really special because it's a wonderful way of life. The grandparents lived nearby and lots of family. You're working as a family and spent lots of time together, worked the fields, worked the cattle. Now it's special for my children to know their heritage.

Traditional landowners' (N = 3) personal history and memories not only evolved with their property, these experiences and memories also helped define who they had been in the past, which in turn shaped the way they were at the present. Through this process, the land and the meanings associated with it were built into traditional landowners' identity and further molded their thoughts and behaviors. Place meanings appeared to become part of informants' self-identity as indicated by traditional landowners (N = 3). The following excerpt is an example.

> This ranch in someway our ownership or our association with this land helps to define us. It helps to define who we are and becomes a part of our personality…It causes us to modify our behaviors and structures our lives in certain ways that become part of who we are.

Study findings show that traditional and non-traditional landowners varied in the meanings (i.e., the natural environment for non-traditional landowners, and rootedness and identify for traditional landowners in addition to the connection with nature) that contributed to their affective association with the land. The scenic beauty and natural environment seemed to be the primary reasons for non-traditional landowners' emotional connection with their property. On the other hand, in addition to scenic beauty, a sense of

rootedness, family heritage, and an identity embedded in the property constituted the primary emotional meanings that traditional landowners ascribed to their property. Research in recreation and natural resource management is replete with studies suggesting outdoor recreationists develop identities and attachment to natural areas partly because of the emotional feelings they form with these areas (Brandenburg & Carroll, 1995; Bricker & Kerstetter, 2002; Davenport & Anderson, 2005). Nonetheless only limited research (Bonaiuto, Breakwell, & Cano, 1996; Bricker & Kerstetter, 2000; Hammitt, Backlund, & Bixler, 2006; Hay, 1998) has examined how the people-place association might differ among individuals who varied in the extent (e.g., social networks, investment on or responsibility to a place) that they had interacted with the place. Findings of this study suggest that the people-place association may differ among individuals who have made various levels of temporal and material investments on the place where they are connected.

2.5.1.3. Temporal Dimension

The physical, functional, and affective dimensions of the meanings that informants attributed to their property appeared to evolve over time. Two factors were identified that triggered or prevented changes in the meanings (Table 5). The first factor represented an internal force derived from informants' need to express self-identity or preserve important place meanings by introducing changes to the physical environment on the property. Landscape change induced by population growth and development in the area represented an external force that drove the change in place identity. Both internal and external forces seemed to work simultaneously to shape informants' property and the meanings they ascribed to that property.

The need to express self-identity through transforming the physical environment of the property characterized the function of informants' property to facilitate self-expression, which in turn generated changes to the property meanings that were desirable to informants. Most non-traditional landowners (N = 4) expressed that they were driven to purchase land in the area primarily due to the preferred environmental

features supported by the land that offered the opportunity to express who they were and what they liked to do. Non-traditional landowners (N = 5) viewed themselves as land stewards and had invested effort to restore the land and create a habitable environment for native plants and animals.

> When we came up here, this was… just an open valley that was overgrazed by cattle… we let everything grow back up and then we introduced things- most of them were native- and now you can see it's not open any more. So it has changed significantly.

Table 5

Evolvement of place meanings- The temporal dimension of place meanings

Changed meanings	Frequency	
	Non-Traditional Landowners	Traditional Landowners
Restoring/Enhancing the native biological community	5	5
Landscaping/Construction for self-expression	5	0
Economic diversification	0	6
Improving infrastructure for hunting or tourism operations	0	4
Selling part of the property	0	2

Non-traditional landowners (N = 5) also revealed interests in construction and landscaping, and had changed their property by building houses and gardens that were consistent with their own tastes. These activities introduced changes to the property and, therefore, meanings associated with it. The physical environment as a medium for individuals to express their tastes and preferences has also been identified in the place

literature as a function of place identity (Korpela, 1989; Proshansky, Fabian, & Kaminoff, 1983). The enjoyment and pleasure non-traditional landowners derived from the natural environment and scenic beauty of their property also enhanced their attachment to the property as expressed in the feelings they ascribed to the property. However, attachment to the scenic beauty and natural environment alone seemed to be an insufficient motive for non-traditional landowners to develop resistance to changes that were externally induced. In fact, some of the non-traditional landowners (N = 2) stated they might consider moving if the area was dramatically changed although most indicated dramatic change in places surrounding their property was not likely to happen during their lifetime (N = 4). When asking one non-traditional landowner if he would move if the area became more developed and fragmented, he responded that

> Yes, it wouldn't bother me. We can have something else, somewhere else until we get too old to do it. But only if we have to. That's not likely because most of the lands out here is large acreages.

On the contrary, the primary reason that internally drove traditional landowners to make changes to their property seemed to be more connected to their roles as a family member and rancher. These roles were intertwined with traditional landowners' family history and personal experiences associated with the property. This was expressed in the emotions tied to a sense of rootedness, responsibility for protecting family heritage, and manifestation and development of traditional landowners' self-identity. Meanings that traditional landowners associated with the biophysical features and functions of the property supplied the raw materials to fulfill the requirement of playing the role. At the same time, through role playing, traditional landowners manifested their connections with and dependence on the property. The internal force of affective connection and role commitment might have contributed to traditional landowners' intent to continue this relationship into the future as exemplified in the following two excerpts.

> It's enjoyment to work the lands and it's a true love…I'm not leaving here. My family heritage is here.

> My ranch is home to me. It's where I live where I want to be…My lifestyle is evolved around here. My lifestyle is very much devoted to those things that help take care of this property.

However, landscape change in the area was threatening traditional landowners' connection with their property[4]. In order to hold on to the land and to prevent changes induced by population growth and development that would threaten traditional landowners' association with the land, actions were taken to ensure the continuity of this association. These actions in turn brought changes to the property. Traditional landowners adopted new land management practices to maintain the ecological quality or enhance the economic function of the property. Most (N = 6) shifted their economic dependence from livestock operations or farming to hunting or other nature tourism operations to generate higher economic returns in an effort to cope with the increasing costs of keeping a property. In order to create a better environment for hunting and tourism operations, traditional landowners (N = 4) had improved the infrastructure to support hunting and tourist activities. Traditional landowners (N = 5) had also engaged in restoring or enhancing the native plants and animals of their property to maintain the ecological attributes of the property and/or to support hunting or other nature tourism activities. These practices introduced changes to the property and the structural and functional dimensions of their property identity. Through these practices, they were able to maintain their affective association with their property under the pressure of landscape change in the area. At the same time, some of the traditional landowners (N = 2) had to sell part of their property to help sustain the rest of it.

2.5.2. Impacts of Landscape Change on Place Identity

Although most informants, especially traditional landowners, revealed the intent and commitment to continue the relationship with their property, they also realized that change was an integral part of the meanings associated with living on the property due to the evolving landscape in the surrounding area. Two types of landscape change were

[4] Impacts of landscape change on informants' place identity are described in the following section.

identified, including changes in the physical environment and the socio-economic environment. Table 6 lists both types of landscape change and the meanings impacted by the change.

Table 6

Perceived landscape change

	Frequency	
	Non-Traditional Landowners	Traditional Landowners
Physical landscape		
Land development and fragmentation	3	7
Increase in the population and traffic	3	6
Socio-economic landscape		
Increasing land values and taxes	5	7
Declining rural characteristics and agriculture-based economy	4	6
Conflicting approaches of natural resource management	3	5
New economic opportunity	0	2
Increasing regulations	0	2
Problem of trespass	0	2

The increase in development (N = 3 for non-traditional and 7 for traditional landowners), and growth in population and traffic (N = 3 for non-traditional and 6 for traditional landowners) were the main sources identified by informants that contributed to the changes on the physical landscape. Interview data suggested that these changes directly impacted the structural and functional dimensions of informants' property

identity (Table 7). Informants identified that development, such as residential and infrastructure development, significantly impaired the hydrological, biological, and topographic features in the local area and on informants' property. They (N = 3 for non-traditional and 2 for traditional landowners) indicated that development increased the water demand and amount of waste water beyond the capacity of the local hydrological system, which in turn affected water quality and supply on their property. Informants (N = 1 for non-traditional and 4 for traditional landowners) also expressed that the growing number of small-lot properties had led to fragmentation of wildlife habitats and the spread of invasive species). The adverse impacts of landscape change on livestock was identified by traditional landowners (N = 3). The growing development in the area also adversely affected the night sky (N = 3).

Changes to the socio-economic landscape included growing land values and taxes, declining rural characteristics and agriculture-based economy in the area, different approaches of land practices by newcomers, increasing regulations on land management, and the problem of trespassing (Table 6). Informants stated that the increase in land values and taxes (N = 5 for non-traditional and 7 for traditional landowners), and decrease in the agriculture-based economy and rural characteristics (N = 4 for non-traditional and 6 for traditional landowners) due to the surrounding development had imposed financial burdens on them. All the traditional landowners had some form of tax reduction (e.g., wildlife and agriculture exemption). For non-traditional landowners, the financial burden was primarily a consequence of the rising property taxes. However, for traditional landowners, since they tended to own a large tract of land and were dependent on the agriculture-based economy, the financial impact could be more significant. The economic dysfunction as a consequence of landscape change was identified by most of the traditional landowners (N = 5) (Table 7) and is illustrated by the following excerpt.

> Until 10 to 12 years ago, we had a livestock auction where I could take my animals to market for sale about 20 miles from here. But because of the increased urbanization we had, there wasn't enough volume of business to

sustain livestock auction. They went out of business. Now there isn't any single livestock auction market where I can take my animals to close to 80 miles.

Table 7

Impacts of landscape change

	Frequency	
	Non-Traditional Landowners	Traditional Landowners
Impacts on structural and functional meanings		
Water quality/supply	3	2
Wildlife/plants	1	4
Night sky	1	1
Soil erosion	1	0
Livestock	0	3
Economic function	0	6
Impacts on affective meanings		
Emotional connection to the property (e.g., identity, spiritual connection, family heritage, a way of life)	0	4
A sense of independence	0	2

The increasing operation costs for maintaining a property due to the changing socio-economic landscape in the area further contributed to traditional landowners' financial difficulty. However, landscape change was not always negatively evaluated. To some traditional landowners (N = 2), it also meant new economic opportunities (Table 6).

> Subdivision is coming. We enjoy our way of life but it's not gonna be that way much longer… It's been changing all the time anyway. I want to let people enjoy some of the stuff. I take advantage of it but take the stuff which was there and make a little bit of money off it at the same time.

Development brought in people who shared different values and natural resource management with the informants. Informants (N = 3 for non-traditional and 5 for traditional landowners) indicated that the way subdivision residents or landowners new to the area managed and consumed natural resources had caused or would cause problems for wildlife populations and livestock on their property.

Other changes that were of socio-economic nature included increasing regulations for traditional landowners' land practices (N = 2), such as application of pesticide, and fire management, and the problems associated with growing tourist activities in the area that caused visitors to trespass on traditional landowners' properties (N = 2). As a consequence, affective place meanings related to traditional landowners' sense of independent landownership and privacy were infringed upon and negatively impacted by these socio-economic changes.

Furthermore, landscape change, both physical and socio-economic, had generated disturbances to traditional landowners (N = 4) by negatively impacting the affective dimension of their place identity. The impact was evident on traditional landowners perhaps due to their extensive connections with their property.

> (I)t's (attachment to the land) 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.

The effect of landscape change on the affective aspect of place identity was also expressed by another traditional landowner.

> There is a very strong spiritual element living here. That's why it's disturbing

me when I think about the fragmentation.

A sense of continuity with a place valued by an individual helps maintain his/her psychological well-being (Fried, 2000; Twigger-Ross & Uzzell, 1996). It also provides a sense of familiarity and certainty for future interactions in the place (Proshansky, Fabian, & Kaminoff, 1983; Rowles, 1983). Moreover, a sense of continuity associated with places serves as an anchor where an individual can develop and verify his/her self-identity (Hay, 1998). When it is interrupted, according to identity control theory (Burke, 1991b, 2004), psychological distress is likely to occur. Empirical studies have suggested that interruption due to the incongruence between individuals' ideal and perceived place identity may lead to disruption with the individual's sense of coherence (Hull, Lam, & Vigo, 1994), personal identity or emotional ties (Brown & Perkins, 1992; Hay, 1998; Milligan, 2003), and functional dependence on the place (Davenport & Anderson, 2005). In this study, the adverse effects of disturbance on place identity identified in previous research were well illustrated by traditional landowners.

Despite the interruption to the sense of continuity of a place caused by landscape change, sometimes change is necessary to encourage individuals to recognize the consequences of disconnecting with the place they value (Milligan, 1998; Rogan, O'Connor, & Horwitz, 2005) and can further strengthen this relationship (Relph, 1976). This is demonstrated by one of the traditional landowners whose perceptions of the unwanted consequences of landscape change on his ranch had made him more committed to protecting the natural value of the land.

> In some way, it makes me feel more committed to protect the natural value on this property but it's also painful to watch. It's really discouraging. Not only the growth is happening but also how poor so much of this is done. A lot of this doesn't look like its belonged here and not done in a very thoughtful and environmentally sensitive way. That's hard to watch.

On the other hand, most non-traditional landowners indicated because of the location of their property further away from major development and transportation

routes, they did not expect any significant influence of landscape change in the immediate future. If the area did become more congested and fragmented, some of them indicated they would probably just move to another place implying that the natural environment they were attached to was substitutable.

2.5.3. Responses to Landscape Change

Consistent with identity control theory (Burke, 1991a, 1991b, 2004), the disturbing effects of landscape change on informants' property identity that adversely influenced the various aspects of place meanings had urged them to engage in activities to reduce further impacts on the identity. It also forced them to take actions to keep the meanings important to their place identity from being transformed beyond their capacity of tolerance. Both traditional and non-traditional landowners interviewed in the study were connected to their property for different reasons. Non-traditional landowners' connection to their property was primarily embedded in the structural, functional, and affective place meanings ascribed to the natural environment of the property. This connection had motivated their attending workshops or seminars to enhance their natural resource management ability (N = 5) and volunteering in resource conservation or educational activities (N = 2) (Table 8). Non-traditional landowners (N = 3) also explored different strategies (e.g., temporary tax reduction and exemption, or permanent conservation programs) to help them cope with the increasing tax burden and prevent the property from been developed.

Table 8

Strategies to cope with landscape change

Strategies	Frequency	
	Non-Traditional Landowners	Traditional Landowners
Economic diversification	0	6
Conservation easements	0	2
Attending workshops/seminars to improve knowledge of natural resource management	5	5
Participating in civic activities	2	3
Seeking ways to reduce tax burden or permanently protect the property	3	0

Traditional landowners' connection to their property was based on a sense of rootedness, identity, attachment to the scenic beauty and natural environment of the property, and the structural and functional components that supported their emotional connections with the property. This connection had driven their engagement in activities to maintain the integrity of their place identity although not without changing certain aspects of the property (Table 8). Most traditional landowners had been exploring or had introduced hunting or nature tourism as a low-impact and high-return economic alternative to agriculture-based income (N = 6). Two traditional landowners had put the property in conservation easements (i.e., legal agreements by landowners to restrict development on their land) to ensure the land remained minimally developed in perpetuity. Like non-traditional landowners, traditional (N = 5) also attended resource management seminars or nature tourism workshops, and visited other ranches to enhance their knowledge and skills to manage the their property. All these efforts were directed to making their property more resistant to the negative impacts of local landscape change. Furthermore, some of them (N = 3) were actively involved in civic activities to improve the natural resource conditions in the area. These activities included volunteering in conservation organizations, serving as committees in federal-sponsored endangered

species programs, participating in regional planning or public hearings for proposed development. Through these efforts, informants were able to control the direction and level of the impacts of landscape change on their property and thus their property identity.

2.6. CONCLUSIONS

The study employed a qualitative approach based on semi-structured interviews to explore the nature of place identity and effects of landscape change based on a conceptual framework built on the symbolic interactionist approach of identity theory (McCall & Simmons, 1978; Stryker, 1980, 1987) and identity control theory (Burke, 1991a, 1991b, 2004), and place-related literature. This conceptual framework views place identity as consisting of meanings that represent the structural, functional, and affective dimensions of a specified geographic location. Place meanings evolve with time and the dynamics of place meanings constitute the fourth dimension, the temporal dimension, of place identity. Place meanings may not always evolve in the desirable direction. Discrepancy between perceived and ideal place meanings that grows beyond one's capacity of tolerance may impact one's place identity. Negative impacts on place identity may become a motivating force that drives individuals' engagement in activities to restore the balance between perceived and ideal place meanings if the identity is highly valued. The conceptual framework was empirically examined based on the place identity of a convenience sample of landowners that was embedded in their property in the Texas Hill Country. The structural, functional, and affective meanings that informants ascribed to their property and became the defining characteristics of their place identity were first explored. How these meanings evolved (i.e., the temporal dimension) was then examined. Finally, the strategies that informants adopted to cope with unwanted changes were explored.

Study findings revealed that most meanings that informants ascribed to their property were positively evaluated. Moreover, the structural, functional, and affective dimensions of place meanings seemed to be interconnected. The reason for positive

evaluation of place meanings was primarily due to the fact that structural components of informants' property supported the functions that were desirable. At the same time, positive evaluation of the structural and functional meanings of the property seemed to enhance the affective feelings that informants associated with their property. The relationship between the dimensions of structural, functional, and affective may be presented as the diagram shown in Fig. 3.

At the same time, place meanings did not remain static. Manifestation of self-identity and landscape change were the primary forces driving the change in the meanings. Self-expression as an internal force driving the change in property meanings reinforced the function of informants' property to support and sustain their self-identity. Landscape change as an external force transformed the physical and socio-economic landscape of the local area, which in turn generated adverse impacts on the biophysical features and functions supported by informants' property and, therefore, the meanings of the property. Landscape change also posed threats to the continuation of informants' relationship with their property into the future. The adverse effect of landscape change seemed to be more prominent on traditional landowners perhaps due to their extensive interactions with their property (i.e., larger property size, longer family and personal history, and economic dependence). Another reason contributing to the greater effect of landscape change on traditional landowners' property identity could be that traditional landowners were connected to more aspects of the functional and affective meanings they attributed to their property. Like non-traditional landowners, traditional landowners expressed positive evaluations of the different biological and physical attributes on their property. They also enjoyed the many functions (i.e., recreation, socialization, self-expression, environmental past, protection, solitude, convenience, research/education, and a sense of ownership/independence) supported by their property as did non-traditional landowners. However, traditional landowners' property also meant an economic tool, a way of life, an important water source and open space for the local area, and a place where they could go to regenerate and improve themselves. Emotionally, although both traditional and non-traditional landowners were attached to

their property because of the scenic beauty and natural environment on the property, traditional landowners' property also helped them develop a sense of rootedness and identity.

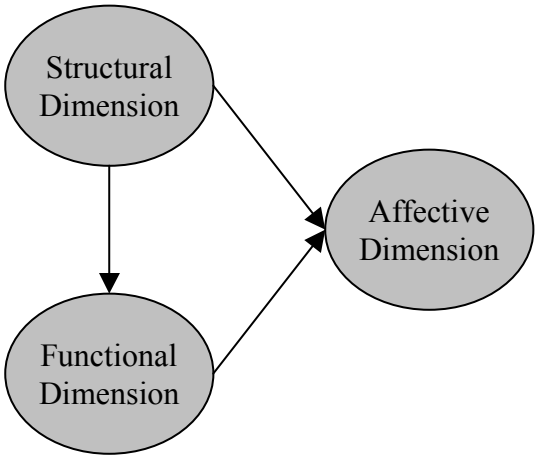

Fig. 3. Interconnectedness of structural, functional, and affective dimensions of place meanings

Both traditional and non-traditional landowners were motivated to adopt or explore measures of resource management to alleviate the negative effects of landscape change on their property. Identity control theory provides a theoretical explanation for the mechanism underlying informants' decision-making relating to the responses to landscape change. The decision to change or maintain place identity can be viewed as an effort to reduce the psychological distress or anxiety resulting from the discrepancy between perceived self-meanings revealed from the external environment and ideal self-meanings that are internally determined. Although both groups had employed difference strategies to cope with unwanted landscape change, perhaps due to the less extensive interactions with the local area and less connection with the different aspects of place meanings, some of the non-traditional landowners expressed the possibility of

giving up their place identity if change continued. Non-traditional landowners' intent to give up their property identity could also be explained by that most of the meanings that comprised their property identity were likely to be substitutable. Their ideal place-identity would perhaps not be seriously affected as long as they could find a place that provided similar meanings. However, for traditional landowners, since their place identity was deeply and extensively ingrained in their property, finding a substitution would be much more difficult if not impossible.

Study findings from this research provided a preliminary understanding of the nature of place identity and the dynamics of the identity as reflected in the meanings that Hill Country landowners attributed to their property. Research using a quantitative approach based on a representative sample will be able to provide more convincing evidence to test and corroborate some of the study findings. Further research is needed to answer the following questions:

a. How good is the three-dimensional model as illustrated in Fig. 3 to be generalized to the other landowners in the Hill Country?
b. Does statistically significant difference of place identity exist between traditional landowners and non-traditional landowners in the area?
c. How does landscape change affect Hill Country landowners' place identity and their behaviors/behavioral intentions to change or preserve the identity?

Quantitative research to explore these questions will also help generate meaningful implications that may contribute to more effective design of resource programs and communication strategies of these programs that may encourage different groups of landowners to support open space conservation by addressing the different aspect of place meanings they value.

CHAPTER III
TESTING THE DIMENSIONALITY OF PLACE IDENTITY: A QUANTITATIVE APPROACH USING COVARIANCE STRUCTURE ANALYSIS

3.1. INTRODUCTION

Research that examined place-related concepts, such as sense of place, place attachment, and place identity, has proliferated in recent years. At the same time, there are critiques for the lack of conceptual clarity in this line of research (Devine-Wright & Lyons, 1997; Hidalgo & Hernández, 2001; Krupat, 1983; Lalli, 1992). Numerous studies have been devoted to empirically examining these concepts and exploring their underlying domains using qualitative and quantitative approaches. Despite research that examined place identity from a qualitative approach primarily viewed this concept as comprising multiple dimensions (e.g., Gustafson, 2001; Korpela, 1989; Twigger-Ross & Uzzell, 1996), much of the quantitative research in this area has measured the concept as a single dimension. Quantitative research has frequently viewed place identity as one of the domains that comprises place attachment (Bricker & Kerstetter, 2000; Kyle, Graefe, & Manning, 2005; Williams & Vaske, 2003), place bonding (Hammitt, Backlund, & Bixler, 2006), or sense of place (Jorgensen & Stedman, 2006).

The purpose of this chapter is to examine a conceptual framework of place identity that integrates the place and identity research based primarily on social psychology, environmental psychology, and human geography. Based on this conceptual framework, place identity is viewed as comprised of three correlated dimensions of place meanings, including structural (i.e., biophysical features), functional (e.g., recreational, social, economic activities, and ecological functions), and affective (e.g., attachment, rootedness, identity) dimensions. This hypothesized model of place identity was tested using a quantitative approach against three alternative models that depicted different dimensional structures of place identity, 1) a single factor model that comprised one dimension of place identity; 2) a first-order model where two dimensions (i.e., cognitive and affective dimensions) of place identity were correlated; and 3) a second-order model

where three first-order factors (i.e., structural, functional, and affective dimensions) loaded onto a single second-order factor (i.e., place identity). The following discussions start with a review of research that examines the dimensionality of different place concepts.

3.2. LITERATURE REVIEW

Sense of place, place attachment, place dependence, and place identity as both single- or multi-dimensional constructs have been conceptualized and empirically tested. The following reviews the place research that adopted either the qualitative or quantitative approach to examining the dimensional structures of these four concepts.

3.2.1. Sense of Place

Sense of place is conceived by many as an overarching concept which encompasses other place-related constructs, such as place meaning, place attachment, and place identity (Hay, 1998; Jorgensen & Stedman, 2001; Shamai, 1991; Stedman, 2002). It is frequently applied to describing individuals' relationship associated with a geographic entity that is cultivated from being in the place (Hay, 1998; Low & Altman, 1992; Tuan, 1977; Williams & Stewart, 1998). Relph (1997) views sense of place as "an innate faculty, possessed in some degree by everyone, that connects us to the world. It is an integral part of all our environmental experiences and it is only because we are first in places that we can then develop abstract arguments about environment, economy, or politics" (p. 208). Stokowski (2002) described sense of place to be "an individual's ability to develop feelings of attachment to particular settings based on a combination of use, attentiveness, and emotion" (p. 369). Sense of place is also conceptualized as including the cognitive and affective aspects of the human-environment relationship. For example, Stedman (2002) referred to sense of place as comprising the symbolic meanings, attachment, and satisfaction an individual or group associated with a geographic setting. Shamai (1991) considered sense of place to be an inclusive construct which encompassed place attachment, national identity and regional awareness. In

general, meanings, affective bonds between individuals/groups and places, and direct place experiences are suggested to be the essential components of sense of place (Cantrill & Senecah, 2001; Hay, 1998; Relph, 1976, 1997; Stedman, 2002, 2003a, 2003b; Tuan, 1974, 1980; Williams & Stewart, 1998).

Discussions in the sense of place literature have focused on conceptual elaboration (Relph, 1976, 1997; Tuan, 1974, 1977, 1980; Williams & Stewart, 1998). Human geography, one of the major contributors to the sense of place research, has greatly influenced this line of research. The phenomenological approach, as the major paradigmatic guidance for human geography, emphasizes the need to experience and examine places as indivisible entities and, therefore, is resistant to view places as components that can be investigated separately and quantitatively (Seamon, 1987; Stedman, 2003b). Relph (1976) has stated that "places are not experienced as independent, clearly defined entities that can be described simply in terms of their location or appearance. Rather they are sensed in a chiaroscuro of setting, landscape, ritual, routine, other people, personal experiences, care and concern for home, and in the context of other places" (p. 29).

Among the few empirical studies that adopted the quantitative research approach, sense of place has been conceived as consisting of one or multiple dimensions. Hay (1998) measured sense of place using a unidimensional scale that includes feelings of place attachment, importance of localized ancestry, feelings of being an insider, and motivation to remain in the place. Likewise, sense of place was conceptualized by Shamai (1991) as unidimensional and differentiated into six levels from not having sense of place, knowledge of being located in a place, belonging to a place, attaching to a place, identifying with the place goals, involving in a place, to sacrifice for a place.

A quantitative approach to exploring sense of place that is based on a unidimensional interpretation may fail to reflect the complexity of the concept (Manzo, 2003; Stedman, 2003b). Jorgensen and Stedman (2001) adopted a hypothesis testing approach to examining the dimensionality of sense of place defined as the meanings individuals or groups ascribed to a geographic setting. They suggested that sense of

place is comprised of the dimensions of place identity, place attachment, and place dependence. This conception of sense of place was tested and compared with the unidimensional structure of the construct. Results suggested better model fit of multidimensional sense of place than the unidimensional one.

3.2.2. Place Attachment

Attachment as a theoretical construct was developed from research on the bond between mothers and babies (Fried, 2000). This type of bond is suggested to be emotional and biologically innate as exemplified in babies' attachment to mothers because of the tendency to seek a secure environment (Bowlby, 1988). Attachment behavior is referred to as "any form of behavior that results in a person attaining or maintaining proximity to some other clearly identified individual who is conceived as better able to cope with the world" (Bowlby, 1988, pp. 26-27). The theory of attachment was applied to explaining the affective connection between humans and physical environments (i.e., place attachment) (Fried, 2000). Place attachment is frequently conceptualized as the affective bond that individuals associate with a meaningful place (Giuliani & Feldman, 1993; Hidalgo & Hernández, 2001; Mesch & Manor, 1998; Milligan, 1998; Shumaker & Taylor, 1983). Shumaker and Taylor (1983) defined it as "a positive affective bond or association between individuals and their residential environment" (p. 233). Fried (2000) referred to it as "the affective ties to local environments" (p. 194). The concept of place attachment was also conceptualized beyond the residential or local settings to include natural or recreational environments (Eisenhauer, Krannich, & Blahna, 2000; Kaltenborn, 1997; Kaltenborn & Williams, 2002; Knopf, 1987; Lee & Allen, 1999; Williams & Roggenbuck, 1989), cultural contexts (Hufford, 1992; Low, 1992), and other physical settings (Hidalgo & Hernández, 2001; Milligan, 1998) using different theoretical approaches. For example, from the symbolic interactionist approach, Milligan (1998) described place attachment to be "the emotional link formed by an individual to a physical site that has been given meaning through interaction" (p. 2).

Place attachment is conceived as not only representing the emotions that people derive from a place but also the cognitive meanings and behavioral patterns they associate with it (Low & Altman, 1992). In fact, much of the place attachment research, both qualitative and quantitative, has examined this concept as being consisted of multiple dimensions. Milligan (1998) examined individuals' attachment to a coffee house using a qualitative research approach. She distinguished between place attachment derived from individuals' past interactions with a physical setting and place attachment associated with the interactional potential in the setting. Interactional past encompasses the experiences or memories that individuals cultivate from being immersed in a physical setting. Interactional potential is referred to as individuals' expectations for what may happen in the setting in the future. Low (1992) suggested that place attachment reflects three aspects of individuals' sociocultural lives, including social, material, and ideological. The social aspects of place attachment include the development of place attachment through family or kinship ties. Disconnection with the land due to loss or destruction of the land or land ownership corresponds to the material aspects of place attachment. Interpretations of the people-place relationship through religion, morality, and mythology are examples of the ideological aspects of place attachment. In a qualitative study by Bricker and Kerstetter (2002) to examine whitewater recreationists' attachment to the South Fork of the American River, five dimensions of place attachment were identified. These included environmental-landscape, recreation, human-social, heritage-historic, and commodity dimensions. Other scholars, such as Feldman (1996), also identified multiple dimensions underlying the construct of place attachment using the qualitative approach.

Dimensionality of place attachment has also been explored using the positivist approach. Some have measured place attachment using unidimensional scales although not without noting the complexity of this concept (Kaltenborn & Bjerke, 2002; Vorkinn & Riese, 2001). For example, Kaltenborn and Bjerke (2002) studied the relationship between place attachment and landscape preference. Although viewing place attachment as encompassing the dimensions of dependence, identity, involvement and satisfaction,

they also indicated that these dimensions were not necessarily distinguishable from one another. The place attachment score used in their analysis was therefore based on the composite mean score of all the measurement items for this construct.

On the other hand, much of the research in recreation and natural resource management viewed place identity and place dependence as the two dimensions that comprises place attachment (Bricker & Kerstetter, 2000; Hou, Lin, & Morals, 2005; Kyle, Mowen, & Tarrant, 2004; Moore & Graefe, 1994; Vaske & Kobrin, 2001; Warzecha & Lime, 2001; Williams, Patterson, Roggenbuck, & Watson, 1992; Williams & Vaske, 2003). Place identity has been purported to reflect the emotional aspect of the human-environment relationships (Giuliani & Feldman, 1993; Williams, Patterson, Roggenbuck, & Watson, 1992) and place dependence (Stokols & Shumaker, 1981), the functional aspect. This two-dimensional structure of place attachment has been tested by Williams and Vaske (2003) who had reported satisfactory model fit, validity, and generalizability. In addition to place identity and place dependence, Kyle, Graefe, and Manning (2005) have suggested social bonding as a third dimension of place attachment and reported acceptable model fit of the three-dimensional model tested on a representative sample of visitors to the Appalachian Trail. Giuliani (2003) has stated that the dimensionality of place attachment is largely determined by how the concept is operationalized because researchers have employed different measurement scales to examine this concept.

3.2.3. Place Dependence

The concept of place dependence was first introduced by Stokols and Shumaker (1981) and represents an "occupant's perceived strength of association between him or herself and specific places" (1981, p. 457). Shumaker and Taylor (1983) suggested that place dependence results from two types of comparisons. The first comparison involves evaluating if places that are currently in use satisfy the needs and goals that individuals pursue in these places based on past experiences at other similar places. The second comparison includes evaluation of places by comparing them with other alternatives that

serve the functions to satisfy similar needs and goals.

Place dependence was adopted in leisure and recreation studies to characterize the functional aspect of attachment associated with a recreation place in a natural or park setting (Bricker & Kerstetter, 2000; Kyle, Graefe, & Manning, 2005; Moore & Graefe, 1994; Williams & Roggenbuck, 1989). Individuals may become dependent on a recreation place because their needs for recreation can be satisfied by its physical characteristics (Vaske & Kobrin, 2001; Williams & Vaske, 2003). Place dependence has frequently been measured as a unidimensional construct. This concept and place identity are viewed as comprising the two dimensions of place attachment (Bricker & Kerstetter, 2000; Kyle, Graefe, & Manning, 2005; Moore & Graefe, 1994; Vaske & Kobrin, 2001; Williams & Vaske, 2003).

3.2.4. Place Identity

Place identity is yet another theoretical construct that has been applied to the study of individuals' interactions with specific geographic settings. An early effort to link the human-environment relationship to self-identity can be traced back to Fried's work (1963) on spatial identity. According to Fried, spatial identity was "a phenomenal or ideational integration of important experiences concerning environmental arrangements and contacts in relation to the individual's conception of his own body in space" (p. 156). The identity aspect of the people-place relationship was further developed by Proshansky and associates (1978, 1983, & 1987). Proshansky, Fabian, and Kaminoff (1983) defined place identity as "a sub-structure of the self-identity of the person consisting of… memories, ideas, feelings, attitudes, values, preferences, meanings, and conceptions of behavior and experience which relate to the variety and complexity of physical settings that define the day-to-day existence of every human being " (p. 59). Likewise, Relph (1976) stated that the physical characteristics of a place, activities supported by and meanings attributed to the place may be integrated one's self-identity. Although this conception of place identity has been criticized as too inclusive and general with an overemphasis on the individualistic aspect of identity

(Dixon & Durrheim, 2000; Twigger-Ross, Bonaiuto, & Breakwell, 2003), it greatly contributed to the early advance of the place theory by integrating environmental psychology and social psychology to explain this aspect of human-environment interaction (Krupat, 1983).

Place identity as defined by Proshansky and his colleagues has been adapted and extended by many to explore individuals' identity with different types of environment. These include built environments and local communities (Dixon & Durrheim, 2004; Feldman, 1990; Hull, Lam, & Vigo, 1994; Lalli, 1992; Milligan, 2003; Twigger-Ross & Uzzell, 1996), recreation and natural settings (Blake, 2002; Bricker & Kerstetter, 2000; Cantrill & Senecah, 2001; Jorgensen & Stedman, 2001; Kyle, Graefe, Manning, & Bacon, 2004; McCabe & Stokoe, 2004), and favorite places (Abbott-Chapman & Robertson, 2001; Korpela, 1989). Studies have also been applied to investigating place identity at different spatial levels. Bonaiuto et al. (1996) examined place identity at the spatial scales of a local town and the nation of the U.K., and Cuba and Hummon (1993) at the scales of dwelling, community, and region.

Various research approaches have been applied to studying place identity. It has been discussed conceptually (Proshansky, 1978; Proshansky, Fabian, & Kaminoff, 1983; Relph, 1976), and tested empirically using both qualitative (Blake, 2002; Hull, Lam, & Vigo, 1994; Korpela, 1989; Twigger-Ross & Uzzell, 1996) and quantitative approaches (Bricker & Kerstetter, 2000; Kyle, Graefe, & Manning, 2005; Moore & Graefe, 1994; Vaske & Kobrin, 2001; Warzecha & Lime, 2001; Williams, Patterson, Roggenbuck, & Watson, 1992; Williams & Vaske, 2003).

Research based on qualitative data has primarily identified place identity as a multidimensional construct. Hull et al. (1994) identified six place attributes that contributed to individuals' self-identity, including personal values and accomplishments, personal and cultural history, emotions/feelings, distinctive characters of the place, person-environment fit, and reference to a group. Korpela (1989) adopted the model of self-regulation (Vuorinen, 1986) and viewed place identity as "consisting of cognitions of those physical settings and parts of the physical environment, in or with which an

individual- consciously or unconsciously- regulates his experience of maintaining his sense of self" (p. 245). Place identity was operationalized as comprising meanings that individuals used to describe their favorite places in terms of their feelings and actions associated with the places. Thirteen dimensions of meanings that participants in the study ascribed to their favorite places were identified, including pleasure, familiarity, belongingness, clearing one's mind, relaxation, freedom of expression, control, humanization, memories, physical features, privacy, togetherness, and activities performed in the places. A multi-dimensional concept of place identity was proposed by Twigger-Ross and Uzzell (1996) based on Breakwell's (1986) identity process theory. Twigger-Ross and Uzzell suggested four principles, including distinctiveness, continuity, self-esteem, and self-efficacy, determine why place meanings are assimilated into or accommodated by one's self-identity. These principles were applied to exploring why and how individuals became identified with a place. Gustafson (2001) also identified aspects of place meaning, including individuals' life paths, emotion, activity, and sources of self-identity, that contribute to development of an individual's sense of self.

Research has also employed quantitative methods to explore place identity. Bonaiuto, Breakwell, and Cano (1996) have conceptualized place identity as the part of environmental meanings that are integrated into one's self-identity. Although recognizing place identity as a complex and multidimensional construct, Bonaiuto et al. (1996) measured students' local identity and national identity based on a single dimensional scale. Likewise, Cuba and Hummon (1993) defined place identity as "an interpretation of self that uses environmental meanings to symbolize or situate identity" (p.112). Place identity associated with respondents' dwelling, community, and region was measured by one item each. Quantitative measurement of place identity as a unidimensional construct has also been applied to much of the research in leisure, recreation and natural resource management. Place identity in this line of research has frequently been viewed as comprising the affective feelings or emotions that individuals ascribe to recreation or natural settings. Along with place dependence (i.e., the functional meanings of places) place identity is operationalized as a component of place attachment and is measured

using a one-dimensional scale (Bricker & Kerstetter, 2000; Kyle, Graefe, & Manning, 2005; Moore & Graefe, 1994; Moore & Scott, 2003; Schreyer, Jacob, & White, 1981; Vaske & Kobrin, 2001; Warzecha & Lime, 2001; Williams & Vaske, 2003). Likewise, place identity is also conceived as a unidimensional component of sense of place (Jorgensen & Stedman, 2001) and place bonding (Hammitt, Backlund, & Bixler, 2006).

In spite of the fact that many place studies have recognized the complex nature of place identity, especially when the concept was defined based on place meanings, there has been a limited use of multidimensional scales to quantitatively measure this concept. For example, Lalli (1992) considered place identity as part of self-identity and measured it in terms of the dimensions of uniqueness and characteristics of a place, continuity with personal past in the place, feeling at home in the place, perception of familiarity, and commitment to the place.

Significant inconsistency among different research approaches can be identified in the ways that place identity and other related concepts were conceptualized and operationalized. It often seems that even when complexity and multidimensionality of place concepts are recognized, they were rarely reflected in the measurements (Stedman, 2003b). Place research has been criticized for the proliferation of different terms and vagueness of their definitions (Devine-Wright & Lyons, 1997; Giuliani, 2003; Kaltenborn, 1998; Lalli, 1992). Despite the tremendous amount of effort invested by researchers in various disciplines, the contribution of place research to developing a coherent place theory has been limited partly due to the lack of integration among different disciplines and research approaches (Hidalgo & Hernández, 2001; Jorgensen & Stedman, 2001; Twigger-Ross, Bonaiuto, & Breakwell, 2003). On the other hand, Patterson and Williams (2005) have recently provided a different perspective related to the evaluation of place research and its contribution to theory development.

Patterson and Williams (2005) indicated that many place studies are examples of interdisciplinary research programs that represent "the site of actual application of science, where theoretical concepts are developed and empirically tested and where traditional disciplinary foundations (e.g., environmental psychology, geography) are

most active. ...Discussions of research programs are typically organized within a discipline according to either different conceptual schools of thought or different substantive concerns within the discipline " (p. 363). Given that research programs within various disciplines examine different place concepts based on the fundamentally different assumptions associated with specific paradigms and worldviews, place theory would likely benefit from the knowledge generated by different research programs if scholars remain open to diverse approaches.

The current study adopts this perspective of progression on the development of place theory and recognizes the contributions of various research programs and their paradigmatic origins. It also recognizes the need for solid theoretical underpinning that provides fundamental assumptions to guide a research program. In this study, identity theory that has its origins from symbolic interactionism of social psychology is adopted to provide the theoretical basis. Moreover, conceptualization of place identity is informed by research primarily from the literature of environmental psychology and human geography as described in Chapter II. A conceptual framework of place identity that comprised three domains, including structural, functional, and affective dimensions, was developed from this literature. The purpose was to empirically test place identity as a multidimensional construct and compare it with other plausible conceptions that have been adopted in place research.

3.3. CONCEPTUAL FRAMEWORK

This study adopts a symbolic interactionism-based identity theory that views identity as being comprised of meanings that form the defining characteristics of an identity (Burke & Tully, 1977). Self consists of multiple identities that are ranked hierarchically based on the centrality and salience of the identities to an individual (McCall & Simmons, 1978; Stryker, 1980). Whether an identity is to be played in a social interaction is based on the salience of the identity in that specific interaction. In other words, identity salience represents the probability of an identity to be manifested in a social interaction (Stryker, 1980, 1987). Meanings defining the identity salient in an

interaction help guide the individual's responses to the stimuli from the interaction (Stryker, 1980; Stryker & Statham, 1985). This study extends the application of symbolic interactionism that focuses primarily on interactions in the social environment (Wells & Stryker, 1988) to the physical environment to conceptualize individuals' place-identity. Based on this approach, place identity is defined as the meanings that an individual ascribes to a geographic location through his/her interaction in and with the socio-economic and biophysical environment in the location and become the defining characteristics of his/her self-identity. A review of place literature in Chapter II has identified three dimensions of place meanings, including structural, functional, and affective. The structural dimension of place meanings consists of the tangible objects (e.g., biological and physical features) and spatial organization (e.g., location) of a specific geographic location. The functional dimension is referred to as the activities, including social, economic, and ecological, that are supported by the place. The affective dimension of place meanings includes the emotions and feelings of attachment, rootedness, and identity that individuals ascribe to the place.

Based on this conceptual framework, Model A (Fig. 4) that hypothesized place identity as comprising three first-order dimensions of structural, functional, and affective that were correlated with one another was evaluated based on its model fit, validity, and internal consistency. At the same time, alternative models of place identity that have been examined in place research were tested and compared with Model A to provide evidence if the model proposed in this study offered a better explanation than the existing ones (Kline, 2005). Since place identity has rarely been examined as a multi-dimensional concept, the dimensional structures of similar concepts, including sense of place and place attachment[5], that have been tested in other place concepts were viewed as plausible alternatives to the proposed dimensional structure of Model A.

[5] Some studies have conceptualized sense of place and place attachment, as reviewed in the previous section, as being comprised of meanings that individuals attribute to places.

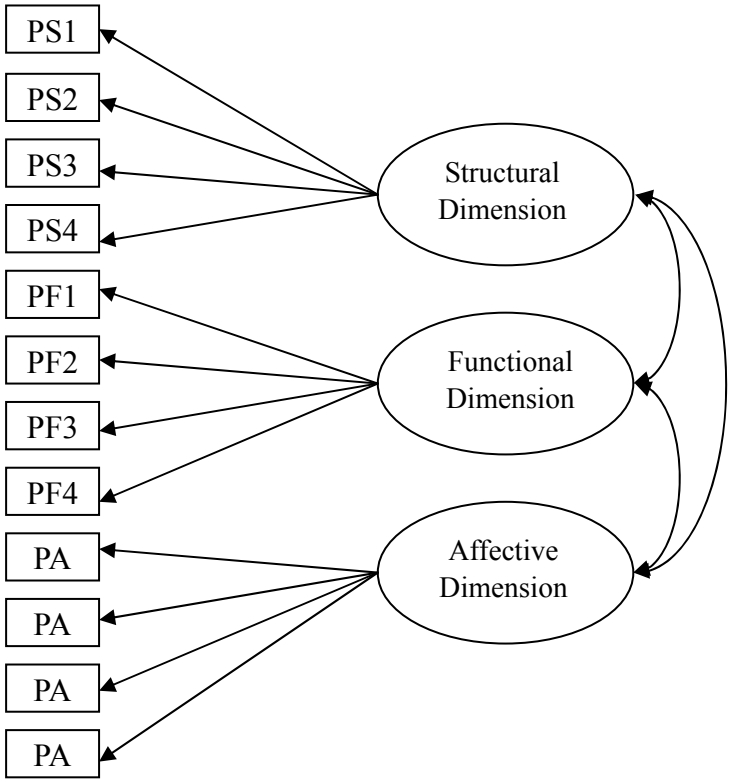

Fig. 4. Model A: First-order model- Three dimensions (Sx are measurement item for the structural dimension; Fx are measurement items for the functional dimension; Ax are measurement items for the affective dimension)

Model B (Fig. 5) resembled the conceptualization of place attachment as a two-dimensional concept that consists of place dependence and place identity (Bricker & Kerstetter, 2000; Vaske & Kobrin, 2001; Williams, Patterson, Roggenbuck, & Watson, 1992; Williams & Vaske, 2003). Since the functions of a place are highly dependent on the presence of certain biophysical attributes, the structural and functional dimensions in Model A were combined into the cognitive dimension similar to the dimension of place dependence in the place-attachment research. The affective dimension in Model A remained unchanged and corresponded to the dimension of place identity of place

attachment. Therefore, the dimensional structure of place identity in Model B hypothesized two correlated dimensions, including the cognitive and affective dimensions. Model C (Fig. 6) illustrated a common conceptualization of place identity as a uni-dimensional concept that consists of one of the dimensions of place attachment. In Model C all the measurement items of place identity were loaded onto one dimension of place identity. In a fourth model, three first-order factors (i.e., the dimensions of structural, functional, and affective) were loaded onto a single second-order factor (i.e., place identity) was tested (Fig. 7). Conceptualization of place identity as a higher-order factor that explains the lower-order factors of different dimensions of place meanings was similar to the conceptualization of sense of place tested by Jorgensen and Stedman (2001).

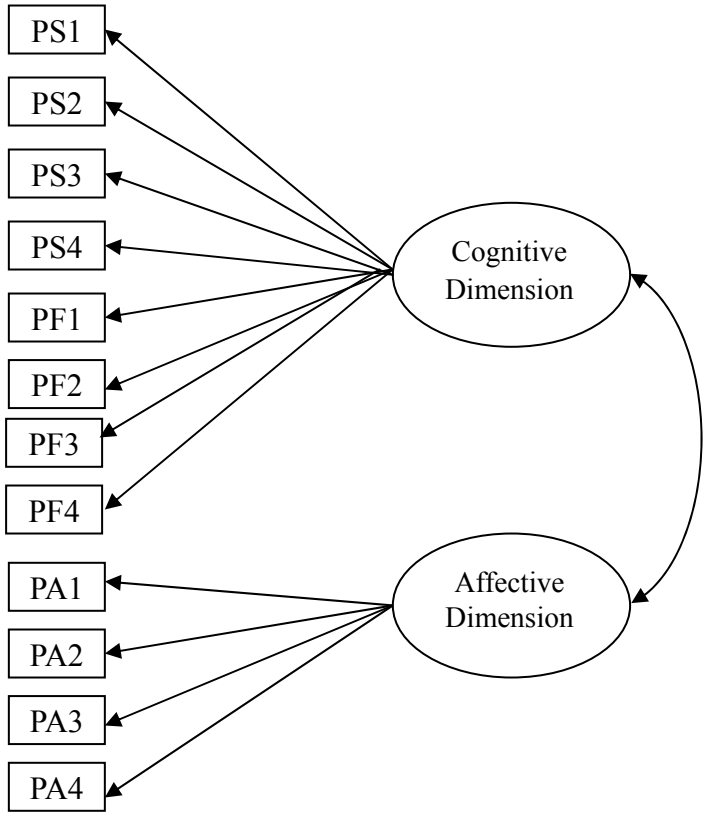

Fig. 5. Model B: First-order model- Two dimensions (Sx and Fx are measurement items for the cognitive dimension; Ax are measurement items for the affective dimension)

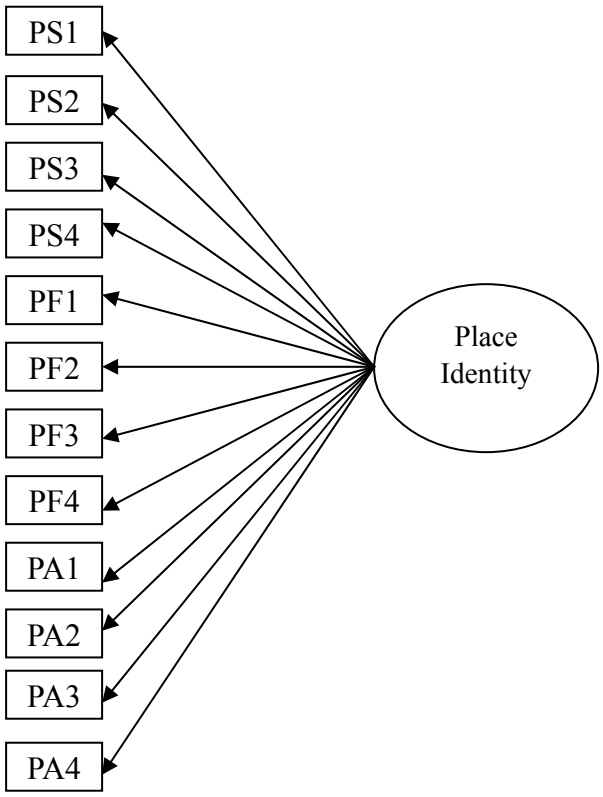

Fig. 6. Model C: One-factor model (Sx, Fx, and Ax are measurement items for place identity)

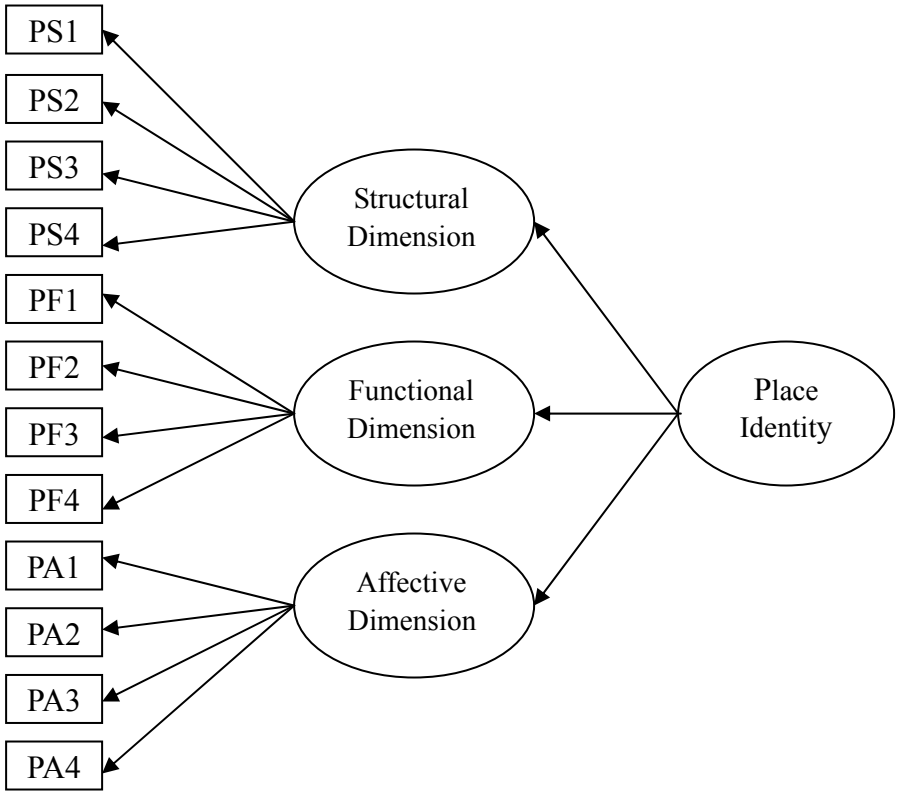

Fig. 7. Model D: Second-order model (Sx = measurement item for the structural dimension; Fx = measurement items for the functional dimension; Ax = measurement items for the affective dimension)

In addition to testing for the dimensionality of place identity, the study also examined if differences in mean scores of the place-identity dimensions existed between different types of landowners using mean and covariance structure (MACS) analyses. Conventionally, mean differences across groups were estimated based on analyses using observed variable means (e.g., t-test, ANOVA) that did not taking into account the effects of measurement errors (Byrne, 1998; Li, Harmer, & Acock, 1996). Moreover, an assumption underlying the analyses based on observed variables[6] is construct

[6] Variables that are directly measured. They are the manifest indicators that represent the underlying construct or the latent variable (Byrne, 1998). In this study, all the measurement items were observed

compatibility or measurement equivalence across groups (Li, Harmer, & Acock, 1996; Little, 1997; Vandenberg & Lance, 2000). Construct compatibility is referred to as the "mathematical equality of corresponding measurement parameters for a given factorially defined construct (i.e., the loadings and intercepts of a construct's multiple manifest indicators) across two or more groups" (Little, 1997, p. 55). Two sources may contribute to the variation in manifest indicators of latent constructs. These include the common variance explained by the latent constructs that are measured by observed variables and specific sources of variance not explained by the latent constructs (i.e., measurement errors) (Maruyama, 1998). Measurement equivalence holds when differences across groups are primarily related to common variance explained by the latent constructs instead of measurement errors (Meredith, 1993). MACS analyses are superior than the conventional statistic approaches to analyzing group differences based on observed variables in that this analytical approach establishes measurement equivalence across groups prior to examining group differences while controlling measurement errors that may contribute to biases and errors (Little, 1997). When measurement equivalence across groups is supported, comparisons of the latent constructs will entail an unambiguous interpretation if any construct differences, such as the means of the latent constructs, is identified (Little, 1997; Meredith, 1993).

From the findings of landowner interviews described in Chapter II, informants who differed in the size of their property, length of ownership, and economic dependence on the property were found to vary in their emphases on different aspects of place identity. Quantitative testing would provide statistical support to corroborate this finding. However, differences in landowner responses to the place-identity scale might be contributed by factors other than the aforementioned landowner characteristics. These factors might include unreliable measurement items (e.g., ambiguous wording or meanings) and random measurement errors due to the unique situations confronted by each individual respondent. Using the MACS approach helped establishing measurement equivalence across landowner groups and ensured that biases and errors caused by

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variables and each dimension of place identity represented a latent variable.

systematic and random measurement errors were minimized. Without measurement equivalence been hold, it is difficult to disentangle if the influences of construct mean differences were due to differences in landowner characteristics or other reasons, such as that the scale was opertionalized differently to different landowner groups or interpreted differently by different landowner groups.

Despite the merits of analyzing latent means based on covariance structure analysis, such as MACS, only relatively few studies have been conducted using this approach (Byrne, 1998; Kyle, Graefe, & Manning, 2005; Li, Harmer, & Acock, 1996). Findings from the qualitative interviews with a non-random sample of landowners in the area showed that landownership characteristics, including property size, length of family history, and economic dependence on the property, might have contributed to the variations in their place identity[7] that was embedded in their property. To quantitatively test if statistically significant differences did exist between different landowners, the sample was divided into subgroups based on size of property, length of family ownership, and if wildlife and/or livestock operation was present on the property. The purpose of this exercise was to test the hypothesis that different types of landowners would display various levels of place identity associated with their property controlling the variation in all other parameters estimated in the model.

3.4. METHODS

3.4.1. Instrument Development

Since most quantitative studies conceptualized place identity as uni-dimensional and many who operationalized the construct as multi-dimensional defined it from different theoretical bases and contexts, the place-identity scale adopted in this study was primarily derived from a series of scale development procedures. Scaling procedures from Step 1 to Step 3 suggested by Netemeyer, Bearden, and Sharma (2003) served as the major guidelines. Deviation was taken from the 4th step of finalizing a scale

[7] Landowners' place identity associated with their property will be referred to as their property identity thereafter.

suggested by Netemeyer et al. (2003). Instead of applying the refined scale from the first 3 steps to different samples, confirmatory factor analysis was applied to further improve the scale using the same set of data for Steps 1 to 3 as limited by only one-time point data were available. The four steps of scale development adopted in this research are described in the following.

3.4.1.1. Construct Definition and Content Domain

The first step of scale development started with identifying an unambiguous definition of the construct and its underlying dimensions based on sound theoretical and literature support (Netemeyer, Bearden, & Sharma, 2003). As stated earlier in this chapter, the symbolic interactionism-based identity theory was employed as the theoretical basis to define place identity. The three-dimensional structure of place identity, including structural, functional, and affective dimensions, was constructed based on the literature of place and place meanings. Items used to measure the three dimensions were effective items that were reflected by the latent constructs of the three place-identity dimensions. That is, the scores of the measurement items are theoretically influenced by the place-identity dimensions that the items intend to measure.

3.4.1.2. Generating and Judging Measurement

The structural, functional, and affective meanings that were identified from the interviews with Hill Country landowners were used to develop items to measure the respective dimension of place identity (Table 9). Furthermore, two items (Item #17 and Item #18 in Table 9) adapted from the existing place-identity scale that is operationalized as the affective aspect of the human-place relationship (Williams & Vaske, 2003) were also included in the initial item pool to measure the affective dimension. Two types of validity, including content and face validity, were addressed during the process of generating the initial pool of measurement items.

Content validity, according to Haynes, Richard, and Kubany (1995), represents "the degree to which elements of an assessment instrument are relevant to and

representative of the targeted construct for a particular assessment purpose "(p. 238). Elements of an assessment instrument include all the factors from individual items, response formats, to instructions of a measurement process. Designs of these elements affect how well the data reflect the targeted construct as theoretically defined. Representativeness refers to the degree to which the elements characterize the facets or domains of the targeted construct. Content validity in this study was addressed by including multiple items that represented the commonly identified meanings in the three domains of place identity that Hill Country landowners attributed to their property as identified from the preliminary study and existing measurements. Study participants were asked to indicate “to what extent you agree or disagree with the following statements regarding your feeling about your property." A 7-point scale where 1 represented “strongly disagree,” 4, “neutral,” and 7, “strongly agree,” was adopted as the response format.

Face validity is referred to that the operationalization of a construct (i.e., the measurement scale of the construct) "on its face it seems like a good translation of the construct" (Trochim, 2001, p. 67). Netemeyer et al. (2003) suggested that face validity is achieved when the response format of an instrument is easy for respondents to use, has a proper reading level, is clear, and the instructions are easy to read.

Both content and face validity of the initial item pool was examined by experts (i.e., the five committee members) and some of the graduate students in the department.

Table 9

Factor loadings and Cronbach's alpha coefficients (pretest)[ab]

Measurement items	Structural dimension[c]	Functional dimension[c]	Affective dimension[c]
Structural dimension (Eigenvalues = 5.18)			
1. The Texas landscape is scenic	.40		
2. The natural environment of the state is of great value	.64		
3. Open space, including large tracts of agricultural and natural lands, is an important characteristic of the state	.65		
4. Being able to see wildlife in the state is important	.59		
5. It doesn't matter to me if the native plants of Texas will be kept in the state forever			
6. Water is critical in maintaining the living quality in Texas	.47		
7. Texas would be less special if the rural character declined	.47		
8. The state has its unique cultural features			.57
9. There are places (e.g., a park, river/creek, lake, community, or ranch/farm) in Texas that are special to me	.43		.55
10. Agriculture is an important part to the state's economy	.73		
Functional dimension (Eigenvalues = 3.34)			
11. Outdoor recreation in Texas is an important part of my life			.45
12. Texas provides me a quality living environment		.66	
13. Texas provides me lots of activities that I enjoy		.66	
14. Texas provides me the economic opportunities that I prefer for my future career		.67	
15. The interactions with my close family members in Texas are valuable			.68

Table 9

(Continued)

Measurement items	Structural dimension[c]	Functional dimension[c]	Affective dimension[c]
Affective dimension			
16. I feel at home in Texas		.51	.70
17. I strongly identify myself as a Texan			.82
18. I feel attached to the natural environment of the state			.64
19. I feel connected to what has happened in the Texas history			.72
20. If I were to move to other state, I would miss my friends in Texas		.43	.51
21. I have deep family roots in Texas			.86
Cronbach's alpha	.74	.71	.86

[a] Measurement items are shown under the intended dimensions.
[b] Only loadings greater than .40 are shown.
[c] 24.67% variance in the structural dimension, 16.14% variance in the functional dimension, and 11.64% variance in the affective dimension was explained.

3.4.1.3. Designing and Conducting Studies to Develop and Refine the Scale (Pretest)

Twenty-one items were generated as a result of Step 2. A pretest was implemented to a convenient sample of students (N = 120) to refine the measurement items. According to Clark and Watson (1995), a sample size between 100 to 200 is considered adequate for the purpose of pilot tests. Students were recruited from four courses offered in the Department of Recreation, Park & Tourism Sciences at Texas A&M University by asking for voluntary participation. Since most students did not own a property in the Hill Country, the 21 items were modified to measure students' place identity associated with the state of Texas (Table 9).

Principal component analysis (PCA) where the number of factors was set to be three and varimax rotation were used to 1) examine the internal consistency of the measurement items for each of the three place-identity dimensions; and 2) detect items that were problematic due to low factor loadings (< .50) (Netemeyer, Boles, &

McMurrian, 1996), extremely high factor loadings (> .90) (Netemeyer, Bearden, & Sharma, 2003), low interitem correlations (< .20) (Bearden, 2001), low corrected item-to-total correlations (< .35) (Bearden, 2001), or poor loadings on intended factors or high cross-loadings (Netemeyer, Boles, & McMurrian, 1996). Items that were detected with these problems were deleted or reworded. Since the purpose of this study is confirmatory, that is, to test a hypothesized factorial structure that was theory-driven, using PCA to set the number of factor to 3 was to identify problematic items that did not achieve the aforementioned criteria. Confirmatory factor analysis was applied in the latter step to confirm if the hypothesized three-factor structure of place identity fit the data well.

In addition to the measurement items of place identity, one additional item was included in the pretest to examine concurrent validity of the three place-identity dimensions as the criterion variable to evaluate the scale validity (Kline, 2005). Concurrent validity is achieved when the associations between the three dimensions of place identity and the criterion variable are in the same direction as expected. The item asked students to what extent they agreed that they would like to see Texas remain pretty much the same as it had been over the next 10 years. It was expected that high scores on the three place-identity dimensions would be associated with a high score on this item. Pearson correlations revealed that the relationships between this item and the three dimensions were in the same direction as expected (Table 10).

Table 10

Predictive validity of the initial place-identity scales

		Structural dimension	**Functional dimension**	**Affective dimension**
I would like to see Texas remain pretty much the same as it has been over the next 10 years.	Pearson Correlation	.32**	.50**	.41**
	N	116	117	116

** Correlation is significant at the 0.01 level (2-tailed).

Landowners who participated in the preliminary study and experts who had extensive experience interacting with Hill Country landowners were asked to review the modified scale and provide feedback to further refine the scale. The scale was again tested on a small sample of Hill Country landowners who attended a natural resource management workshop at the Cibolo Nature Center in Berne, Texas in November, 2006. Seventy copies of questionnaire were distributed and 25 were returned completed. Results of the completed questionnaires were used to help further improve clarity of wording and understandability of the questions.

3.4.1.4. Testing the Dimensionality of Place Identity

The measurement scale (Table 11) resulted from the previous three steps was tested on a random sample of Hill Country landowners. The scale was modified based on the results of confirmatory factor analysis to improve model fit, validity, and internal consistency. The rest of this chapter is devoted to describing the procedures from sampling, data collection, data screening, model testing and respecification, results, to discussions and conclusions of testing for the dimensionality of place identity based on covariance structure analyses.

3.4.2. Study Area

Three counties in the Hill Country area, including Hays, Blanco, and Gillespie County, were selected for data collection to quantitatively test and refine the place-identity scale. The three counties are located to the west of Austin and to the north of San Antonio (Fig. 1), and have experienced different levels of change in some of the sociodemographic (U.S. Census Bureau, 2006) and landuse (NASS, 2007) characteristics influenced by urban expansion from both metropolitan areas.

The population in Hays (48.7%) and Blanco (41.0%) has increased rapidly during 1990 and 2000. Population growth in both counties have greatly exceeded the average growth rate of Texas (22.8%). On the other hand, the population in Gillespie has grown 21.0% during 1990 and 2000, a little less than the state average. Similarly, Hays

has the largest increase (41.2%) in housing unit during the same period followed by Blanco (28.6%) and Gillespie (19.8%).

The numbers of farms and ranches in the three counties have increased by 7.8%, 7.3%, and 6.3%, respectively, while the number of farms and ranches has remained almost unchanged (.3%) throughout the state during 1997 and 2002. Regarding the overall acreage of land in farms and ranches, Hays has the greatest reduction by 14.9% followed by Gillespie, 9.2%, and Blanco, .7%. The average farm or ranch size has also decreased in the three counties. Hays has the smallest average size (312 acres in 1997 and 252 acres in 2002) compared to Blanco (536 acres in 1997 and 497 acres in 2002) and Gillespie (413 acres in 1997 and 356 acres in 2002). Moreover, the average size of agricultural land in Hays (19.2%) has decreased more than Blanco (7.3%), Gillespie (13.8%), and the state (3.4%). The market value of farmland and ranchland has greatly increased during the same 5 years with Blanco having the largest increase from $1,252 in 1997 to $2,441 in 2002, an increase of 95.0%. The market value has increased from $1,332 to $1,994 in Gillespie (50.8% increase) and from $2,023 to $2,877 in Hays (42.2% increase). The average market value of farmland and ranchland in the state has increased only 24.7% from $616 to $768.

Census data have shown that population and housing unit have increased at different rates in the three counties. The data also suggested that the agricultural land has been transformed for other uses and the average size of the land in these counties has become smaller, an indication of fragmentation. The increase in the market value of agricultural lands is likely to further encourage landholders to sell the land for a higher market value. In general, Hays has experienced greater changes and fragmentation compared to Blanco and Gillespie during. However, Blanco seems to be at an early stage of change and fragmentation given the higher than the Texas average of growth rates in population and housing unit and the greatest jump of the market value of agricultural land during the past few years.

Table 11

Refined measurement scale for place identity

Structural dimension (6 items)
1. The natural environment makes the property special
2. Water features are a crucial element of the property
3. The terrain is an essential quality of the property
4. Native wildlife is an important feature of the property
5. Native plants of the property are of little value to me
6. 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)
Functional dimension (7 items)
7. The property provides the opportunity to work on the land
8. The property provides a quality living environment
9. The property provides an important source of income
10. The property is a great place to enjoy the outdoors
11. I enjoy having people visit me on the property
12. I enjoy the friendship with neighbors
13. There are better places to enjoy the activities I do on the property
Affective dimension (6 items)
14. The property says a lot about who I am and what I like to do
15. The property is important to my family heritage
16. I feel at home when I'm here
17. I feel the property has become a part of me
18. I feel spiritually connected to the property
19. The property doesn't mean much to me

3.4.3. Sampling

The population of the study was landowners who owned or managed properties of at least 10 acres in Hays, Blanco, or Gillespie. Owners who possessed properties of less than 10 acres were excluded from the study because of their relatively small impacts on resource management for open space conservation in the area and limited resources available to implement the survey to a larger population. Property tax records were obtained from the County Appraisal Offices of the three counties and combined to form the sampling frame. After excluding individuals of property sizes less than 10 acres, 11,116 records were retained with property sizes ranging from 10 to 14,766 acres.

Two-step stratification, first based on property size and then on the counties where the properties were located, was applied to sampling. The two stratification criteria were used because it was assumed that the property size and location of a property were likely to influence responses to the key variables (i.e., place identity and perception of landscape change) to be measured in the survey (Schutt, 2004). In addition to examining the dimensional structure of place identity, the survey was also concerned with how landowners' place identity and their perception of landscape change would affect their intention to participate in government funded land improvement programs, cooperative land management organizations, conservation easements, and nature tourism operations. Participation in these programs or organizations often requires a minimum of 50 acres of property. This size is viewed necessary to generate effective outcomes (personal communication with Texas Parks and Wildlife Department personnel). However, it was also recognized that natural resource impacts from smaller property landowners, especially those who own properties proximate to Austin or San Antonio, were becoming more significant. The first step of sampling included stratifying landowners into three groups, those who owned small, medium, and large properties respectively. Six thousand one hundred and thirty-nine landowners who possessed properties between 10 and 49 acres were categorized into the small-property owner group. The remaining property records were further categorized into two groups using the median (158 acres) between the property size of 50 and 14,766 acres as the cutting

point. 2,489 landowners of property sizes between 50 and 157 acres were grouped into the medium-property owner group and 2,488 landowners of property sizes between 158 and 14,766 acres into the large-property owner group.

The second step of stratification involved selecting an equal number of landowner who owned a property in Hays, Blanco, and Gillespie from the small-, medium-, and large- property groups. It was assumed that individuals who owned properties close to Austin and San Antonio were more likely to encounter a higher level of pressure of population growth and urban development, and impacts of landscape change induced by these two factors. An equal number of 120 landowners were randomly selected from each of the three counties in each property size category. This resulted in an overall sample size of 1,080 (120 landowners/county-property size category × 3 counties × 3 property size categories). To adjust the disproportion of each stratum in the sample resulted from this sampling procedure to that in the population, data collected from each stratum were weighted to reflect its true proportion in the population (Schutt, 2004). For example, the probability of selecting a small property owner of Hays County from the sample was 10.9% (33.3% probability of sampling a small property owner and 33.3% probability of sampling a property from Hays). However, the probability of sampling a small property owner in Hays from the sampling frame was 20.9% (55.2% probability of sampling small property owners and 38.0% probability of sampling a Hays County property owner). A weight of 1.91 (20.9% divided by 10.9%) was given to small property owners of Hays County in the sample to reflect the true proportion of this population in the sampling frame.

3.4.4. Survey Procedures

The survey was administered using the multiple-contact procedure adapted from Dillman (2000). The procedure included an advance letter, two waves of survey mailings, and two reminder postcards. A pre-survey letter was sent to the landowners identified from the sampling procedure to notify them about the purpose of the study and to let them know that a questionnaire would be sent to them. The first questionnaire along with

a cover letter describing the purpose of the study, and a self-addressed, pre-paid return envelop were sent one week after the pre-survey letter. A small packet of wildflower seeds was included in the survey package as an incentive to encourage response. One week after the first questionnaire, a postcard reminder was sent to encourage responses. Two weeks after the postcard reminder, a replacement questionnaire package was sent to non-respondents. A final postcard reminder was sent two weeks after the mailing of the replacement questionnaire package. Local Extension and Natural Resources Conservation Service personnel were informed about the study and a poster aimed at raising landowners' awareness about the study was sent to them prior to commencing the survey to encourage participation. The survey was implemented between February and May of 2007. A short version of the survey was sent to 150 landowners randomly selected from those who did not respond to the survey two months latter to examine non-response biases.

3.4.5. Data Screening and Analyses

Data collected were screened and then weighted. The first step involved in data screening was to process missing data. Sinharay, Stern, and Russell (2001) suggested that ignoring missing data may seriously affect the results of data analyses when data are not missing at random. Furthermore, information is likely to be lost and fewer observations will be available in the final analysis. The problem is more significant when a large number of variables are included in an analysis. There are various approaches to replacing missing data (e.g., available case methods, single imputation methods, and model-based imputation methods). Among these approaches, multiple imputation has been reported to outperform several other approaches (Duncan, Duncan, & Li, 1998; Gold & Bentler, 2000). Multiple imputation includes a process that replaces missing values with a number of more than one plausible value. The same number of complete data sets are generated and used to estimate parameters and standard errors that take into account the uncertainty derived from missing values (Sinharay, Stern, & Russell, 2001).

3.4.5.1. Testing of Competing Models

The approach of confirmatory factor analysis (CFA) was adopted to test the competing models and refine the place-identity scale. CFA is a commonly used approach for testing dimensionality of theoretical concepts (Netemeyer, Bearden, & Sharma, 2003). It is advantageous than the traditional multivariate approach because the underlying domains and the relationships among the domains of the tested concepts are hypothesized prior to testing (Byrne, 1998). That is, data analyses based on CFA are inferential. On the other hand, the traditional multivariate approach, such as exploratory factor analysis, is explanatory and incapable of testing hypothesized relationships among domains/factors. Moreover, the use of CFA takes into account measurement errors by including them in data analyses whereas traditional multivariate statistics usually ignore them (Byrne, 1998). Therefore, the use of CFA fit the needs of the study to identify the underlying dimensionality of place identity and associations among the place-identity dimensions without ignoring the existence of measurement errors.

LISREL Version 8.70 for Microsoft Windows based on robust maximum likelihood estimation (RMLE) was applied for model testing. Maximum likelihood estimation (MLE) is a major form of estimation in CFA aimed at identifying the parameters specified in a model to "maximize the likelihood of a sample that is actually observed" (Kline, 2005, p. 112). MLE includes an iterative process of minimizing the differences between the observed covariance matrix and implied matrix derived from the hypothesized model. A convergent solution is achieved when differences between both matrices are minimized (Netemeyer, Bearden, & Sharma, 2003). A major assumption underlying MLE is multivariate normality of the endogenous variables (i.e., variables whose presumed predictors are specified in a model) (Bollen, 1989; Kline, 2005). In other words, the assumption of normal distributions of the responses to the observed variables or measurement items needs to be sustained. However, given that respondents of the study were asked to indicate place identity associated with their own property, it was expected that a majority of responses would be more likely to concentrate at the positive end of the scale. Since normal distributions for the endogenous variables were

not tenable for the current study, RMLE that does not assume normality and needs no large sample sizes was applied for model testing and parameter estimation (Jöreskog & Yang, 1996). RMLE uses the augmented moment matrix to fit the model and generate parameter estimates (Jöreskog & Yang, 1996). The asymptotic covariance matrix is also required for RMLE to correct standard errors and chi-squares due to non-normality (Jöreskog & Sörbom, 1988).

After data screening, CFA was applied to examining the scales to "confirm an a priori hypothesis about the relationship of a set of measurement items to their respective factors" (Netemeyer, Bearden, & Sharma, 2003, p. 148). CFA is a useful tool to examine scale dimensionality, discriminant validity, and internal consistency at the later stage of scale development (Anderson & Gerbing, 1988). It also helps detect and remove problematic items that may threaten the dimensionality of a scale (Floyd & Widaman, 1995; Hair, Anderson, Tatham, & Black, 1998). The proposed model (Fig. 4) was examined and compared with three competing models, including a two-dimensional first-order (Fig. 5), one-factor (Fig. 6) and 2nd-order model (Fig. 7).

1. Model convergence and an acceptable range of parameter estimates: LISREL issues warning messages when it fails to generate a converged solution. Inaccurate start values, negative variance estimates, or correlations among factors greater than one are possible causes to the failure of deriving a convergent solution (Kline, 2005). Respecification of the model and redefining the start values are among the solutions to solve the problem (Chen et al., 2001).

2. Convergent validity: Convergent validity is one of the components of construct validity that is referred to as the degree to which the measurement scales represent the theoretical constructs to be measured (Trochim, 2001). Evidence of convergent validity is revealed when items have statistically significant loadings on the factors they are to measure at the .01 level (Netemeyer, Boles, & McMurrian, 1996) and magnitude of the loadings between .60 and .90 (Bagozzi & Yi, 1988). Due to the exploratory nature of this study, factor loadings no less

than .50 were deemed acceptable.

3. Modification indices: Modification indices are measured as χ^2 statistics with one degree of freedom (Jöreskog & Sörbom, 1988). It is the χ^2 difference between a model when a measurement item is fixed and when the item is freely estimated. When the χ^2 value drops to equal or more than 3.84 after freeing a fixed item, it means the model can be significantly improved when the item-factor relationship is freely measured. However, similar to other χ^2 statistics modification indices are also sensitive to sample size. They provide only one of the references for model improvement. Decisions to respecify the model need to consider if freeing a path makes a logical and theoretical sense given that a parsimonious model is usually preferred for that it has a greater potential to withstand hypothesis testing compared to a more complex model (Jöreskog & Sörbom, 1996; Kline, 2005).

4. Fit indices: Model fit will be evaluated by both χ^2 tests and model fit indices, including the root mean square error of approximation (RMSEA) (Browne & Cudeck, 1993), the comparative fit index (CFI) (Bentler, 1990), non-normed fit index (Bentler & Bonett, 1980) the goodness of fit index (GFI) (Jöreskog & Sörbom, 1978), the standardized root mean square residual (SRMR) (Hu & Bentler, 1995) and the model Akaike information criterion (AIC) (Akaike, 1987). The Satorra-Benterler scaled χ^2 (S-B χ^2) (Satorra & Bentler, 1988) was applied as correction for the χ^2 statistics when the assumption of normal distribution is violated (Hu, Bentler, & Kano, 1992). The S-B χ^2 is computed based on the model, the estimation methods, and the sample kurtosis values (Byrne & Campbell, 1999). RMSEA and CFI were adjusted accordingly (i.e., adjust RMSEA and robust CFI). The values of RMSEA <= .06 (Hu & Bentler, 1999), CFI and NNFI >= .95 (Hu & Bentler, 1999), GFI >=.90 (Hu & Bentler, 1995), and SRMR <=.08 (Hu & Bentler, 1999) indicate reasonably good model fit. The AIC values are used for the comparison of more than one model with the smaller

AIC value indicating a better model fit.

5. Internal consistency: Internal consistency represents one form of reliability and examines the consistency of results across the items of a scale measured in the same test (Trochim, 2001). Composite reliability, coefficient alpha, and average variance extracted estimates (AVE) provide evidence of internal consistency.
    a. Composite reliability: Composite reliability is similar to Cronbach's coefficient alpha and reflects the internal consistency among the items measuring the same latent factor. A composite reliability index of narrowly defined constructs equal or more than .80 with the number of items between five to eight is recommended (Clark & Watson, 1995). The criteria of .70 and .60 were suggested by Hair, Anderson, Tathm, and Black (1998) and Bagozzi and Yi (1988) respectively. The formula to compute the composite reliability index is (Hatcher, 1994):

$$\text{Composite reliability} = \frac{\left(\sum L_i\right)^2}{\left(\sum L_i\right)^2 + \sum Var\left(E_i\right)}$$

where L_i = the completely standardized factor loadings for the factor
$Var(E_i)$ = the error variance associated with the individual items.

    b. Average variance extracted estimates (AVE): AVE measures the amount of variance explained by the items in a scale relative to measurement error (Netemeyer et al., 2003). Netemeyer et al. suggested a threshold value of AVE near .50 (> .45) to be acceptable for newly developed scales. AVE is computed using the following equation (Claes & David, 1981).

$$\text{Average variance extracted estimate} = \frac{\sum L_i^2}{\sum L_i^2 + \sum Var(E_i)}$$

6. Discriminant validity: Discriminant validity refers to that the underlying dimensions of a scale, despite related, can be distinguished from one another (Netemeyer, Bearden, & Sharma, 2003). Discriminant validity is evident when the parameter estimate for the correlation between two latent factors is constrained to 1 (constrained model) and compared with a model where the same parameter is freely estimated (unconstrained model), the chi-square value of the unconstrained model is significantly lower than the chi-square value of the constrained model (Anderson & Gerbing, 1988). The second criterion for discriminant validity is when the 95% confidence interval (± 2 standard errors) around the disattenuated correlation does not contain a value of 1 (Anderson & Gerbing, 1988). Another evidence of discriminant validity is present when the average variance extracted for the two latent factors is greater than the square of the correlation between the two factors (Claes & David, 1981).

3.4.5.2. Examination of Latent Mean Differences

The second phase of data analyses included a series of procedures to test if mean differences of the dimensions of place identity existed between the subgroups of landowners who differed in terms of their property size, length of family ownership, and if they had wildlife and/or livestock operations on the property. K-mean cluster analysis was applied using the three landownership characteristics as the classification criteria to identify different landowner groups. Due to the non-normal distributions of property size (Mean = 244.9, S.D. = 529.7) and length of family ownership (M = 42.5 years, S.D. = 40.4 years), responses to both variables were rescaled. Responses to property size were rescaled into 10 categories with approximately an equal number of respondents in each category (Table 12). Responses to length of family ownership were rescaled to 5

categories with approximately an equal number in each category (Table 12). After groups were identified, mean and covariance structure (MACS) analysis was then applied to examining if different landowner groups differed in the latent means of the place-identity dimensions.

3.5. RESULTS

Six hundred and eight returned questionnaires were received which resulted in a raw response rate of 56.3%. Thirty-two landowners responded to the short version of the survey for the purpose of non-response check. No significant difference was found between respondents of the original survey and the short survey in terms of their socio-demographic and landownership characteristics. The two groups also did not differ in their responses to some of the items in the scales of place identity and perception of landscape change included in the short survey. After excluding undeliverable addresses and those indicating that they either did not own properties in the study area or were not managers of properties no less than 10 acres, 528 questionnaires were retained for data screening and analyses (effective response rate = 51.0%). Table 12 shows the characteristics of respondents' landownership. Among the 528 respondents, 178 (33.7%) owned properties in Hays County, 163 (30.9%) in Blanco, and 187 (35.4%) in Gillespie. 161 respondents (30.5%) owned a small property between 10 and 49 acres, 185 (35.0%) owned a medium property between 50 and 157 acres, and 182 owned a (34.5%) large property no less than 158 acres. Chi-square tests showed that large properties were more likely to be located in Gillespie County while medium size properties were more likely to be located in Hays County. The sizes of property reported ranged from 10 acres to 6,500 acres (Mean = 244.9, S.D. = 529.7).

Respondents had owned the property from less than 1 year to 160 years in the family (Mean = 42.5, S.D. = 40.4). The history of visiting the property ranged from few months to 93 years (Mean = 31.0, S.D. = 23.2). More than half of respondents resided on their property (56.6%). For those resided on the property, the property had been the primary residence for as short as less than 1 year to as long as 84 years (Mean = 19.4, S.D. = 18.3). Respondents who indicated that they did not reside on the property had visited the property from 0 to 365 days (Mean = 74.1, S.D. = 79.9) during the year of 2006. The numbers of respondents' relatives who lived in the community where the property was located ranged from 0 to 200 (Mean = 6.3, S.D. = 16.6). Some respondents had never participated in community groups or organizations while some had participated up to 10 (Mean = 2.0, S.D. = 2.0). Respondents had reported that they derived income from the property as low as 0 to as high as 100% in the year of 2006 (Mean = 6.7%, S.D. = 16.3%).

Study participants were predominantly male (70.5%), more than 55 years old (70.2%) and had an education level of at least some college (90.0%). For those who reported their annual household income in 2006, more than half of them (58.7%) had annual household income equal or more than $80,000. Respondents' sociodemographic characteristics are shown in Table 13.

Table 12

Respondents' landownership characteristics

County where the property was located (N=528)
Hays: 178 (33.7%)
Blanco: 163 (30.9%)
Gillespie: 187 (35.4%)
Property size (N=528)
Small (<50 acres): 161 (30.5%)
Medium (50-157 acres): 185 (35.0%)
Large (>= 158 acres): 182 (34.5%)
Length of ownership in the family (N=517)
42.5 years (S.D.=40.4)
Length of visiting the property (N=515)
31.0 years (S.D.=23.2)
Length of residence on the property (N=291)
19.4 years (S.D.=18.3)
Frequency of visiting the property if not residing on it (N=212)
74.1 days (S.D.=79.9)
Number of relatives (N=496)
6.3 (S.D.=16.6)
Number of organizations (N=508)
2.0 (S.D.=2.0)
Percentage of income derived from the property (N=460)
6.7% (S.D.=16.3%)

Table 13

Respondents' sociodemographic profile

Gender (N=509)
Male: 359 (70.5%)
Female: 150 (29.5%)
Age (N=507)
18-45 years: 41 (8.1%)
46-55 years: 110 (21.7%)
56-65 years: 159 (31.4%)
66-75 years: 128 (25.2%)
76-85 years: 57 (11.2%)
>=86 years: 12 (2.4%)
Education (N=509)
Less than high school: 9 (1.8%)
High school graduate or GED: 78 (15.3%)
Vocational/Technical training: 15 (2.9%)
Some college: 108 (21.2%)
Bachelor's degree: 153 (30.1%)
Post-graduate degree: 146 (28.7%)
Income (N=461)
Less than $20,000: 27 (5.9%)
$20,000-$39,999: 57 (12.4%)
$40,000-$59,999: 74 (16.1%)
$60,000-$79,999: 60 (13.0%)
$80,000-$99,999: 52 (11.3%)
$100,000 or more: 191 (41.4%)

Table 14

F tests on the influences of property locations and sizes on perceptions of landscape change

	Mean (SD)				F
	Overall	Hays	Blanco	Gillespie	
Native wildlife	3.88 (1.53)	3.66 (1.49)	3.78 (1.46)	4.17 (1.59)	$F_{2,504}=5.44^{**}$
Native plants	4.11 (1.22)	4.00 (1.26)	4.07 (1.14)	4.24 (1.24)	$F_{2,505}=1.86$
Water quality	3.78 (1.30)	3.56 (1.39)	3.69 (1.24)	4.06 (1.23)	$F_{2,498}=7.05^{**}$
Water supply	3.53 (1.49)	3.23 (1.53)	3.46 (1.47)	3.88 (1.42)	$F_{2,502}=8.82^{***}$
Soil stability	4.09 (1.10)	3.95 (1.11)	4.07 (1.09)	4.25 (1.09)	$F_{2,499}=3.39^{*}$
Air quality	3.80 (1.15)	3.61 (1.16)	3.73 (1.17)	4.04 (1.08)	$F_{2,503}=6.61^{**}$
Background sounds	2.92 (1.36)	2.66 (1.33)	2.87 (1.34)	3.22 (1.35)	$F_{2,502}=7.66^{**}$
Scenic quality	3.51 (1.54)	3.18 (1.57)	3.61 (1.60)	3.74 (1.42)	$F_{2,504}=6.22^{**}$
A rural way of life	3.32 (1.62)	2.86 (1.56)	3.37 (1.55)	3.71 (1.63)	$F_{2,503}=12.69^{***}$
	Mean (SD)				F
	Overall	Small	Medium	Large	
Native wildlife	3.88 (1.53)	3.75 (1.36)	3.92 (1.51)	3.95 (1.68)	$F_{2,504}=.81$
Native plants	4.11 (1.22)	4.03 (1.23)	4.19 (1.19)	4.09 (1.23)	$F_{2,505}=.71$
Water quality	3.78 (1.30)	3.66 (1.22)	3.82 (1.37)	3.84 (1.30)	$F_{2,498}=.93$
Water supply	3.53 (1.49)	3.40 (1.32)	3.56 (1.58)	3.63 (1.53)	$F_{2,502}=1.03$
Soil stability	4.09 (1.10)	3.92 (1.01)	4.17 (1.08)	4.17 (1.17)	$F_{2,499}=2.69$
Air quality	3.80 (1.15)	3.73 (1.05)	3.80 (1.20)	3.86 (1.17)	$F_{2,503}=.51$
Background sounds	2.92 (1.36)	2.81 (1.17)	2.98 (1.46)	2.96 (1.41)	$F_{2,502}=.69$
Scenic quality	3.51 (1.54)	3.23 (1.45)	3.60 (1.59)	3.66 (1.54)	$F_{2,504}=3.69^{*}$
A rural way of life	3.32 (1.62)	3.17 (1.46)	3.49 (1.68)	3.29 (1.67)	$F_{2,503}=1.62$

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

The assumptions that perceptions of landscape change were influenced by the county where respondents' property was located and the size of the property were examined based on F tests. Generally, respondents perceived that conditions of the different environmental aspects of the area around their property were deteriorated compared to 5 years ago (Table 14). However, significant differences were identified for perceptions of change in the conditions of all the environmental aspects except for the conditions of native plants among respondents who owned properties in different counties. Specifically, respondents whose property were located in Gillespie County which is further away from the metropolitans of Austin and San Antonio tended to perceive less worse conditions of native wildlife, water quality and supply, soil stability, air quality, background sounds, and scenic quality as a result of landscape change compared to the past. On the other hand, respondents of small, medium, and large properties differed significantly only in their perceptions of the scenic quality in the area where small property owners (Mean = 3.2) tended to report the condition of the scenic quality getting worse than large property owners (Mean = 3.7).

3.5.1. Responses to Place Identity Scale

After data screening, 15 cases were deleted from the 528 respondents due to a large number of missing values in the place identity scale (i.e., more than 50% of items in the scale). Multiple imputation was implemented using PRELIS, a component of the LISREL program, to replace the missing values for the rest of 513 cases. Table 15 shows the means and standard deviations of the 19 items of the place identity scale. As expected, responses to the items did not follow the shape of normal distribution. Tests of skewness and kurtosis showed that the hypothesis of normality did not hold for most of the 19 items. On average, except for the economic function of the property (Mean = 3.2), respondents identified positively with the biophysical attributes of their property, functions supported by the property, and emotional meanings they attributed to the property (Means >= 5.0). RMLE was applied for model testing due to the non-normal distributed nature of the data.

Table 15

Descriptive statistics of the place identity scale

Items	Mean (St. Dev.)	Skewness[b]	Kurtosis[b]
Structural dimension			
PS1: The natural environment makes the property special	6.67 (.80)	-17.19***	11.68***
PS2: Water features are a crucial element of the property	5.91 (1.62)	-10.55***	4.33***
PS3: The terrain is an essential quality of the property	6.33 (1.04)	-12.82***	8.35***
PS4: Native wildlife is an important feature of the property	6.44 (1.09)	-14.55***	9.41***
PS5: Native plants of the property are of little value to me[a]	5.81 (1.77)	-10.47***	3.58***
PS6: 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)	-13.75***	8.75***
Functional dimension			
PF1: The property provides the opportunity to work on the land	6.21 (1.30)	-12.78***	7.57***
PF2: The property provides a quality living environment	6.49 (.99)	-14.57***	9.50***
PF3: The property provides an important source of income	3.22 (2.08)	3.54***	-17.44***
PF4: The property is a great place to enjoy the outdoors	6.74 (.61)	-15.64***	10.71***
PF5: I enjoy having people visit me on the property	6.11 (1.34)	-11.62***	6.27***
PF6: I enjoy the friendship with neighbors	5.58 (1.48)	-8.18***	2.48*
PF7: There are better places to enjoy the activities I do on the property[a]	5.11 (4.72)	-7.07***	-3.12**
Affective dimension			
PA1: The property says a lot about who I am and what I like to do	6.05 (1.26)	-10.88***	6.12***
PA2: The property is important to my family heritage	5.52 (1.80)	-8.37***	1.01
PA3: I feel at home when I'm here	6.57 (.90)	-15.08***	10.03***
PA4: I feel the property has become a part of me	6.38 (1.08)	-12.91***	7.76***
PA5: I feel spiritually connected to the property	5.90 (1.46)	-9.83***	4.27***
PA6: The property doesn't mean much to me[a]	6.62 (1.03)	-16.62***	10.75***

a. Items were reverse coded

b. z-score

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

3.5.2. Model Testing

Exploratory Factor Analysis (EFA) based on Principal Component Analysis and varimax rotation was first applied to identify problematic items that might contribute to the failure of generating a converged solution in CFA (Netemeyer, Bearden, & Sharma, 2003). Three items, including, PS5, PF3, and PF7, were identified to be highly cross-loaded on the dimensions other than the ones they were supposed to measure. Moreover, they also contributed to low reliability (low Crobach's alpha coefficients). These items were dropped prior to CFA. Sixteen items were retained as the observed variables of the place-identity scale. Responses to the 16 observed variables were used to test and compare the four competing models based on RMLE using weighted augmented moment and asymptotic covariance matrices of the entire sample.

3.5.2.1. Model Evaluation and Respecification

Model evaluation included a series of procedures to examine the performance of the hypothesized models. Respecification of the models was made based on the results of CFA if needed (Netemeyer, Bearden, & Sharma, 2003). The first sign of model misspecification is the failure to generate a convergent solution. In this study, the application of EFA prior to CFA to identify problematic items has helped screen out the problematic items and reduce the probability of this problem. Converged solutions were obtained for the initial forms of all four models. At the same time, none of the solutions generated parameters that were out of range (e.g., negative error variances, correlations among latent factors greater than one). The hypothesized models were then evaluated based on fit indices and modification indices.

The fit indices of the initial forms of Models A, B, and D were very close to the criteria of acceptability suggested in the literature (Table 16). However, the fit indices suggested that the performance of the initial form of Model C was much less than acceptable. Due to the exploratory nature of the study, specification search was proceeded to “detect and correct for specification errors” (Jöreskog & Sörbom, 1996, p. 274). Large specification errors are signs of lacking correspondence between the

hypothesized model and the "true" model characterized by the population of the study. All the initial forms of the hypothesized models were modified after examining the estimated factor loadings and modification indices to improve the model performance. Items that did not have statistically significant factor loadings (t-value >= 2.57 at $p < .01$) or had factor loadings less than .40 were deleted. Modification indices that had χ^2 values equal or greater than 3.84 were also referred to when adding or dropping parameters made logical and theoretical sense.

After several iterations, the best fit form was obtained for Model A by dropping PS2, PS4, PF1, PF6, PA1, and PA2, and by adding the parameter that estimated the correlations between the error terms of PA5 and PA3 (Appendix A, Fig. A1). Model fit was significantly improved as reflected in the significant reduction of S-B χ^2 from 331.24 to 74.86 ($\Delta df = 70$). Adjust RMSEA was improved from .067 to .053, robust CFI from .94 to .97, NNFI from .96 to .98, SRMR from .067 to .054, and GFI from .89 to.95 (Table 16). Convergent validity of the scale was achieved indicated by that all the factor loadings were greater than .45, the threshold of convergent validity for newly developed scale suggested by Netmeyer et al. (2003), and the factor loadings were significant at $p < .01$ (Table 17). However, the correlation between the dimensions of biophysical attributes and place functions were very high ($r = .97$) that signaled the lack of discriminant validity.

The final form of Model B was modified from the initial one by dropping PS2, PS4, PF1, PF6, PA1, and PA2, and by correlating the error terms of PS3 and PS1, and PA5 and PA3 (Appendix A, Fig. A2). S-B χ^2 was significantly reduced from 365.54 to 59.64 ($\Delta df = 71$). Adjust RMSEA was improved from .069 to .044, robust CFI from .93 to .98, NNFI from .96 to .99, SRMR from .069 to .044, and GFI from .88 to .96 (Table 16). That all the factor loadings were equal or grater than .50 and significant at $p < .01$ indicates convergent validity of the place-identity scale (Table 18).

Table 16

Estimates of fit indices (initial and final forms)

Model	χ^2 (df)	S-B χ^2	Adjust RMSEA	SRMR	Robust CFI	NNFI	GFI	AIC	Difference in: S-B χ^2	Difference in: df
Model A										
Initial	482.42 (101)	331.24	.067 (.058-.076)	.067	.94	.96	.89	402.24	256.38^{***}	70
Final	133.38 (31)	74.86	.053 (.044-.061)	.054	.97	.98	.95	122.86		
Model B										
Initial	517.82 (103)	365.54	.071 (.062-.080)	.069	.93	.96	.88	431.54	305.90^{***}	71
Final	104.58 (32)	59.64	.042 (.032-.050)	.044	.98	.99	.96	105.64		
Model C										
Initial	720.43 (104)	534.62	.091 (.081-.101)	.076	.91	.93	.82	598.62	372.30^{***}	71
Final	266.12 (33)	162.32	.088 (.078-.098)	.076	.94	.95	.89	206.32		
Model D										
Initial	490.89 (102)	339.49	.068 (.059-.077)	.067	.94	.96	.89	407.49	262.74^{***}	70
Final	135.96 (32)	76.75	.053 (.044-.061)	.053	.97	.98	.95	122.75		

$^{***}p < .001$

Table 17

Factor loadings and standard errors of Model A (final form)

Items	Factor Loading[ab]			SE	t-value
	Structural Dimension	Functional Dimension	Affective Dimension		
PS1	.69			--	--
PS3	.60			.17	7.14
PS6	.60			.22	5.89
PF2		.71		--	--
PF4		.69		.09	6.72
PF5		.53		.14	7.61
PA3			.84	--	--
PA4			.87	.11	11.14
PA5			.79	.16	9.52
PA6			.59	.12	7.08
Cronbach's Alpha	.64	.62	.83		

a. Completely standardized solution
b. All the factor loading are significant at .01

Table 18

Factor loadings and standard errors of Model B (final form)

Items	Factor Loading[ab]		SE	t-value
	Cognitive Dimension	Affective Dimension		
PS1	.62		--	--
PS3	.52		.17	6.90
PS6	.62		.26	5.81
PF2	.71		.21	6.89
PF4	.69		.13	6.70
PF5	.54		.23	6.61
PA3		.84	--	--
PA4		.86	.11	11.26
PA5		.79	.16	9.55
PA6		.59	.12	7.11
Cronbach's Alpha	.76	.83		

a. Completely standardized solution
b. All the factor loading are significant at .01

Model C was respecified by deleting PS2, PS4, PF1, PF6, PA1, and PA2, and by freely estimating the correlations between the error terms of PS3 and PS1, and PA5 and PA3 (Appendix A, Fig. A3). The model was significantly improved as indicated by the reduction of S-B χ^2 from 534.62 to 162.32 (Δdf = 71), and by the improvement of Adjust RMSEA from .091 to .088, robust CFI from .91 to .94, NNFI from .93 to .95, and GFI from .82 to .89. The value of SRMR remained the same after model respecification (Table 16). The factor loading of the item, PS3, that was less than the criterion of .45 caused the concern of convergent validity of the scale (Table 19).

The final form of Model D was modified by removing PS2, PS4, PF1, PF6, PA1, and PA2, and by correlating the error terms of PA5 and PA3 (Appendix A, Fig. A4). The value of S-B χ^2 was significantly reduced from 339.49 to 76.75 (Δdf = 70). Adjust RMSEA was improved from .067 to .053, robust CFI from .94 to .97, NNFI from .96 to .98, SRMR from .067 to .053, and GFI from .89 to .95 (Table 16). Factor loadings and t-values all met the minimum criteria for convergent validity (Table 20).

The value of S-B χ^2, fit indices, and the value of AIC indicated that the final form of Model B outperformed the other three competing models although the hypothesized model (Model A) and the hierarchical form based on this model (Model D) also fell within the acceptable range of model fit. The final form of Model B was further evaluated based on its internal consistency and discriminant validity.

Table 19

Factor loadings and standard errors of Model C (final form)

Items	Factor Loading[ab]	SE	t-value
	Place identity		
PS1	.47	--	--
PS3	.38	.16	7.14
PS6	.60	.38	4.95
PF2	.58	.25	6.40
PF4	.56	.16	5.97
PF5	.47	.31	5.64
PA3	.82	.40	5.41
PA4	.85	.54	4.93
PA5	.75	.67	4.68
PA6	.60	.46	4.03
Cronbach's Alpha	.85		

a. Completely standardized solution
b. All the factor loading are significant at .01

Table 20

Factor loadings and standard errors of Model D (final form)

Items	Factor Loading[ab]			SE	t-value
	Structural Dimension	Functional Dimension	Affective Dimension		
PS1	.67			--	--
PS3	.58			.15	7.26
PS6	.61			.24	5.86
PF2		.72		--	--
PF4		.69		.09	6.73
PF5		.53		.13	7.65
PA3			.84	--	--
PA4			.86	.11	10.93
PA5			.79	.16	9.50
PA6			.59	.12	7.04
Cronbach's Alpha	.64	.62	.83		

a. Completely standardized solution
b. All the factor loading are significant at .01

3.5.2.2. Internal Consistency and Discriminant Validity

Internal consistency indicated by composite reliability, Cronbach's alpha coefficients, and average variance extracted estimates (AVE) provided further criteria for model evaluation and was computed for the best fit model, the final form of Model B, as shown in Table 21. The composite reliability estimates for the two dimensions of Model B met the criterion of .70 suggested by Hair et al. (1998). Cronbach's alpha coefficients of the two dimensions, .75 and .83 respectively, met the criterion of .7 that is widely suggested (Netemeyer, Bearden, & Sharma, 2003). However, the estimate of AVE of the Cognitive Dimension in Model B (.38) fell short of the threshold of .45 suggested by Netemeyer et al. (2003) for newly developed scales.

Discriminant validity was examined first by comparing the differences of chi-square values between the model that fixed the correlation between Cognitive Dimension and Affective Dimension to 1 and the model that freely estimated the correlation (Table 22). Results showed that the values of S-B χ^2 significantly increased by forcing the correlation of the latent factors to be perfectly correlated with 1 degree of freedom change (χ^2 >= 3.84). In other words, the model was significantly deteriorated by forcing the two dimensions to be perfectly correlated. This provides the first evidence of discriminant validity for the two dimensions of place identity as hypothesized in Model B. The second piece of evidence of discriminant validity for the two dimensions of Model B was revealed by that the 95% confidence interval (.56-.93) of the correlation between the two dimensions did not include 1.0 or perfect correlation. The third criterion of discriminant validity was partially supported by the AVE of Affective Dimension (.61) greater than the squared correlation of Cognitive and Affective Dimension ($(.74)^2 = .55$).

Table 21

Internal consistency estimates for Model B (final)

	Composite Reliability	Cronbach's Alpha Coefficient	Average Variance Extracted (AVE)
Cognitive Dimension (6 items)	.79	.76	.38
Affective Dimension (4 items)	.86	.82	.61

Table 22

Discriminant validity estimates for Model B (final form)

	S-B χ^2	df	S-B χ^2 Difference*
Unconstrained Model			
Latent factor correlation freely estimated	59.64	32	
Constrained Model			
Correlation between Functional and Affective Dimension set to 1	118.62	33	58.98

a The correlation between the error terms of ε9 and ε7 was removed because of the problem of not positive definite psi when correlated.
* S-B χ^2 difference between constrained and unconstrained models with 1 degree of freedom change.

3.5.3. Latent Mean Differences between Different Landowner Groups

Respondents were categorized into two groups after K-mean cluster analysis based on three landowner characteristics (i.e., property size, length of family ownership, and whether the property had wildlife and/or livestock operations). The decision of a two-group solution was made based on whether there was a sufficient sample[8] in each group and meaningful interpretation for each group was tenable. Landowners in the first group (Group 1) tended to own a larger property, have kept the property in the family for a longer period of time, and have wildlife and/or livestock operations on the property compared to landowners in the second group (Group 2) (Table 23). Group 1 was

[8] Covariance factor analysis is a large sample statistic approach. Using small samples in covariance structure analysis may lead to the limited power of statistical tests (Kline, 2005).

thereafter referred to as the traditional landowner group (N = 262) and Group 2, the non-traditional landowner group (N = 251). Regarding the responses to the place-identity scale, both groups attributed a high level of importance to the meanings pertaining to the cognitive and affective dimensions of their property (Table 24). However, Mann-Whitney U test for the non-normally distributed data of observed variables showed that traditional landowners reported a higher level of importance in the affective meanings of their property.

Table 23

Comparing property size and length of family ownership between traditional and non-traditional landowners

	Traditional Landowners	Non-Traditional Landowners	$\chi^2_{(df)}$
Property Size			$\chi^2_{(9)}=470.05^{***}$
10-14 acres	0 (-7.8)[a]	52 (7.8)	
15-25 acres	0 (-8.1)	56 (8.1)	
26-46 acres	0 (-7.2)	45 (7.2)	
47-67 acres	0 (-7.8)	52 (7.8)	
68-100 acres	14 (-4.6)	46 (4.6)	
101-130 acres	44 (6.8)	0 (-6.8)	
131-200 acres	53 (7.5)	0 (-7.5)	
201-300 acres	50 (7.3)	0 (-7.3)	
301-580 acres	52 (7.4)	0 (-7.4)	
581-6,500 acres	49 (7.2)	0 (-7.2)	
Years in Family			$\chi^2_{(4)}=122.98^{***}$
0-7 years	26 (-6.0)	79 (6.0)	
8-17 years	31 (-4.6)	70 (4.6)	
18-40 years	45 (-2.4)	65 (2.4)	
41-82.8 years	73 (5.7)	21 (-5.7)	
82.9-160 years	87 (7.6)	16 (-7.6)	
Wildlife/Livestock Operation	157 (6.0)	84 (-6.0)	$\chi^2_{(1)}=36.03^{***}$

[a] Adjusted standardized residuals are included in parentheses

$^{***}p < .001$

Table 24

Descriptive statistics of place identity (overall sample and two landowner groups)

	M (SD)			Z[a]
	Overall Sample	Traditional Landowners	Non-Traditional Landowners	
PS1	6.67 (.80)	6.62 (.84)	6.72 (.75)	-1.38
PS3	6.32 (1.04)	6.29 (1.02)	6.35 (1.06)	-.98
PS6	6.39 (1.10)	6.50 (.97)	6.27 (1.21)	-1.94
PF2	6.49 (.99)	6.45 (1.00)	6.53 (.98)	-1.01
PF4	6.73 (.61)	6.76 (.63)	6.71 (.58)	-1.35
PF5	6.11 (1.34)	6.05 (1.42)	6.17 (1.26)	-.84
PA3	6.57 (.90)	6.66 (.83)	6.47 (.96)	-2.63**
PA4	6.38 (1.08)	6.52 (.99)	6.23 (1.15)	-3.52***
PA5	5.19 (1.46)	6.10 (1.37)	5.71 (1.53)	-3.2***
PA6	6.62 (1.03)	6.68 (1.01)	6.56 (1.04)	-2.35*

a. Mann-Whitney U test was used for group comparisons because the data were non-normally distributed
* $p < .05$, ** $p < .01$, *** $p < .001$

The first step of testing for equivalence of latent means[9] between groups involved developing a baseline model that was tested independently using the covariance matrices of each group based on the final form of Model B. The baseline model represents "the one that best fits the data from the perspective of both parsimony and substantive meaningfulness" (Byrne & Stewart, 2006, p. 294). The final form of Model B represented the parsimonious and substantively meaningful model of the place-identity dimensionality compared to the other alternatives after the model testing processes described earlier. Fit indices of testing the model on the two landowner groups (Table 25) showed that the model fit well on each group. The model was then used as the baseline model for each of the landowner group.

[9] Latent means are the means of the cognitive and affective dimensions of place identity.

Table 25

Fit indices for mean and covariance structure analyses (final form of Model B)

Model	S-B χ^2	df	ΔS-B χ^2	Δdf	Adjust RMSEA	Robust CFI	NNFI
Baseline Model (overall)	59.64	32	--	--	.042 (.043-.050)	.99	.99
Traditional landowner group	49.18	32	--	--	.055 (.035-.070)	.99	.96
Non-traditional landowners group	39.39	32	--	--	.027 (.000-.041)	1.00	1.00
Model B_1 (Configuration)	84.16	64	--	--	.025 (.008-.035)	1.00	.99
Model B_2 (Invariant loadings, λs)	91.94	72	7.55	8	.024 (.002-.034)	1.00	.99
Model B_3 (Invariance intercepts, τs)	107.60	80	19.64*	3	.026 (.011-.036)	.99	.99
Final Model[a]	98.94	79			.022(.000-.033)	1.00	.99

[a] Only τ6 was not constrained invariant across groups.

*p<.05

A prerequisite for comparing group differences is measurement equivalence across group. It has been suggested that the minimal requirement for latent mean comparisons is that invariance in the form and pattern of a factorial structure (i.e., configural invariance), factor loadings, and intercepts[10] should be maintained (Byrne, 1998; Li, Harmer, & Acock, 1996; Little, 1997; Meredith, 1993). At the same time, it has also been argued that full measurement equivalence is difficult to achieve and group comparisons based on partial measurement invariance where some of the factor loadings or intercepts are invariant and some are not can still render meaningful results (Byrne, Shavelson, & Muthén, 1989; Steenkamp & Baumgartner, 1998). For the rest of the steps, all the testing was simultaneously conducted on both landowner groups. The first step to establish measurement equivalence across groups was to test configural invariance (Model B_1) where the model was tested on both groups simultaneously without imposing any equality constraints. Congifural invariance would hold when the fit indices did not show significant deterioration compared to when the model was tested separately on each group (i.e., the baseline model). Fit indices in Table 25 show that the fit indices of Model B_1 did not change much and fell within the acceptable range.

Steps were then taken to increasingly impose more stringent equality constraints on factor loadings (Model B_2) and then intercepts (Model B_3). The chi-square difference test based on Satorra-Benter Scaled χ^2 (S-B χ^2) was used here as the criterion for testing if the model with constraints imposed was significantly different from the less constrained one[11] (Byrne, 1998). Significant differences in S-B χ^2 between two nested models would signal that the two models were not equivalent across groups in terms of the parameters that were tested. Since the distribution of S-B χ^2 differs from the normal chi-square, corrected S-B χ^2 was used to test measurement equivalence (Satorra & Bentler, 2001). No significant change in S-B χ^2 was identified when the factor loadings

[10] Intercepts are the coefficients associated with regressing the observed variables onto the constant (i.e., τs). When represented in a regression equation (Byrne, 1998), it is the constant in the equation (i.e., "α" in the equation of $y = \alpha + bx$, where b is the slope or the factor loading, x is the observed variable, and y is the latent variable). When the model is perfectly reproduced, the estimated intercept would be equal to the mean of the observed variable (Li, Harmer, & Acock, 1996).

[11] The more constrained model is said to be nested in the less constrained one.

in Group 2 were constrained to be equal to Group 1 (ΔS-B χ^2 = 7.55, Δdf = 8). All the other fit indices still indicated good model fit. However, when the intercepts of Group 2 were constrained to be the same as Group 1, the model was significantly deteriorated as shown by the increase in S-B χ^2 (ΔS-B χ^2 = 19.64, Δdf = 8) and slightly declined in the other fit indices (ΔRMSEA = .02 and ΔCFI = .1). Invariance testing on each individual intercept identified that the means of the observed variable PS6 were significantly different between both groups. Specifically, the mean of PS6 for the traditional landowner group (M = 6.56) was significantly higher than that for the non-traditional landowner group (M = 6.27). In other words, Traditional Landowner Group consistently evaluated the importance of the special places on their property higher than Non-Traditional Landowner Group. The intercept for this item was left unconstrained in the final model (Steenkamp & Baumgartner, 1998) (Fig. 8).

The imposition of equality constraints on the intercepts across groups makes it impossible to determine the exact values of latent means (Byrne, 1998). A standard approach to solve this problem is to fix the latent means in a group (i.e., the reference group) to be zero and freely estimate the latent means in other groups. Differences between the latent means in other groups and those in the reference group can then be estimated (Jöreskog & Sörbom, 1996). In this study, the latent means (κs) in Group 2 were fixed to zero to serve as the reference to estimate the level of differences of the latent means in Group 1 from Group 2. The two latent means in Group 1 were freely estimated. Results of the latent mean differences were shown in Table 26. Significant difference of latent means existed only in the affective dimension of place identity where Group 1 (traditional landowners) had a significantly higher level of the affective place-identity than Group 2 (non-traditional landowners) by .23 units.

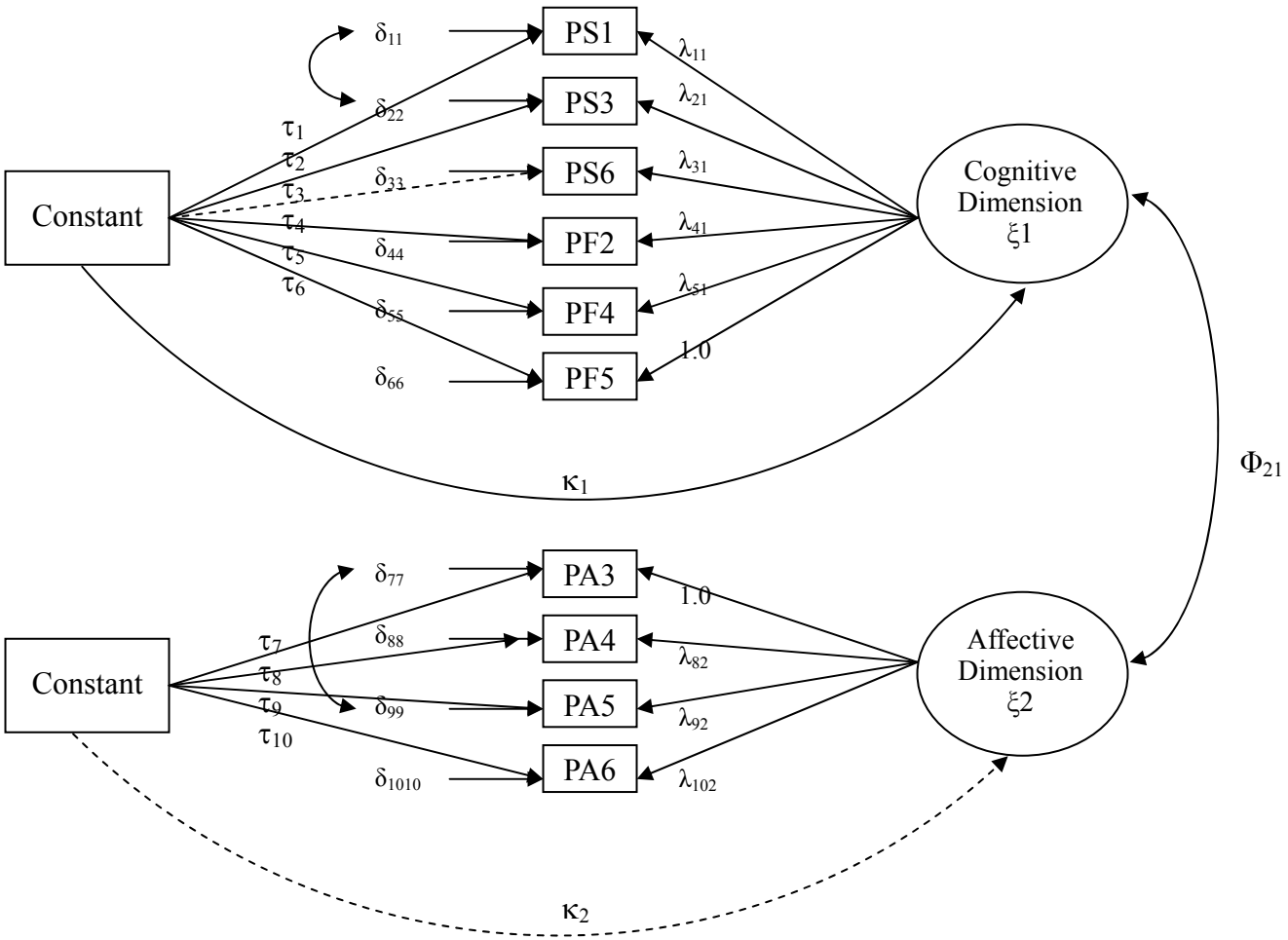

Fig. 8. Multigroup mean structures model. Sx and Fx are measurement items for the cognitive dimension; Ax are measurement items for the affective dimension

Table 26

Latent mean differences

	Cognitive Dimension	Affective Dimension
Mean Difference, Δκ	-.08	.23
(t-value)	(-1.06)	(3.04)**

**p<.01

3.6. DISCUSSION AND CONCLUSION

This study defined place identity as comprising meanings that characterize the aspect of individuals' identity that is cultivated through their interactions with a specific geographic location based on identity theory (Burke & Tully, 1977; Stryker, 1980). Meanings that comprise individuals' place identity were hypothesized to be distinguishable into three dimensions (i.e., structural, functional, and affective) based on a review of related literature (e.g., Canter, 1977; Proshansky, 1978; Relph, 1976). This conception of place identity was tested against three competing models that conceptualized place identity as consisting of a single dimension of place identity, two dimensions of cognition and affection, and a second-order model where structural, functional, and affective dimensions were subsumed to a higher-order factor of place identity.

Although the three-dimensional structure of place identity and the second-order model based on the three-dimensional structure fit the data well, limitations of both models were identified. Although χ^2 tests for discriminant validity showed that the hypothesis of perfect correlation between the cognitive and affective dimensions was rejected, the confidence interval of the correlation that included 1.0 (i.e., perfect correlation between the two latent factors) had rendered discriminant validity between the structural and functional dimensions doubtful. Both dimensions may be distinguishable conceptually but difficult to be separated from each other in empirical tests.

Some research has defined and operationalized place identity as a

uni-dimensional construct (e.g., Bonaiuto, Breakwell, & Cano, 1996; Cuba & Hummon, 1993). However, findings of this study suggested that viewing place identity as a single latent construct was less than an optimal way to conceptualize this construct and not tenable to model testing (i.e., Model C). Even after model respecification to improve the model, fit indices still indicated that this conceptualization of place identity performed worst among the other three models.

When examining the χ^2 statistics, model fit indices, convergent and discriminant validity, and internal consistency, Model B that hypothesized place identity as consisting of the cognitive and affective dimensions had the best model fit and met the criteria for convergent validity. This result is consistent with much of the research in recreation and natural resource management, and supports a meaning-based interpretation of place identity that resembles the construct of place attachment defined as comprising the dimensions of place dependence and place identity (Schreyer, Jacob, & White, 1981; Williams & Roggenbuck, 1989; Williams & Vaske, 2003). Place dependence represents the functional aspect of place attachment. In this study, the functional aspect of place meanings along with the structural aspect of place meanings constituted the cognitive dimension hypothesized in Model B. Place identity encompasses the affective meanings individuals attribute to a place and resembles the affective dimension of place identity tested in Model B. Studies that operationalized place attachment as comprising two dimensions have found these two dimensions functioned differently. For example, Kyle, Grafe, Manning, and Bacon's study (2004) identified that place identity and place dependence had different effects on hikers' perceptions of the environmental and social conditions along the Appalachian Trail. Similarly, Kyle, Absher, and Graefe (2003) reported that both dimensions exerted distinct influences on the relationship between attitudes toward spending revenue generated from the entrance fees to a National Forest and preferences for spending the revenue for environmental education, environmental restoration, and facility development. Evidence of discriminant validity for these two dimensions and their differential effects on other psychological constructs has also been reported elsewhere (Bricker & Kerstetter, 2000; Jorgensen & Stedman, 2001; Kyle,

Graefe, & Manning, 2005; Vaske & Kobrin, 2001; Williams & Vaske, 2003).

The preliminary study described in Chapter II where a non-random sample of landowners were interviewed found that traditional and non-traditional landowners who differed in their landownership characteristics, including property size, length of property ownership, and economic dependence on the property, also varied in the different aspects of place identity they valued. This finding was quantitatively tested in this study on two groups of respondents categorized by their landownership characteristics using the analyses of mean and covariance structure. Invariance tests revealed that response patterns were equivalent in terms of factor structure and factor loadings across groups. However, the hypothesis of invariance across the groups was rejected for the observed means of the importance of special places on respondents' property between both groups. Traditional landowners consistently reported a higher level of importance of the special places on their property compared to non-traditional landowners perhaps due to their longer association with the special places on the property. After the variation in this observed variable was controlled, traditional landowners still showed a significant higher level of importance they attributed to the affective dimension of the meanings pertaining to their property compared to non-traditional landowners. This result is consistent with the findings from the preliminary study where traditional landowners expressed a wider range of emotional feelings associated with their property. Moreover, they were impacted by landscape change on more aspects of their emotional association with their property (e.g., rootedness, identity, and a sense of independent landownership) compared to non-traditional landowners.

The landownership characteristics that were used as the criteria to distinguish the two landowner groups might have contributed to the variation in responses to the affective meanings that comprised landowners' place identity of their property. According to identity theory (Stryker, 1980, 1987), individuals' commitment to their identity determines the probability of the identity to be manifested in an interaction. An individual's commitment to an identity represents the "the degree to which the person's

relationships to specified sets of others depends on his or her being a particular kind of person" (Stryker & Statham, 1985, p. 207). The relationships developed from an individual's living in and interacting with a geographic setting may be extended from the social relationships as suggested in identity theory to including the interactions that he/she has with the physical environment in the setting. Following the same line, traditional and non-traditional landowners in this study were likely to have different levels of commitment to the different aspects of the social and physical environment on their property. The variation in commitment to place identity might have affected the salience of place identity in both groups. This is supported by the finding that traditional landowners valued the affective meanings comprising their place identity more than non-traditional landowners. The relationship between commitment and place identity was further examined in Chapter IV.

The mean difference between traditional landowner and non-traditional landowner may have a practical implication for natural resource management in the area. Although not tested in this study, other research (Payton, Fulton, & Anderson, 2005; Stedman, 2002; Vaske & Kobrin, 2001; Vorkinn & Riese, 2001) has shown that place identity may be associated with proenvironmental attitude or behavior. At the same time, conflicting results have been reported in terms of attitudes toward environment, population growth, economic development, and approaches to resource management between newcomers and long-term residents. For example, studies have suggested that some of the newcomer characteristics were associated with environmental consciousness, support for environmental policies, and conservation practices (Green et al., 1996; Jones, Fly, Talley, & Cordell, 2003; Nelson, 1999; Raedeke, Charles, & Rikoon, 2001; Reading, Clark, & Kellert, 1994). Others have reported that newcomers and long-term residents were not significantly different in their environmental attitudes and behaviors (Fortmann & Kusel, 1990; Smith & Krannich, 2000). Research has also suggested that newcomers were different from traditional landowners in their approaches to land management. For examples, newcomers emphasize more on land management for amenity and recreation features. On the other hand, traditional landowners focus more on the agricultural

production function of the land (Gosnell, Haggerty, & Travis, 2006; Wilkins et al., 2003a). Further research to examine how these two groups may differ in their commitment, place identity, and behavior/behavioral intention to maintain their property against land fragmentation will provide more insights into this debate and generate applicable information for natural resource managers. If results show that respondents' place identity of their property did contribute to their behavior or intention to conserve the property, then designs of resource conservation programs and communication strategies to promote them will need to integrate the place-identity components to promote these assistance programs. Moreover, the communication strategies will need to emphasize more on the affective components of place identity if the target is traditional landowners.

A limitation of the study that needs to be noted. Although in general most of the criteria of validity and internal consistency were met in testing for the final form of Model B, concerns remain with the low level of AVE, an indicator of convergent validity, for the cognitive dimension. The low AVE suggested that the variance contributed by measurement errors was greater than the variance captured by the latent construct cognitive place-identity (Claes & David, 1981). Two factors may be attributable to this result. Firstly, measurement errors might come from the variation in responses due to the heterogeneity of respondents. After respondents were categorized into traditional and non-traditional landowners, the AVE estimate for each group was computed. Results still showed unsatisfactory low values of AVE in the cognitive dimension (.34 for the traditional landowner group, .42 for the non-traditional landowner group).

A second factor contributing to the low AVE might be derived from the failure of the scale to capture the other components that are important to the cognitive aspect of landowners' identity of their property. This also implies that the components comprising the cognitive aspect of place identity may be more diverse than what were measured in the study. Efforts are needed to further improve the ability of the scale to capture the essence that represents the cognitive dimension of place identity.

CHAPTER IV
IS PLACE IDENTITY AN INTRINSIC INCENTIVE FOR OPEN SPACE CONSERVATION?

4.1. INTRODUCTION

Studies have been conducted to explore the motives for environmental or conservation behavior. According to De Yong (2000), this line of research has primarily focused on incentives that are materially based or altruistically driven. Material incentives or disincentives may include using monetary rewards or financial support to encourage environmental behaviors, or regulations, punishments, and fines to deter behavior that may have adverse environmental consequences. However, research has shown that intervention mechanisms that use externally induced incentives or disincentives do not create long-lasting effects on intended behavior. Frequently, individuals stop practicing the behavior once the intervention is terminated (Dwyer et al., 1993; Geller, 1992; Katzev & Johnson, 1987; Kohn, 1999).

The second focus of research on motivation for environmental behavior has been on how altruism (e.g., concerns for human or non-human beings) contributes to environmental behaviors (Kaplan, 2000; Schultz, 2000). A behavior is referred to as completely altruistic when a decision to act is based on the consequences to others' long-term welfare regardless of the impacts of the act on the person that initiates the action (Jencks, 1990). Although altruistic behaviors that promote public goods are valuable assets to society, Mansbridge (1990b) has argued that self-interest is a necessary element to sustain altruistic motives for desired behaviors. Self-interest helps individuals to reduce feelings of being overburdened by engaging in altruistic behaviors without benefiting from the actions. Some environmental activism was motivated initially by self-interests, such as NIMBY (not in my backyard) or LULUs (locally undesirable land uses) (Kaplan, 2000). Studies have also reported that individuals may be motivated to provide support for the environment because of their desire to sustain the environment for their own enjoyment or their emotional connections with nature or

the environment of a specific place (Kaplan & Kaplan, 1989; Payton, Fulton, & Anderson, 2005; Vorkinn & Riese, 2001), or to enhance their self-esteem and express their self-identity (Galliano & Loeffler 1999; Mannetti, Pierro, & Livi, 2004; Terry, Hogg, & White, 1999).

When self-interest is not narrowly viewed as pursuing short-term benefits entirely for the self or selfishness, then most of the decisions in our daily lives are likely to involve cost-benefit analyses that are more or less self-related (Mansbridge, 1990b; Perloff, 1987). However, mechanisms to promote environmental behaviors based on self-interests have received only limited research attention (De Young, 2000; Mannetti, Pierro, & Livi, 2004). Moreover, some of the environmental research has been criticized as failing to integrate the contextual elements within which individuals' attitudes toward conservation or intentions to conserve the environment are embedded (Bonaiuto, Carrus, Martorella, & Bonnes, 2002; Vorkinn & Riese, 2001). Place identity represents one of the self-interests that is intrinsically motivating and contextually relevant, and that, if appropriately reinforced, may enhance adoption of environmental or conservation behavior.

Place identity is generally referred to as individuals' feelings toward a specific geographic location. It is a psychological process where the features and meanings of a place become integrated into one's self-identity and manifestation of the identity (Cuba & Hummon, 1993; Hull, Lam, & Vigo, 1994; Proshansky, Fabian, & Kaminoff, 1983; Relph, 1976). Environmental degradation that leads to the failure of a place for an individual to maintain and express his/her self-identity that is ingrained in the place is likely to induce distress or anxiety (Burke, 1991b; Proshansky, Fabian, & Kaminoff, 1983). As a consequence, environmental problems become self-relevant because of the adverse impacts on self-identity. Actions in response to these problems become a process that is intrinsically motivating to verify and maintain one's identity in this specific context (Stets & Burke, 2000).

A growing literature has been devoted to examining place-related concepts and their effects on attitude or behavior toward various natural resource policies or practices.

For example, impacts of sense of place (Cantrill & Senecah, 2001; Stedman, 2002), place attachment (Kaltenborn & Bjerke, 2002; Kyle, Bricker, Graefe, & Wickham, 2004; Payton, Fulton, & Anderson, 2005; Vaske & Kobrin, 2001; Vorkinn & Riese, 2001), place identity (Bonaiuto, Breakwell, & Cano, 1996; Bonaiuto, Carrus, Martorella, & Bonnes, 2002; Uzzel, Pol, & Badenas, 2002), and place meaning (Davenport & Anderson, 2005; Oreszczyn & Lane, 2000) on attitudes, perceptions, or behaviors toward natural resource conditions or management have been studied. However, this has been criticized for failing to provide a theoretical explanation for the association between place identity and behavior (Korpela, 1989; Sarbin, 1983; Twigger-Ross, Bonaiuto, & Breakwell, 2003). At the same time, how change in a place may impact place identity and behavior to cope with the impacts have only been sparsely examined (Davenport & Anderson, 2005; Rogan, O'Connor, & Horwitz, 2005). Even fewer studies have investigated the effects of place identity as an intrinsic and self-related incentive to engage private landowners in resource management that will enhance the conservation of many ecosystem goods and services under the pressure of environmental change, such as urbanization and land fragmentation[12].

Private lands in the United States provide habitats for a majority of the endangered species and many other native plants and wildlife (Bean & Wilcove, 1997; Ewing et al., 2005). These lands also provide other critical ecosystem goods and services, such as supplying agricultural products and water, maintaining scenic landscapes and air quality, controlling flooding damage, creating recreation and tourism opportunities, and allow for a rural way of life (American Farmland Trust, 2006; Heimlich, 1989; Lockeretz, 1987; Pfeffer & Lapping, 1995; Ryan & Walker, 2004). The ecological and social functions of private lands and the needs to conserve these lands were not well recognized until recently by scientists and the public (Ewing et al., 2005; Miller & Hobbs, 2002; Myers, 1999; E. Nelson, Uwasu, & Polasky, 2007).

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[12] Although a few studies have examined the relationships between place-related factors (Erickson, Ryan, & De Young, 2002; Ryan, Erickson, & De Young, 2003), self-interest (Liffmann, Huntsinger, & Forero, 2000; Sanders, Wilkins, Conner, Hamilton, & Peterson, 2004), and private land protection, none of them have quantitatively tested these relationships in the context of environmental change.

Private land conservation is a prominent issue in Texas since private agricultural lands comprise 84% of the state. Rapid population growth of the state in the recent decades has facilitated the process of urbanization and converting private agricultural lands for urban uses (Wilkins et al., 2003a). Urbanization is ranked as the top threat to species conservation by transforming the habitat for native species to built environments (Czech, Krausman, & Devers, 2000). Urbanization and the sprawl of urban development to the adjacent rural landscape result in large contiguous rural properties becoming fragmented or developed as a result of the temptation for landowners to sell land due to high development values, growing property taxes, and increasing difficulty of maintaining agricultural land surrounded by an urban population (Heffernan & Elder, 1987; Lisansky & Clark, 1987; Lockeretz, 1987). A consequence of ownership fragmentation is an increase in small agricultural lands which become economically nonviable for maintenance of traditional farming, ranching and forest harvesting (Wilkins et al., 2003a), and may further facilitate fragmentation.

Private ranchlands in the Hill Country represents one of the top fragmentation concerns in Texas (Wilkins et al., 2003b). This area is impacted by urbanization from the Austin-Round Rock metropolitan area (pop. = 1,249,763 in 2000) in the east and San Antonio metropolitan area (pop. = 1,711,703 in 2000) in the south. The population in the Austin-Round Rock metropolitan area has grown 47.7% and San Antonio metropolitan area, 21.6%, between 1990 and 2000. More than one hundred thousand acres of farms and ranches in this region were converted to non-agricultural uses between 1992 and 2001 (Wilkins et al., 2003b). The rapid land fragmentation occurring in this region is now threatening habitats for many native plants and animals, including the endangered species of black-capped vireos and golden-cheeked warblers (TPWD, 2005). Fragmentation also impairs the ecological function of ranchlands to recharge the Edwards Aquifer that supports the water supply of almost two million people living in and around San Antonio (Wagner & Kreuter, 2004).

The purpose of this study was to develop a theoretical framework to examine the associations among place identity, perception of landscape change, and behavior and

behavioral intention to conserve the environmental quality of private lands from been lost to urbanization. Theoretical bases were drawn from identity theories based in social psychology, and the place literature of environmental psychology and geography. Two structural models based on this framework were tested in the context of a changing environment in the Hill Country. Implications of the study to engaging private landowners in private land conservation in the area are discussed.

4.2. LITERATURE REVIEW

4.2.1. Functions of Place Identity

Proshansky and associates (Proshansky, 1978; Proshansky & Fabian, 1987; Proshansky, Fabian, & Kaminoff, 1983) provided one of the early and most frequently cited conceptions of place identity that integrated environmental psychology and social psychology. Place identity is defined by Proshansky et al. (1983) as "a sub-structure of the self-identity of the person consisting of… memories, ideas, feelings, attitudes, values, preferences, meanings, and conceptions of behavior and experience which relate to the variety and complexity of physical settings that define the day-to-day existence of every human being " (p. 59). They further suggested that place identity functions in certain ways to assist individuals to react to stimuli from a physical environment, and to adjust themselves or express their self-identity in the environment (Proshansky, Fabian, & Kaminoff, 1983). One of the place-identity functions suggested (Proshansky, Fabian, & Kaminoff, 1983) is that place identity helps individuals cope with environmental change. When discrepancies are perceived between the ideal conditions of a physical environment that constitute individuals' place identity and the actual conditions of that environment, three types of cognitive process may be provoked to reduce the discrepancies.

The first type of cognition is related to changing the environment. These may include knowledge about the behaviors, tools, and skills that individuals need to acquire, or support from other people to provide necessary aids and resources for desirable changes. For example, when the biking route that is routinely taken to the workplace is

blocked, an individual will use his/her knowledge about the local environment to decide another route to the destination. Alternatively, he/she may call a friend for a ride when the alternative route is too far or too dangerous to bike on. The second type of cognition involves learning the social norms of the environment. This knowledge helps individuals send appropriate signals when others' behaviors do not conform to the norms or when individuals' private space or sense of territory is infringed upon by others. Placing personal items, such as books or mugs, to claim the personal space in a public area is an example. When strategies derived from the aforementioned activities at the cognitive level do not work, the third type of cognition is likely to come into play. That is, an individual may change his/her own behavior to reduce the perceived discrepancies. For instance, when placing personal items do not stop others from using the space, the individual may start to think other strategies, such as moving to another area, to avoid crowding. These three types of cognitions provide guidelines for individuals to cope with the undesirable changes. Place identity and other place-related psychological constructs that function to help individuals adjust to environmental change so as to maintain the continuity of self-identity and a sense of belongingness is also suggested by Feldman (1990), Lalli (1992), Korpela (1989), Rowles (1983), and Twigger-Ross and Uzzell (1996).

Research in natural resource management has explored the relationship between place constructs and environmental attitudes and behaviors. For example, Kyle, Graefe, Manning, and Bacon (2004) found that two dimensions of place attachment, place identity and place dependence, had different effects on outdoor recreationists' perceptions of the social and environmental conditions along the Appalachian Trail. Specifically, recreationists who were highly identified with the trail were more likely to perceive problematic trail conditions. On the other hand, place-dependent recreationists were less likely to give negative evaluations to more developed trail conditions. Study findings of Vaske and Kobrin (2001) suggested that a high level of place identity significantly contributed to environmentally responsible behaviors, such as learning how to solve environmental issues and convincing friends to practice environmentally

responsible behaviors. Stedman (2002) identified that second homeowners' willingness to engage in maintaining or enhancing setting attributes could be explained by their high level of place attachment. The emotional aspect of place attachment was identified by Payton, Fulton, and Anderson (2005) as influencing participation in civic activities directly or indirectly through the mediation of trust among individuals and between individuals and resource management agencies.

Studies that examined the relationship between place constructs and environmental attitudes/behaviors have also taken into consideration the effects of contextual factors that are external to individuals' psychological processes in this relationship. One of the contextual variables that have been examined is reversibility (Kaltenborn, 1998) or immediacy (Cantrill & Senecah, 2001) of an environmental damage. For example, Kaltenborn (1998) examined the association between sense of place and responses to various levels of environmental impacts. Respondents of his study were categorized into three groups based on their sense of place (i.e., strong, medium, and weak). Tests revealed that the three groups significantly differed in their behavioral responses to environmental impacts which were most likely to be remediable and manageable. However, when environmental impacts generated serious damage and were likely irreversible (i.e., large amounts of crude oil spoiled along the shores), no significant differences among responses to finding alternative locations, shifting to alternative activities, or contributing to solutions were found. Kaltenborn's study suggested that there might be an interaction effect of perceived environmental impacts on the relationship between individuals' connection with a place and their attitudes/behaviors to maintain natural resources of the place. That is, the relationship between place attachment and resource management attitudes/behaviors may change depending on if environmental impacts are reversible or irreversible.

The functions of place identity suggested by Proshansky et al. (1983) provide useful guidelines to illustrate at the cognitive level how place identity may inform certain behaviors. However, they have been criticized for not explicating the theoretical basis underlying this relationship (Korpela, 1989; Sarbin, 1983; Twigger-Ross, Bonaiuto,

& Breakwell, 2003). Proshansky and his colleagues did state that place identity is likely to be transformed when one acquires a new social role or the physical world is modified due to technological developments and demographic or ecological changes. Nonetheless, they did not offer a theoretical description to explain why individuals may change their place identity under a changing environment. Identity theory (Stryker, 1980, 1987) provides a theoretical explanation for place identity as a motivating for behavior to preserve or change the identity. Identity control theory (Burke, 1991a, 1991b, 2004) supplements the theoretical understanding for how place identity may change as a consequence of changes in the physical and socio-economic environment where the identity is embedded.

4.2.2. Identity Theory and Identity Control Theory

Identity theorists suggest that self consists of multiple identities that can be organized into a hierarchical structure based on the levels of salience or prominence of the identities (McCall & Simmons, 1978; Stryker, 1980, 1987). Identity salience refers to the probability that an identity is invoked in a specific interactive situation or across situations compared to other identities (Stryker, 1980; Stryker & Serpe, 1982). An identity that is most relevant to a situation and important across situations is more likely to be activated from a set of identities. A salient identity is, therefore, likely to be central or important to the individual (Burke, 1991b) and helps guide the person's behavior in the situation (Nuttbrock & Freudiger, 1991; Stryker & Serpe, 1994). According to identity theory (Stryker, 1980, 1987), salience of an identity is determined by individuals' commitment to the identity. Commitment is defined as "the degree to which the person's relationships to specified sets of others depends on his or her being a particular kind of person" (Stryker & Serpe, 1982, p. 207). Stryker (1987) further suggested that two dimensions of commitment could be identified. The first refers to the extent of commitment (i.e., the interactive dimension) or the number of social relations associated with an identity. The second is the intensity of commitment (i.e., the affective dimension) or the importance of these social relations. It is suggested when the social

relationships associated with an identity are widely connected and highly valued, then the identity is more likely to be provoked (Cassidy & Trew, 2004; Nuttbrock & Freudiger, 1991; Serpe, 1987; Stryker & Serpe, 1994). In addition to the structural characteristics, identity also contains a temporal component. That is, the self-meanings that constitute an identity may evolve over time.

Identity control theory (Burke, 1991b, 2004) suggests that formation or evolvement of an identity involves a continuous process of adjustment. When there is discrepancy between perceived self-meanings and ideal self-meanings, an individual is likely motivated to act to bring the two sets of self-meanings into congruence. Perceived self-meanings are self-related meanings that one perceives from how others respond to him/her since others' responses to the individual reflect how they define who the person is. Perceived self-meanings can also be reflected from the physical environment. For example, one's home or personal space, and how it is arranged is manifestation of his/her self-identity. Ideal self-meanings are the meanings that one ascribes to define who he/she is. Ideal self-meanings are used as standards to evaluate how perceived self-meanings differ from the ideal ones. When perceived self-meanings are incongruent with ideal self-meanings, the person is motivated to reduce the discrepancy that may induce the psychological discomfort of distress or anxiety. When the environment is new to the person, he/she will need to learn or acquire new skills or knowledge to minimize the discrepancy by enacting certain behaviors. The psychological process to keep a minimum level of discrepancy between the ideal and perceived meanings of self-identity is called an identity process. Identity process represents continuous cognitive activities aimed at reducing the distress or anxiety caused by the discrepancy (Burke, 1991a, 1991b). In the context of place identity, the three functions of place identity suggested by Proshansky (1978) as discussed earlier may guide the individual to develop strategies to minimize the uncomfortable feelings. Once a strategy is decided, the act to implement the strategy is an output of the identity process that may influence the social situation or change the physical environment to bring the perceived self-meanings closer to the ideal ones. This effort may result in changing the ways that others respond to the person or

changing the environment to the one that is more consistent with who the person is (i.e., reflected appraisal). Reflected appraisals perceived by the person will then feed into his/her identity control process that will reevaluate if perceived self-meanings have been changed closer to the standards.

The identity process becomes automatic when one is repeatedly exposed to similar social and physical settings. However, when changes are induced by an agent in the social and physical settings and lead to an enlarging discrepancy between perceived self-meanings and identity standards, the changing agent becomes an interruption that interferes with the continuous and automatic identity process. Burke (1991b) suggested four conditions where interruptions on identity processes may become problematic: 1) repeated or severe interruptions of the identity process cause greater distress than occasional or infrequent interruptions; 2) interruption of the identity process causes greater distress when the interrupted identity is highly salient; 3) interruption of the identity process causes greater distress when the interrupted identity is one to which the person is highly committed[13]; and 4) interruption of the identity process causes greater distress when the source of the perceived identity is significant to the individual, i.e., interruption of feedback from a significant other is more stressful than interruption from a casual acquaintance.

As already mentioned in Chapter II, both identity theory and identity control theory focus primarily on individuals' interactions with the social environment (Burke, 1991b; Wells & Stryker, 1988). Individuals' transactions with the physical environment are relatively ignored. However, that the biophysical attributes and the symbols or meanings of an environment may become integrated into one's self-identity has been examined and demonstrated in different lines of research (Devine-Wright & Lyons, 1997; Greider & Garkovish, 1994; Gustafson, 2001; Korpela, 1989; Low & Altman, 1992; Milligan, 2003; Relph, 1976; Rowles, 1983; Twigger-Ross & Uzzell, 1996). This study adopted identity theory and identity control theory, and extends their application to

[13] The commitment stated here is different from the commitment as defined in identity theory (Stryker, 1987; Stryker & Serpe, 1982). Here, commitment is referred to as "the strength of the response an individual makes to restore perceptions of the self (inputs) to match the identity standard when there is a discrepancy between them" (Burke, 1991b, p. 841).

explore the process of place identity and its implications on behaviors taking account individuals' interactions with both the social and physical environments. Specifically, the study examined the relationship among individuals' commitment to the social and physical environments of the place, place identity, and behavior or behavioral intention that may lead to preserving or changing the identity. Moreover, the impacts of environmental change as a continuous source of interruption on the relationships between place identity and identity-related behavior/behavioral intention were examined.

4.3. CONCEPTUAL FRAMEWORK AND HYPOTHESES

Based on the symbolic interactionist perspective, identity theory views self-identity as comprising meanings that characterize the identity (Burke & Tully, 1977). Following the same line and extending this conception of identity to include interactions with the physical environment, place identity is defined in this study as the meanings that an individual ascribes through his/her interaction in and with the social and biophysical environment in a place and become the defining characteristics of his/her self-identity.

According to identity control theory (Burke, 1991a, 1991b), meanings that comprise place identity may be changed by externally induced interruption on the identity process. Fragmentation of open space comprised of large private lands that is induced by population growth and urban development represents a form of interruption that continuously reshapes the biophysical and socio-economic attributes of the environment. This form of landscape change repeatedly interrupts landowners' place identity that is embedded in the biophysical and social environment of the place as well as the continued delivery of ecosystem goods and services. Three possible outcomes may result as a consequence of the interruption based on identity control theory. When interruption of landscape change on place identity is minimal, impacts of the interruption on the process of place identity can be controlled automatically without being brought into consciousness. However, as changes accumulate over time or become more intense, the level of interruption is likely to increase and may exceed the threshold of

unconsciousness below which maintenance of place identity is automatically and unconsciously operated. When the change exceeds the threshold of unconsciousness, the individual becomes aware of the discomfort induced by the discrepancy between the ideal and perceived place-identity. If place identity is significant to the individual because of his/her commitment to the identity, then interruption of landscape change is likely to force him/her to engage in behaviors to restore the environment that has undergone unwanted changes and, therefore, restore the identity. If the interruption of landscape change becomes so severe and exceeds the individual's capacity to tolerate and to manage the interruption, he/she may have no choice but to modify the identity to accommodate the change or abandon the identity.

Two hypothesized models (Fig. 9 and Fig. 10) were developed based on this framework to test the process of landowners' place identity associated with their property in the Texas Hill Country. Different from identity theory where commitment is conceptualized as comprising the dimensions of extensiveness and intensiveness associated with one's social relationships, commitment, as defined in this study, represents the extensiveness of one's relationships with the social and physical environment in a geographical setting. Social and environmental commitment was hypothesized as the predictor of identity salience. At the same time, based on identity control theory, the effects of landscape change as an external source of interference of the identity process were hypothesized. That is, the relationships among commitment, place identity, and behavior and behavioral intention to preserve or change the identity were hypothesized to be influenced by perceptions of landscape change.

Definitions of the latent constructs included in both structural models are described in the following:

1. Social commitment: the extensiveness/number of one's connection to the social relationships developed from his/her living in a specified geographic location (adapted from Stryker, 1980).
2. Environmental commitment: the extensiveness of one's connection with the biophysical environment associated with one's living in a specified geographic

location (adapted from Stryker, 1980).

3. Salience of place identity: an individual's evaluation of the set of meanings that are associated with his/her interactions in a specific geographic location and become defining characteristics of his/her self-identity (adapted from Burke & Tully, 1977). Three dimensions of the meanings that constitute place identity (i.e., biophysical features, place functions, and affective feelings) could be identified based on the place literature (Canter, 1977; Proshansky, 1978; Relph, 1976). However, results of confirmatory factor analysis in the previous study suggested that biophysical features and place functions were highly correlated and failed to meet discriminant validity. These two dimensions were combined to represent the cognitive dimension along with affective feelings that represented. Cognitive and affective dimensions together constituted the two dimensions of place identity in the hypothesized models.
    3.1. Cognitive dimension of place identity: meanings of the place that represent the biological and physical features of the place, and the activities supported by or functions provided by the features of the place
    3.2. Affective dimension of place identity: meanings of the place that represent the affective or emotional feelings that an individual associates with the place
4. Perception of landscape change: an external source of interruption that interferes with the process of place identity and may lead to the discrepancy between ideal and perceived place-identity. Aspects of landscape change may include changes in the conditions of natural resources, scenic quality, and a rural way of life.
5. Behavior: In Model A, two types of behavior were tested. The first included landowners' behavioral investment in directly managing their property to maintain the features and functions supported by the property. The second included behavioral investment that was less directly related to property management but did help landowners enhance their ability or control to manage

the property and keep the property from being lost to land fragmentation. Engaging in behaviors to directly or indirectly manage the property would have implications for preserving or changing landowners' identity associated with their property.

6. Behavioral intention: Identity theory suggests that place identity mediates the relationship between commitment and behavior. However, since landowners' future behavior to preserve or change their property where their place identity was embedded was unobservable, the most proximate predictor for future behavior, behavioral intention (Fishbein, 1997), was used as the proxy for future behavior. In the current study, two types of behavioral intentions regarding landowners' future plans for their property were tested, including the intention to conserve the property and intention to change the property.

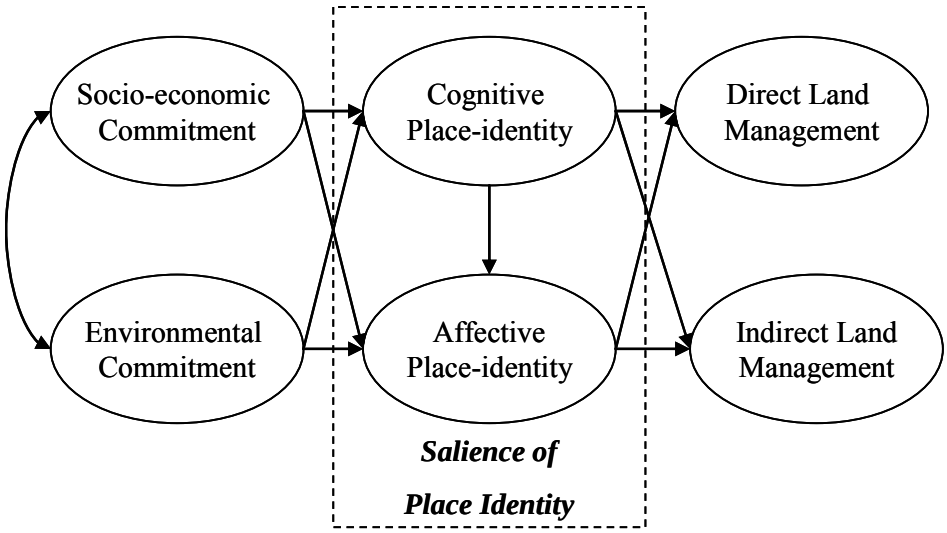

Fig. 9. Hypothesized Model A (behavior)

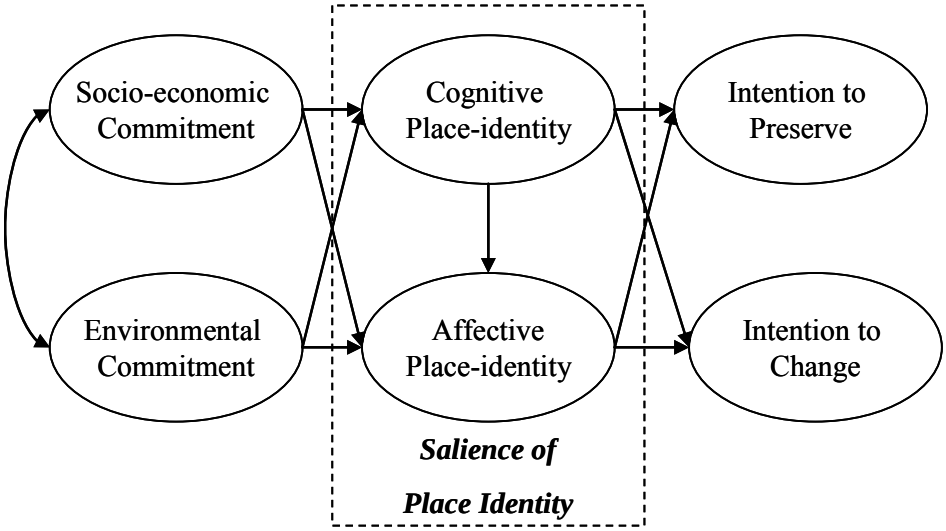

Fig. 10. Hypothesized Model B (behavioral intention)

Before providing detailed descriptions of the hypothesized relationships in the models, the rationale for some of the hypothesized relationships requires some explanation. Firstly, although identity theory suggests two dimensions of commitment that affect identity salience (i.e., interactive and affective dimensions) (Stryker, 1980, 1987), only interactive commitment was included in the hypothesized models. Affective commitment as defined in identity theory is similar to salience of place identity as conceptualized in this study. Both represent individuals' evaluation of their interactions with the biophysical and socio-economic environment in a specific geographic location. The second point to be noted is the potentially causal relationship between cognitive and affective place-identity. The biophysical and functional attributes of a place or changes of these attributes in the place are frequently experienced first during an individual's initial encounter of the place. These experiences may then be developed into their affective feelings toward the place after repeat encounters. This causal effect may be partially due to processes described in the biological theories (Appleton, 1975; Balling & Falk, 1982) and information-processing theories (Gibson, 1979; Kaplan & Kaplan, 1989;

Lynch, 1960) in the landscape perception literature. This literature provides a biological and evolutionary explanation for the way that biophysical attributes and their functions trigger certain responses to the environment. For example, the prospect refuge theory (Appleton, 1975) is based on the idea that landscapes which afford wide and open view (prospect) or afford protection for the viewer (refuge) are preferred due to the biological instinct for survival that has developed through human evolution. Kaplan and Kaplan (1989), based on information-processing theories, have suggested that a landscape that conveys complexity and mystery and yet is understandable is preferred. Based on this literature, that the meanings of the biophysical and social (e.g., recreation and friends/family activities afforded by the environments) attributes (i.e., cognitive place-identity) might contribute to meanings of the affective aspects (i.e., affective place-identity) of an individual's place identity was tested.

The following relationships were hypothesized in the two structural models.

Hypothesis 1: A higher level of social commitment will contribute to a higher level of environmental commitment and vice versa.

Hypothesis 2: A higher level of social and environmental commitment will contribute to a higher level of cognitive and affective place-identity.

Hypothesis 3: A higher level of cognitive place-identity will contribute to a higher level of affective place-identity.

Hypothesis 4: A higher level of cognitive/affective place-identity will contribute to a higher level of behavioral investment in direct/indirect property management (Model A). However, the associations between cognitive/affective place-identity and the two latent variables of behavioral investment will be moderated by perception of landscape change. Specifically, the positive relationships between cognitive/affective place-identity and the behavioral investment variables will be enhanced when landscape change is perceived to become moderately worse than in the past compared to when it is perceived to be not changed or improved.

Hypothesis 5: A higher level of cognitive/affective place-identity will contribute to a higher level of stated behavioral intention to conserve the property and a lower level of

behavioral intention to change the property (Model B). Perception of landscape change is likely to moderate the associations between cognitive/affective place-identity and the two latent variables of behavioral intention. Specifically, the positive relationships between cognitive/affective place-identity and behavioral intention to conserve will be enhanced when landscape change is perceived to become moderately worse than in the past compared to when it is perceived to be not changed or improved. Likewise, the negative relationships between cognitive/affective place-identity and behavioral intention to change will be enhanced when landscape change is perceived to become moderately worse than in the past compared to when it is perceived to be not changed or improved.

The hypotheses were tested using a random sample of private landowners in the Texas Hill Country where open-space fragmentation is affecting landowners' place identity of their property.

4.4. SCOPE CONDITIONS

Place identity as an intrinsic motive for conservation behaviors or behavioral intentions may only work well in certain conditions contingent to individuals' social structures. From the postmaterialist perspective (Inglehart, 1981, 1995), support for resource conservation cannot be attained without the basic human needs, such as the basic physical survival needs and safety suggested by Maslow (1970). It is likely that those who are struggling with the basic material needs do not have sufficient resources to maintain their place identity that may encompass the higher needs of belonging, self-esteem, and self-actualization (Maslow, 1970). To this population, strong place identity may be devastating. They may suffer more serious psychological distress because of the lack of resources to bring the perceived self-meanings to their ideal self-meanings when they are forced to give up their self-identity that is embedded in a place important to them (Fried, 1963, 2000). That place identity is likely to predict conservation behaviors and behavioral intentions when basic needs have been met provides the scope condition that delineates the application of the proposed framework.

4.5. METHODS

4.5.1. Sampling and Data Collection

Please refer to Chapter III for the procedures of sampling and data collection.

4.5.2. Measurements

4.5.2.1. Commitment

Two dimensions of commitment were measured, 1) commitment to the biophysical environment (i.e., environmental commitment) and 2) commitment to the social environment (i.e., social commitment). Items used to measure landowners' commitment to the social environment of their property were adapted by extending the interactive dimension of commitment as defined and measured in research based on identity theory (Serpe, 1987; Stryker & Serpe, 1982; Stryker & Serpe, 1994). Six items (CS1-CS6) were used to measure this latent construct, including number of years the property was in the family, number of relatives or friends living in the nearby community, number of relatives and friends with whom contact would be lost if the property were sold, number of community organizations that respondents were affiliated with, and level of economic dependence on the property (Table 27). Since identity theory does not distinguish between social and environmental commitment, there was no existing scale to measure environmental commitment. Two items (CE1 and CE2) that represented the extensiveness of landowners' connection with the biophysical environment of their property were used to measure this latent construct, including size of the property and years of interacting with the property (Table 27).

Table 27

Commitment to the socio-economic and biophysical environments on landowners' property

Items	Mean (St. Dev.)	Skewness[a]	Kurtosis[a]
Commitment to the Bbiophysical Environment			
CE1: What is the acreage of the property? (N = 513)	244.52 (529.69)	22.26***	14.48***
CE2: How long have you been coming to the property? (N = 500)	30.86 (23.02)	3.51***	-12.36***
Commitment to the Socio-economic Environment			
CS1: How long has the property been in your family? (N = 502)	42.46 (40.56)	7.64***	-.67
CS2: How many relatives or in-laws are living in the community in which the property is located? (N = 484)	6.17 (16.69)	22.27***	14.40***
CS3: How many friends are living in the community in which the property is located? (N = 423)	39.06 (147.87)	24.77***	14.91***
CS4: Think of those people as identified in the previous two questions. About how many would you lose contact with if you no longer owned the property? (N = 427)	28.12 (144.90)	24.95***	14.96***
CS5: How many community groups or organizations (e.g., church, school, municipal, civic, or ranch/farm organization) are you an active member in? (N = 495)	1.99 (2.03)	8.61***	4.00***
CS6: About what proportion of your 2006 income came from the property? (N = 450)	6.58 (15.95)	16.27***	10.62***

a: z-score

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

4.5.2.2. Salience of Place Identity

Place identity as measured in this study was the identity associated with respondents' property in the Texas Hill Country. The measurement scale was composed in two ways. First, some items were developed primarily from a preliminary study designed to identify the common meanings that landowners ascribed to their property.

Second, some items were adapted from the existing scale of place attachment to measure the affective aspect of place identity (Williams & Roggenbuck, 1989; Williams & Vaske, 2003). The scale was refined using confirmatory factor analysis as described in Chapter III. Ten items measuring the cognitive and affective dimensions of place identity that represented sufficient model fit, convergent validity, discriminant validity, and internal consistency were retained. The cognitive dimension was measured by 6 items (PS1, PS3, PS6, PF2, PF4, and PF5) that represented the biological, physical, and functional features of one's property (Table 28). The affective dimension of place identity was measured using 4 items (PA3, PA4, PA5, and PA6) that described emotions elicited by the property (Table 28). All items were measured using 7-point scales ranging from 1, "strongly disagree," 4, "neutral," to 7, "strongly agree."

4.5.2.3. Behavior

Direct and indirect behavioral investments in managing landowners' property were measured by 9 (BD1-BD9) and 3 (BI1-BI3) items, respectively. Direct behavioral investment in the property to maintain the biophysical attributes and functions of the property was measured by asking respondents to indicate the amount of effort, ranging from 1, "no effort," to 7, "a lot of effort," they had invested in managing their property during the past 5 years (Table 29). Indirect behavioral investment was measured using the same 7-point scales. Respondents were asked the amount of effort that they devoted to acquiring new knowledge and skill to manage or maintain the property or to expressing their opinions about new development (Table 29).

Table 28

Cognitive and affective dimensions of place identity

Items	Mean (St. Dev.)	Skewness[a]	Kurtosis[a]
Cognitive Dimension			
PS1: The natural environment makes the property special (N = 512)	6.67 (.80)	-17.19***	11.68***
PS3: The terrain is an essential quality of the property (N = 500)	6.33 (1.04)	-12.82***	8.35***
PS6: 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) (N = 513)	6.39 (1.10)	-13.75***	8.75***
PF2: The property provides a quality living environment (N = 507)	6.50 (.99)	-14.57***	9.50***
PF4: The property is a great place to enjoy the outdoors (N = 512)	6.74 (.61)	-15.64***	10.71***
PF5: I enjoy having people visit me on the property (N = 506)	6.11 (1.35)	-11.62***	6.27***
Affective Dimension			
PA3: I feel at home when I'm here (N = 509)	6.57 (.90)	-15.08***	10.03***
PA4: I feel the property has become a part of me (N = 513)	6.38 (1.08)	-12.91***	7.76***
PA5: I feel spiritually connected to the property (N = 499)	5.90 (1.47)	-9.83***	4.27***
PA6: The property doesn't mean much to me[b] (N = 512)	6.62 (1.03)	-16.62***	10.75***

a: z-score

b: Items were reverse coded

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

Table 29

Behavioral investment in maintaining property

Items	Mean (St. Dev.)	Skewness[a]	Kurtosis[a]
Behavioral Investment in Direct Property Management			
BD1: Managing the property for outdoor activities (N = 507)	5.18 (1.75)	-6.65***	-.15
BD2: Managing the property for family activities (N = 509)	4.93 (1.79)	-5.36***	-2.20*
BD3: Maintaining the friendships with neighbors (N = 510)	4.45 (1.81)	-2.70**	-5.48***
BD4: Maintaining water quality (N = 507)	5.37 (1.86)	-8.17***	.27
BD5: Maintaining water supply (N = 508)	5.47 (1.84)	-8.65***	1.05
BD6: Controlling invasive plants (including noxious weeds and brush) (N = 511)	5.47 (1.71)	-8.60***	2.13*
BD7: Enhancing native plant communities (N = 507)	4.39 (1.92)	-3.37**	-7.82***
BD8: Maintaining native wildlife populations (N = 512)	5.45 (1.82)	-8.87***	1.55
BD9: Preserving special places (N = 508)	5.18 (1.87)	-6.91***	-1.53
Behavioral Investment in Indirect Property Management			
BI1: Attending public hearings regarding new development in the area to have my voice heard (N = 510)	3.06 (2.07)	4.95***	-9.71***
BI2: Attending workshops or seminars to enhance my land management ability (N = 511)	3.33 (2.13)	2.71**	-31.04***
BI3: Learning different ways to keep the property in the family (N = 510)	3.89 (2.29)	-.03	69.02***

a: z-score

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

4.5.2.4. Behavioral Intention

Behavioral intention that could lead to preserving or changing respondents' property in the future was measured (Table 30). First, intention to conserve the property was measured by 3 items (IP1-IP3) that described the likelihood of keeping the property in the family, maintaining the current features of the property, and continuing the activities that respondents had been doing on the property. Second, intention to change the status of the property was measured using 4 items (IC1-IC4), including converting the property to a different land use, subdividing the property, moving to another place, or selling the property. Respondents were asked to indicate how likely or unlikely they were to engage in the aforementioned activities in the next 5 years (Table 30). Items were measured using 7-point scales ranging from 1, "strongly unlikely," 4, "neutral," to 7, "strongly likely."

Table 30

Behavioral intention to conserve or change property in the future

Items	Mean (St. Dev.)	Skewness[a]	Kurtosis[a]
Behavioral Intention to Conserve Property			
IP1: Keeping the property in the family (N = 510)	6.05 (1.70)	-11.97***	5.55***
IP2: Maintaining the current features of the property (N = 512)	6.48 (1.08)	-15.41***	10.03***
IP3: Continuing the activities which I've been doing (N = 507)	6.50 (1.02)	-15.56***	10.29***
Behavioral Intention to Change Property			
IC1: Converting the property or a portion of it to a land use different from the way it is currently used (N = 511)	2.83 (2.16)	6.33***	-9.33***
IC2: Subdividing the property (N = 511)	1.62 (1.44)	14.21***	8.17***
IC3: Moving to another place (N = 499)	1.93 (1.65)	11.31***	4.78***
IC4: Selling the property (N = 513)	2.10 (1.87)	10.76***	3.30**

a: z-score
* $p < .05$; ** $p < .01$; *** $p < .001$

4.5.2.5. Perception of Landscape Change

Perception of landscape change was measured using 9 items representing different environmental qualities impacted by population growth and urban development (Table 31). The 9 items (LC1-LC9) were identified from the preliminary study described in Chapter II. Respondents were asked how they had perceived change in the 9 aspects of environmental quality in the area surrounding their property during the past 5 years, or since they first owned the property if less than 5 years. A number ranging from 1, "much worse," 4, "no change," to 7, "much better" was selected to represent the perception of the change in the respective environmental quality.

Table 31

Perception of landscape change

Items	Mean (St. Dev.)	Skewness[a]	Kurtosis[a]
LC1: Native wildlife (N = 507)	3.88 (1.53)	2.58*	-1.02
LC2: Native plants (N = 508)	4.11 (1.22)	2.31*	3.26**
LC3: Water quality (N = 501)	3.78 (1.30)	1.49	3.12**
LC4: Water supply (N = 505)	3.54 (1.49)	2.40*	1.09
LC5: Soil stability (N = 502)	4.09 (1.10)	3.68**	4.98***
LC6: Air quality (N = 506)	3.80 (1.15)	1.46	5.14***
LC7: Background sounds (N = 505)	2.92 (1.36)	3.45**	1.06
LC8: Scenic quality (N = 507)	3.51 (1.54)	3.19**	-.15
LC9: A rural way of life (N = 506)	3.32 (1.62)	4.15***	-.80

a: z-score

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

4.5.3. Data Screening

Overall, 608 respondents returned the questionnaires which resulted in a raw response rate of 56.3%. After excluding undeliverable addresses, those indicating that they either did not own properties in the study area or were not the manager of a property no less than 10 acres, and cases with substantial number of missing values in any of the latent constructs (>= 50% of the items in any of the scales), 513 cases were retained for further analyses (effective response rate = 49.6%). Multiple imputation was applied to replace the missing values in the 513 cases.

4.5.4. Data Analyses

Covariance structure analysis was conducted to examine the hypothesized models following the two-step approach suggested by Muliak, James, Alstine, Bennett, Lind, and Stilwell (1989). The first step examined how the factor structures hypothesized for all the latent constructs (i.e., commitment, salience of place identity, and behavior/behavioral intention) in the measurement models (Fig. 11 & Fig. 12) fit the data. Since most of the items used in this study were newly developed or adapted from existing scales (e.g., some of the items in social commitment and affective place-identity), one of the early steps in data analyses involved refining the measurement scales and models by removing problematic items and allowing some of the parameters to be correlated. Items with lots of missing data were deleted before testing for the measurement models. Respecification of measurement models was based on the rationale described in Chapter III. Refined models were examined based on indicators for model fit, validity, and internal consistency.

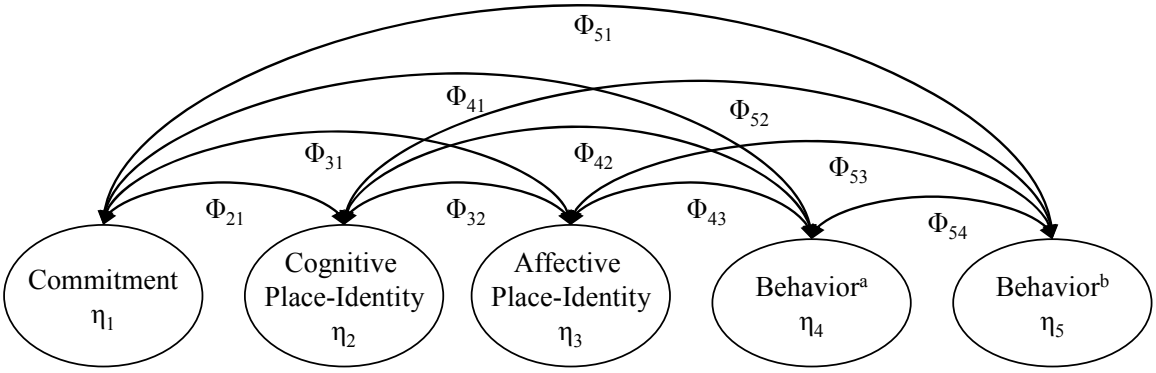

Fig. 11. Measurement Model A (a: behavioral investment to direct property management; b: behavioral investment to indirect property management)

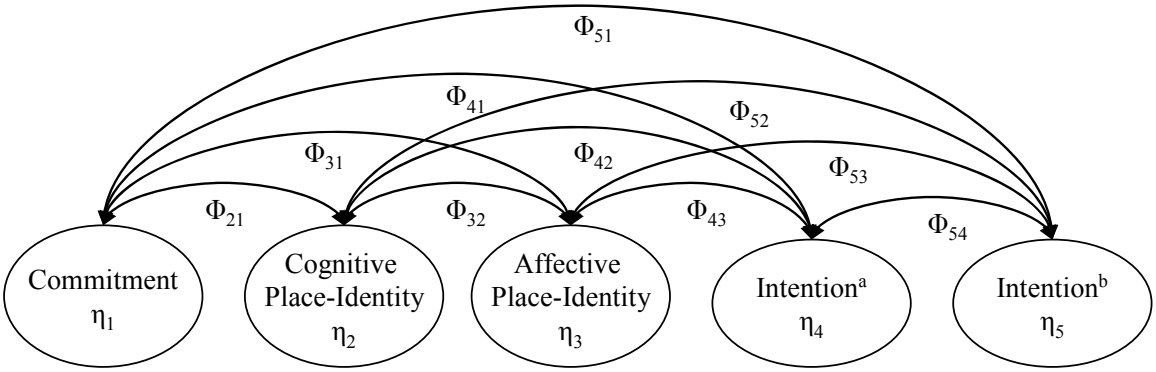

Fig. 12. Measurement Model B (a: behavioral intention to conserve property; b: behavioral intention to change property)

Model fit was assessed using the Satorra-Bentler scaled statistic (S-B χ^2) (Satorra & Bentler, 1988) as a correction for the chi-square statistic when the assumption of normality does not hold by taking into account the model, the estimation method, and the kurtosis values. Since the chi-square statistic is sensitive to large samples, other fit indices, including the root mean square error of approximation (RMESA) (Steiger & Lind, 1980), non-normed fit index (NNFI) (Bentler & Bonett, 1980), comparative fit index (CFI) (Bentler, 1990), standardized root mean square residual (SRMR) (Bentler, 1995), and goodness of fit index (GFI) (Jöreskog & Sörbom, 1978), were also used to evaluate the fit of the hypothesized models. RMSEA and CFI were adjusted to reflect the lack of normality. Therefore, adjust RMSEA and robust CFI were used to evaluate model performance. RMSEA <= .08 (Browne & Cudeck, 1993), NNFI and CFI >= .95 (Hu & Bentler, 1999), SRMR <= .08 (Hu & Bentler, 1999), and GFI >= .90 (Hu & Bentler, 1995) indicate acceptable model fit. Furthermore, construct validity (i.e., convergent validity and discriminant validity) and internal consistency (Conbach's alpha coefficients, composite reliability, and average variance extracted estimates (AVE) of the latent variables in each measurement scale were also examined.

The second step involved evaluating the structural models (Fig. 11 & Fig. 12) and testing the predictive validity of the latent constructs. Invariance testing was then applied to examining the moderating effect of the perception of landscape change on the relationships between the two dimensions of place identity and the latent behavioral/behavioral intention variables based on the chi-square statistics. The hypothesized effects of perception of landscape change on the relationship between place identity and behavior/behavioral intention represent moderating effects (Baron & Kenny, 1986). Specifically, the moderating effect would be evident when perception of landscape change interacted with the cognitive and affective dimensions of place identity to change the zero-order correlation between the two place-identity dimensions and behavior or behavioral intention. Rigdon, Schumacker, and Wothke (1998) recommended using the multisample approach to modeling moderating effects between latent variables when covariance structure analysis was applied. The multisample

approach categorized the sample into a number of subgroups based on the responses to the moderator variable. Moderating effects are evident when the structural coefficients in the hypothesized model are statistically different among the groups based on the chi-square difference test[14] (Jöreskog & Sörbom, 1996). In this study respondents were categorized into three groups based on their perception of landscape change. Invariance testing was conducted to examine if the relationships between cognitive/affective place-identity and behavior in Model A and between cognitive/affective place-identity and behavioral intention in Model B varied among the three groups.

4.6. RESULTS

4.6.1. Descriptive Statistics

4.6.1.1. Commitment

Table 27 shows the descriptive statistics and the normality tests of the measurement items for the environmental and social commitment scales. The average acreage of the property owned by study participants was 244.5 acres. Respondents had been coming to their property for an average of 30.9 years. On average, respondents had a history of family ownership of the property for more than 40 years (M = 42.5), had approximately 6 relatives or in-laws living in the same community where the property was located (M = 6.2), and had participated in 2 community groups or organizations (M = 2.0). Normality tests indicated that the hypothesis of normal distribution was rejected for all at $p < .001$. However, normality tests are very sensitive to large samples (Tabachnick & Fidell, 1996). The shape of the distribution should also be inspected when data from large samples are analyzed (Pallant, 2001; Tabachnick & Fidell, 1996). Inspection of histograms also revealed that these observed variables were non-normally distributed.

Three items of the original social commitment scale were removed from the analyses because more than 12% of the respondents either did not respond to the questions or did not give a numerical response (17.5% for CS3, 16.8% of CS4, and

[14] Corrected S-B χ^2 values were used here due to the lack of normality of the data and that the distribution of S-B χ^2 differs from the normal chi-square (Satorra & Bentler, 2001).

12.3% for CS6).

4.6.1.2. Salience of Place Identity

Table 28 shows only the 10 items measuring salience of place identity that were retained after the scaling procedures as described in the previous chapter. In general, the natural, built, and functional attributes of respondents' properties were highly valued (M >= 6.1). Respondents were also emotionally connected to their property as indicated by the mean scores of at least 5.9 for all the items. Since respondents were asked about their feelings to their own property, it was not surprising that responses to the items were negatively skewed and highly peaked, and did not conform to normal distribution.

4.6.1.3. Behavior

During the past 5 years or since the property was first owned, if less than 5 years, respondents had invested more effort on directly managing the biophysical and functional attributes of their property compared to the amount of effort invested in indirect property management (Table 29). Regarding direct management, respondents invested most in maintaining a water supply (M = 5.5), controlling invasive plants (M = 5.5), and maintaining native wildlife populations (M = 5.5). Respondents also invested more effort in maintaining water quality (M = 5.4), managing property for outdoor recreation (M = 5.2), and preserving special places on the property (M = 5.2). Less effort was invested in managing the property functions to support family activities (M = 4.9), maintaining friendship with neighbors (M = 4.5), and enhancing native plant communities (M = 4.4). Respondents, on the other hand, spent less than "some effort" in indirect management activities to maintain their property. Among the indirect management activities, more effort was allocated to learning ways to keep the property in the family (M = 3.9) followed by attending workshops/seminars to enhance management ability (M = 3.3) and attending public hearings to express opinions about new development (M = 3.1). Tests for normality showed that the majority of the items did not conform to the normal distribution.

4.6.1.4. Behavioral Intention

Respondents showed a high level of intention to conserve their property and low level of intention to change the property in the next 5 years (Table 30). Specifically, they were very likely to continue their current activities on the property (M = 6.5), maintain the current features of the property (M = 6.5), and keep the property in the family in the near future (M = 6.1). It was most unlikely for them to subdivide the property (M = 1.6) or plan to move to some other place (M = 1.9), followed by selling the property (M = 2.1) and changing the land use of the property (M = 2.8). Inspection of normality showed that all of the items in this scale were significantly skewed and peaked. The 3 items of intention to conserve were negatively skewed, while the 4 items of intention to change were positively skewed.

4.6.1.5. Perception of Landscape Change

Overall, respondents perceived that most environmental and natural resource qualities in the area surrounding their property were deteriorating (Table 31). Background sounds were perceived to be the worst change (M = 2.9) followed by a rural way of life (M = 3.3), scenic quality (M = 3.5), water supply (M = 3.5), water and air quality (M = 3.8), and native wildlife (M = 3.9). On the other hand, the conditions of native plants (M = 4.1) and soil stability (M = 4.1) were perceived to be improving. Responses to only few of the items in this scale were not normally distributed.

4.6.2. Measurement Models

Since the assumption of normality did not hold for most of the items, evaluation of measurement models using covariance structure analysis was conducted based on robust maximum likelihood estimation (RMLE) using LISREL (version 8.70) for Microsoft. Although normal distribution was not assumed in the study, observed variables that were severely skewed and had large values of standard variance could lead to failure of generating a convergent solution. Responses to CE1 (property size), CE2 (personal history of visiting the property), CS1 (history of family ownership), and CS2

(number of relatives or in-laws living in the same community) were highly skewed and/or peaked, and had large values of standard deviation. Therefore, these items were rescaled. CE1 was rescaled into 10 categories, and CE2, CS1, CS2, and CS5 were rescaled into 5 categories each, with an approximately equal number of respondents in each category.

Table 32 shows the model fit indices of the initial forms of the two measurement models. Since χ^2 statistics are sensitive to large sample sizes (Kline, 2005) as was the case in this study, other fit indices were used to evaluate the model performance. Although the fit index of SRMR (.072) fell within the acceptable range, adjust RMSEA (.080), robust CFI (.93), NNFI (.93), and GFI (.82) did not meet the criteria for acceptable model fit. Due to the exploratory nature of the study, model respecification was made to delete items, allow correlation between error terms, or combine latent factors when 1) completely standardized factor loadings were less than .40; 2) modification indices suggested high cross-loadings of the items on the factors where they were not hypothesized to load; 3) modification indices that suggested freely estimating the correlation between error terms would improve the model fit; 4) lack of internal consistency was evident; 5) lack of discriminant validity was revealed; and 6) decisions of respecification made logical and theoretical sense (Jöreskog & Sörbom, 1996; Netemeyer, Bearden, & Sharma, 2003). Following these 6 rationales, the initial form of Model A was respecified to

1. Drop CS5, DB3, BD4, BD7, and BI3
2. Due to the extremely high correlation (r = .99) between the latent variables of social commitment and environmental commitment, an indication of lack of discriminant validity, these two latent variables were combined to create a single commitment variable
3. Correlate the error terms between PS3 and PS1, PA5 and PA3, PA6 and PA3, BD2 and BD1, BD6 and BD1, and BD9 and BD8.

Table 32

Fit indices for measurement models

	S-B χ^2	df	Adjust RMSEA (90% confidence interval)	Robust CFI	NNFI	GFI	SRMR	ΔS-B χ^2 (Δdf)
Model A (Behavior)								
Measurement Model (initial form)	1302.18	309	.080 (.071-.089)	.93	.93	.82	.072	889.39 (116)
Measurement Model (final form)	412.79	193	.048 (.038-.056)	.98	.97	.92	.053	
Model B (Intention)								
Measurement Model (initial form)	476.73	174	.059 (.050-.067)	.97	.96	.90	.061	258.05 (53)
Measurement Model (final form)	218.68	121	.040 (.030-.049)	.99	.98	.94	.047	

The fit indices of the final form of Model A (Table 32) showed that the model was significantly improved by the reduction in S-B χ^2 by 834.97 with the change of 116 degrees of freedom. Adjust RMSEA (.048), robust CFI (.98), NNFI (.97), GFI (.92), and SRMR (.053) were also improved and met the criteria for acceptable model fit. Convergent validity was evident indicated by significant factor loadings on the intended latent variables at the level of $p < .01$ (Netemeyer, Boles, & McMurrian, 1996) and most of the items but CE1 ($\lambda = .48$) had factor loading no less than .50[15] (Table 33). Although the observed variable fell short of minimally acceptable level of factor loading, it represented an important component of respondents' commitment to their property (i.e., size of the property). Therefore, it was retained for further analyses. Discriminant validity was supported because none of the latent variables were highly correlated with each other[16] (Table 34). Three indicators of internal consistency, including composite reliability, average variance extracted estimates (AVE), and Cronbach's alpha coefficients, suggested that internal consistency was mostly achieved although the AVE for the latent variable of cognitive place-identity was lower than the criterion suggested for newly developed scale (>.45) (Netemeyer, Bearden, & Sharma, 2003) (Table 35).

[15] Although Bagozzi and Yi (1988) suggested the range of factor loadings between .60 and .90, due to the exploratory nature of this study, the criterion for factor loading of .50 was deemed reasonable.

[16] Although the correlation between the cognitive and affective dimension of place identity was .74, test for discriminant validity using CFA and that the 90% confidence interval of the correlation not including 1.00 provided the evidence of discriminant validity.

Table 33

Factor loadings and standard errors (final form of Model A)[ab]

Items	Commitment (SE, t-value)	Cognitive Dimension (SE, t-value)	Affective Dimension (SE, t-value)	Direct Management (SE, t-value)	Indirect Management (SE, t-value)
CE1	.48 (--)				
CE2	.97 (.08, 12.25)				
CS1	.96 (.08, 12.48)				
CS2	.53 (.06, 9.17)				
PS1		.60 (--)			
PS3		.51 (.17, 6.96)			
PS6		.61 (.27, 5.74)			
PF2		.71 (.22, 6.86)			
PF4		.69 (.14, 6.67)			
PF5		.56 (.25, 6.52)			
PA3			.86 (--)		
PA4			.85 (.10, 11.46)		
PA5			.80 (.15, 9.78)		
PA6			.62 (.11, 7.61)		
BD1				.68 (--)	
BD2				.66 (.06, 17.80)	
BD5				.72 (.09, 13.24)	
BD6				.67 (.07, 14.41)	
BD8				.75 (.08, 15.12)	
BD9				.81 (.09, 15.21)	
BI1					.88 (--)
BI2					.71 (.08, 11.09)
α	.73	.76	.82	.87	.78

a. Completely standardized solution

b. All the factor loadings are significant at .01

Table 34

Bivariate correlation between the latent variables (final Form of Model A)

	Commitment	Cognitive Dimension	Affective Dimension	Direct Management	Indirect Management
Commitment	1.00				
Cognitive Dimension	-.09 (.03)[a]	1.00			
Affective Dimension	.22 (.06)	.74 (.07)	1.00		
Direct Management	.10 (.08)	.53 (.07)	.52 (.09)	1.00	
Indirect Management	.18 (.13)	.22 (.05)	.29 (.07)	.48 (.13)	1.00

a: Standard errors in the parentheses

Table 35

Internal consistency estimates (final form of Model A)

	Composite Reliability	Cronbach's Alpha Coefficient	Average VarianceExtracted (AVE)
Commitment (4 items)	.84	.73	.59
Cognitive Dimension (6 items)	.79	.75	.38
Affective Dimension (4 items)	.87	.83	.62
Direct Management (6 items)	.87	.87	.52
Indirect Management (2 items)	.77	.78	.64

The fit indices of the initial form of Model B, including adjust RMESA (.059), robust CFI (.96), NNFI (.96), GFI (.90), and SRMR (.061), indicated an acceptable model fit. However, the completely standardized factors loadings of CS5 ($\lambda = .12$) and IC1 ($\lambda = .21$) signaled the lack of convergent validity in their respective scales. Moreover, the problem of discriminant validity between environmental commitment and social commitment was also identified for Model B ($r = .99$). The initial form of the model was respecified based on the same rationale applied to Model A by:

1. Dropping CS5, IP1, IC1, and IC4
2. Combining environmental commitment and social commitment into a single latent variable of commitment
3. Correlating the error terms between PS3 and PS1, PF4 and PS1, PA5 and PA3, and PA6 and PA3.

The final form of Model B was significantly improved by reducing S-B χ^2 by 258.05 with the change of 53 degrees of freedom. Fit indices including RMSEA (.041), NFI (.97), CFI (.99), GFI (.94), and SRMR (.047) were also improved and displayed a relatively good model fit. Although all the items loaded on the intended latent variables ($p < .01$), factor loadings of CE1 ($\lambda = .48$) in the commitment scale, and IC2 ($\lambda = .44$) in the intention-to-change scale were less than .50 indicating the problem of convergent validity (Table 36). However, decisions were made to retain the items since they both measured the important components of the respective latent constructs. That none of the latent variables were highly correlated with each other indicated discriminant validity (Table 37). Table 38 shows the results of the tests for internal consistency. The low AVE of the cognitive dimension remained a concern for internal consistency of this scale. Moreover, that the composite reliability and Cronbach's alpha coefficient of the intention-to-change scale less than .60 and AVE less than .40 caused another concern for internal consistency. However, considering that the study was exploratory and that the latent construct of intention to change consisted of only two items, invariance tests were proceeded to examine the effects of perception of landscape change on the hypothesized

relationships among commitment, the two dimensions of place identity, and latent behavioral/intention variables.

Table 36

Factor loadings and standard errors (final form of Model B)[ab]

Items	Commitment (SE, t-value)	Cognitive Dimension (SE, t-value)	Affective Dimension (SE, t-value)	Intention to Conserve (SE, t-value)	Intention to Change (SE, t-value)
CE1	.48 (--)				
CE2	.96 (.08, 12.47)				
CS1	.97 (.08, 12.23)				
CS2	.53 (.06, 9.17)				
PS1		.59 (--)			
PS3		.52 (.18, 6.87)			
PS6		.61 (.28, 5.57)			
PF2		.71 (.23, 6.71)			
PF4		.68 (.15, 6.37)			
PF5		.56 (.27, 6.07)			
PA3			.86 (-)		
PA4			.85 (.10, 12.05)		
PA5			.80 (.15, 10.03)		
PA6			.62 (.11, 7.82)		
IP2				.89 (--)	
IP3				.83 (.08, 12.03)	
IC2					.44 (--)
IC3					.73 (.47, 4.42)
α	.73	.76	.82	.83	.52

a. Completely standardized solution
b. All the factor loadings are significant at .01

Table 37

Bivariate correlation between the latent variables (final form of Model B)

	Commitment	Cognitive Dimension	Affective Dimension	Intention to Conserve	Intention to Change
Commitment	1.00				
Cognitive Dimension	-.09 (.03)[a]	1.00			
Affective Dimension	.22 (.06)	.75 (.07)	1.00		
Intention to Conserve	.07 (.06)	.53 (.06)	.52 (.07)	1.00	
Intention to Change	-.16 (.06)	-.38 (.03)	-.50 (.06)	-.60 (.10)	1.00

a: Standard errors in parentheses

Table 38

Internal consistency estimates (final form of Model B)

	Composite Reliability	Cronbach's Alpha Coefficient	Average Variance Extracted (AVE)
Commitment (4 items)	.84	.73	.59
Cognitive Dimension (6 items)	.78	.75	.38
Affective Dimension (4 items)	.87	.83	.62
Intention to Conserve (2 items)	.85	.82	.74
Intention to Change (2 items)	.52	.52	.37

4.6.3. Structural Models

As shown in Fig. 13 and Fig. 14 seven structural equations were hypothesized for Model A and Model B to examine the relationships among commitment, place identity, and behavior (Model A) or intention (Model B). Model specification search was conducted to identify if adding or removing parameters from the models were necessary, and if they made logical and theoretical sense. Although not all the structural coefficients were statistically significant at $p < .05$, they were retained since these relationships were hypothesized based on theories (Jöreskog & Sörbom, 1996). Table 39 shows that all the fit indices, including adjust RMSEA, robust CFI, NNFI, GFI, and SRMR, fell within the acceptable range suggesting acceptable model fit. The structural models were then used to test if variations of the structural coefficients existed among respondents who had different perceptions of the environmental conditions in the landscape surrounding their property.

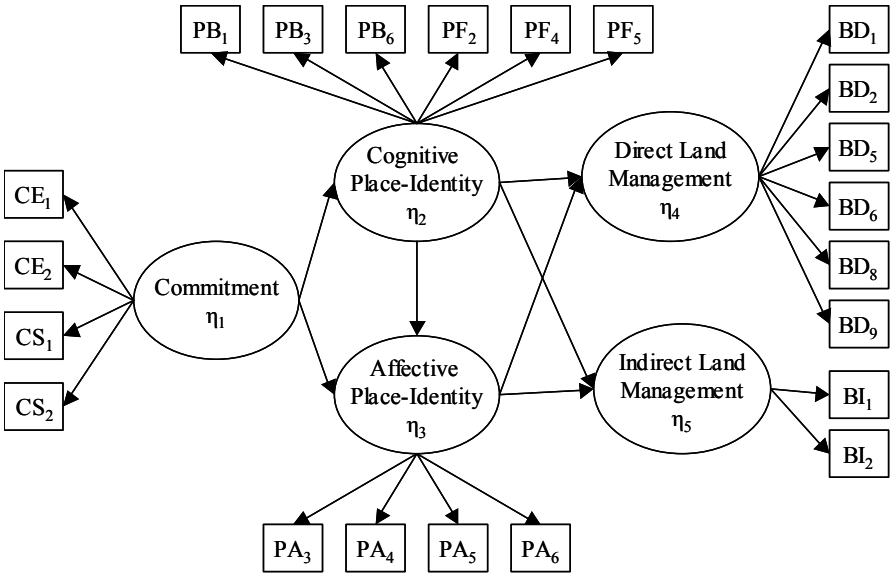

Fig. 13. Structural Model A

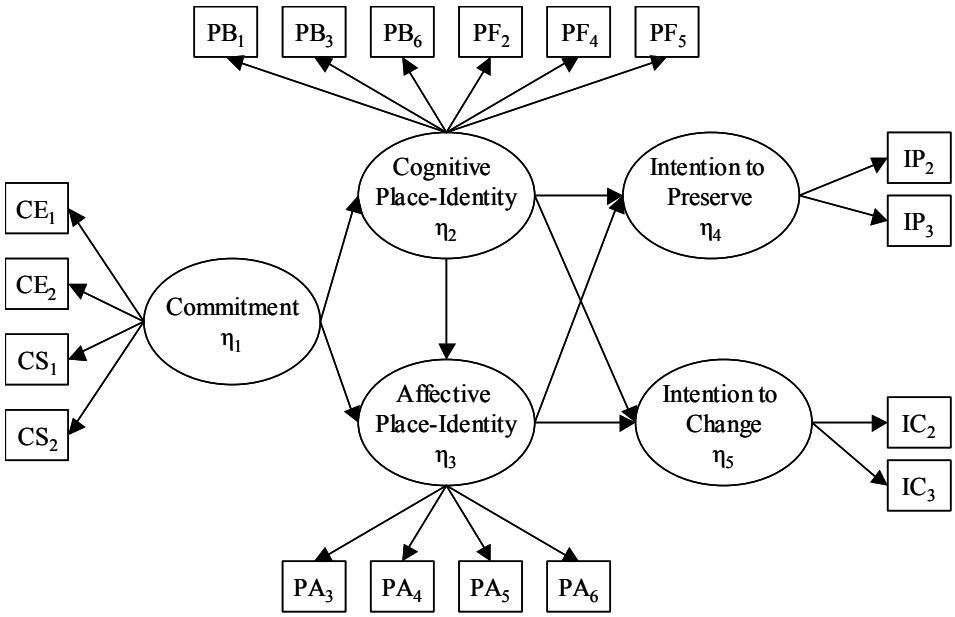

Fig. 14. Structural Model B

Table 39

Fit indices for structural models

	S-B χ^2	df	Adjust RMSEA (90% confidence interval)	Robust CFI	NNFI	GFI	SRMR
Model A (Behavior)	414.66	195	.047 (.038-.056)	.98	.98	.92	.057
Model B (Intention)	220.47	123	.040 (.030-.048)	.99	.98	.94	.048

4.6.3.1. Socio-Demographic Profile and Landownership Characteristics

Table 40 shows respondents' socio-demographic and landownership characteristics. In general, the average age of the respondents was 61.9 years. Majority of respondents were male (70.7%), and had an education level of at least some college (80.6%). Approximately half of respondents had household income of equal or more than $80,000 (53.2%), much greater than the medium household income ($39,937) in Texas as estimated in 1999 (U.S. Census Bureau, 2007). A little less than half of respondents had wildlife and/or livestock operations on their property (47.0%). On average, respondents had owned a property of 244.5 acres, visited the property for 30.9 years, kept the property in the family for 42.5 years, and had approximately 6 relatives living in the same community where the property was located.

Respondents in the 3 groups based on perception of landscape change were significantly different in some of their socio-demographic and landownership characteristics (Table 40). There were significantly more females in Group 1 (35.6%) and less in Group 2 (22.2%). In other words, females were more likely to report that they perceived deteriorated environmental conditions. More post-graduates were found in Group 2 (37.7%) than in Group 3 (22.2%). Regarding income, respondents in Group 2 were relatively wealthy. A higher percentage of this group had an income level of equal or more than $100,000 (49.4%) and a lower percentage of this group had an income level less than $20,000 (1.3%) and between $20,000 and $39,999 (7.1%). More respondents in Group 1 had a longer history of family ownership (M = 47.4) and interaction with the property (M = 34.7), and had more relatives living in the community where their property was located (M = 7.7). No significant differences were found among groups in terms of age, whether there were livestock and/or wildlife operations on the property, and the size of the property.

Table 40

Sample profile

	Overall	Group 1[a]	Group 2[b]	Group 3[c]	F/χ^2
Age	61.85	60.97	61.19	63.22	$F_{(2,491)}=2.02$
M (SD)	(11.44)	(12.32)	(10.54)	(11.41)	
Gender					
Female	29.3%	35.6%	22.2%	30.7%	$\chi^2_{(2)}=7.12^{*}$
Male	70.7%	64.4%	77.8%	69.3%	
Education					
Less than college	19.4%	17.4%	16.8%	23.3%	
Some college	21.4%	23.5%	14.4%	26.1%	$\chi^2_{(6)}=16.32^{*}$
Bachelor's degree	30.4%	32.2%	31.1%	28.3%	
Post-graduate degree	28.8%	26.8%	37.7%	22.2%	
Household income					
Less than $20,000	5.8%	9.0%	1.3%	7.4%	
$20,000-$39,999	12.4%	13.5%	7.1%	16.7%	
$40,000-$59,999	16.2%	14.3%	17.9%	16.0%	$\chi^2_{(10)}=25.64^{**}$
$60,000-$79,999	12.4%	16.5%	10.3%	11.1%	
$80,000-$99,999	11.3%	12.8%	14.1%	7.4%	
$100,000 or more	41.9%	33.8%	49.4%	41.4%	
Wildlife/livestock operation					
Yes	47.0%	51.3%	51.7%	55.7%	$\chi^2_{(2)}=.83$
No	53.0%	48.7%	48.3%	44.3%	
Property size (acres)[a]	244.52 (529.69)	250.27 (590.80)	255.62 (558.90)	229.34 (442.74)	$\chi^2_{(2)}=.10$
Years of visiting[a]	30.86 (23.02)	34.68 (21.07)	26.21 (21.38)	31.94 (25.39)	$\chi^2_{(2)}=13.93^{**}$
Years of family ownership[d]	42.46 (40.56)	47.35 (38.31)	35.29 (38.20)	44.92 (43.70)	$\chi^2_{(2)}=14.00^{**}$
Number of relatives[a]	6.17 (16.69)	7.67 (19.22)	6.02 (19.21)	4.98 (10.68)	$\chi^2_{(2)}=6.14^{*}$

a: Group 1 consisted of respondents who perceived much worse landscape change in the local area compared to the other two groups

b: Group 2 consisted of respondents who perceived a little worse landscape change

c: Group 3 consisted of respondents who perceived better landscape change

d: Kruskal-Wallis test was used to test mean difference due to the non-normal distribution

$^{*}p < .05$; $^{**}p < .01$

4.6.3.2. Descriptive Statistics of the Groups

The three groups scored very high (M >= 5.7) in the items measuring the cognitive and affective dimensions of place identity (Table 41). No significant variation was found for the items in the place-identity scale. By contrast, significant differences were found for behavioral investment in directly managing the property (Table 42). Group 1 and Group 3 tended to invest more efforts in maintaining water quality, controlling invasive plants, maintaining wildlife populations, and preserving special places on the property compared to Group 2. No significant difference was found for items measuring efforts invested in indirect property management. Respondents in all the groups expressed strong intention (M > 6.0) to preserve their property and lack of intention (M < 3.0) to change the property in the near future. No significant variation of intention to conserve or change the property was found across the 3 groups (Table 43).

Table 41

Descriptive statistics of place identity (3 subgroups)[a]

	M (SD)				$\chi^2_{(2)}$
	Overall	Group 1	Group 2	Group 3	
Cognitive Dimension					
PS1	6.67 (.80)	6.77 (.58)	6.59 (1.05)	6.66 (.68)	2.68
PS3	6.32 (1.04)	6.35 (.97)	6.34 (1.05)	6.28 (1.09)	.35
PS6	6.39 (1.10)	6.51 (.97)	6.28 (1.16)	6.38 (1.14)	3.99
PF2	6.49 (.99)	6.58 (.81)	6.48 (1.00)	6.43 (1.11)	.35
PF4	6.73 (.61)	6.76 (.49)	6.69 (.73)	6.76 (.57)	.79
PF5	6.11 (1.34)	6.12 (1.41)	6.12 (1.34)	6.09 (1.30)	.15
Affective Dimension					
PA3	6.57 (.90)	6.65 (.76)	6.55 (.93)	6.51 (.97)	1.32
PA4	6.38 (1.08)	6.53 (.88)	6.23 (1.24)	6.39 (1.06)	5.61
PA5	5.91 (1.46)	6.13 (1.24)	5.73 (1.57)	5.88 (1.51)	5.62
PA6	6.62 (1.03)	6.72 (.86)	6.51 (1.17)	6.64 (1.03)	2.94

a: Kruskal-Wallis test was used to test mean difference due to the non-normal distribution

Table 42

Descriptive statistics of behavioral investment in maintaining the property (3 subgroups)[a]

	M (SD)				$\chi^2_{(2)}$
	Overall	Group 1	Group 2	Group 3	
Direct Management					
BD1	5.17 (1.75)	5.12 (1.72)	5.01 (1.75)	5.36 (1.77)	5.28
BD2	4.93 (1.78)	4.89 (1.87)	4.84 (1.65)	5.04 (1.83)	2.36
BD5	5.47 (1.84)	5.78 (1.63)	5.16 (1.88)	5.49 (1.92)	10.47**
BD6	5.47 (1.71)	5.56 (1.62)	5.26 (1.70)	5.59 (1.78)	7.11*
BD8	5.45 (1.81)	5.51 (1.74)	5.17 (1.91)	5.65 (1.76)	8.03*
BD9	5.19 (1.86)	5.29 (1.80)	4.90 (1.84)	5.36 (1.91)	8.90*
Indirect Management					
BI1	3.06 (2.06)	3.24 (2.10)	2.74 (1.91)	3.19 (2.15)	5.70
BI2	3.33 (2.12)	3.46 (2.06)	3.14 (2.13)	3.40 (2.17)	2.52

a: Kruskal-Wallis test was used to test mean difference due to the non-normal distribution
*$p < .05$; **$p < .01$

Table 43

Descriptive statistics of intention to conserve or change property in the future (3 subsamples)[a]

	M (SD)				$\chi^2_{(2)}$
	Overall	Group 1	Group 2	Group 3	
Intention to Conserve					
IP2	6.49 (1.04)	6.48 (1.02)	6.51 (.94)	6.47 (1.15)	.32
IP3	6.48 (1.04)	6.54 (1.01)	6.50 (.83)	6.41 (1.22)	1.13
Intention to Change					
IC2	1.61 (1.42)	1.56 (1.32)	1.79 (1.63)	1.48 (1.29)	1.66
IC3	1.99 (1.69)	2.00 (1.70)	2.15 (1.78)	1.84 (1.58)	3.20

a: Kruskal-Wallis test was used to test mean difference due to the non-normal distribution

4.6.3.3. Invariance Testing

Invariance testing based on covariance structure analysis was applied to examine if there were statistically significant differences in the structural coefficients that represented the relationships between commitment, cognitive place-identity, affective place-identity, and behavior/behavioral intention across the three groups. Before testing for invariance in the structural coefficients, measurement equivalence of configuration (i.e., the form and number of latent constructs) and factor loadings across groups needs to be established to exclude confounding factors that may interfere with interpretation and ensure that different groups respond to the observed variables in a consistent direction (Little, 1997; Vandenberg & Lance, 2000). When invariance in factorial configuration and pattern of factor loadings is established, variations across groups can be attributed to the differences in the structural coefficients instead of the differences in the factorial structure or factor loadings. Invariance testing involves imposing increasingly restrictive equality constraints (i.e., constraining same parameters to be equal across groups) on the model that simultaneously tests all the groups to identify if significant variations exist between the models with and without the constraints (i.e., nested models)[17]. Invariance in factorial structure holds when the hypothesized model is tested on all the groups simultaneously without deteriorating the overall model fit. Chi-square difference tests based on S-Bχ^2 between two nested models provide a commonly used approach to examine invariance in factor loadings and structural parameters.

The invariance testing procedures adopted in this study followed Byrne (1998) and Bagozzi and Lee (2002). The first step of invariance testing involved fitting a baseline model to each group based on the hypothesized models in Fig. 13 and Fig. 14 that represented the optimal form of the model in terms of model fit, validity, internal consistency, substantial meaningfulness, and parsimony of the factorial structure. Invariance testing was proceeded based on the baseline model to test the following

[17] Two models are nested if the simpler model is a result of dropping one or more than one of the structural coefficients from the more complex model.

hypotheses in sequence for Model A and Model B[18]:

H_1: Testing for configural invariance across groups

H_{2a}: Testing for factor loading (λ) invariance across Group 1 and Group3 (factor loadings in Group 2 were freely estimated)

H_{2b}: Testing for factor loading (λ) invariance across Group 2 and Group3 (factor loadings in Group 1 were freely estimated)

H_{2c}: Testing for factor loading (λ) invariance across Group 1, Group 2, and Group3 (factor loadings in Group 2 and Group 3 were constrained to be equal to Group 1)

H_{3a}: Testing for structural coefficient (β) invariance across Group 1 and Group 3 (structural coefficients in Group 2 were freely estimated)

H_{3b}: Testing for structural coefficient (β) invariance across Group 2 and Group 3 (structural coefficients in Group 1 were freely estimated)

H_{3c}: Testing for structural coefficient (β) invariance across Group 1, Group 2, and Group 3 (structural coefficients in Group 2 and Group 3 were constrained to be equal to Group 1)

Table 44 and Table 45 show the summary of invariance tests. Significant differences in S-B χ^2 between two nested models are signals that two nested models are not equivalent across groups in the parameter that is constrained. Since the distribution of S-B χ^2 differs from the normal chi-square, corrected S-B χ^2 values were used to for the invariance testing (Satorra & Bentler, 2001).

Results of testing for H_1 showed that the factorial configuration was equivalent across the 3 groups because none of the fit indices (i.e., adjust RMSEA, robust CFI, and NNFI) were significantly deteriorated compared to the fit indices of the baseline model of each group when the model was tested on the three groups simultaneously. The results of the first hypothesis test showed that all the model fit indices fell within the acceptable range

[18] The hypotheses stated here are procedures for invariance testing to test the main hypothesis that perception of landscape change moderates the relationship between cognitive/affective place-identity and behavior/behavioral intention.

for Model A (S-B χ^2 = 828.89, df = 585, adjust RMSEA = .029, robust CFI = .98, and NNFI = .97) and Model B (S-B χ^2 = 485.87, df = 369, adjuat RMSEA = .005r, robust CFI = .98, and NNFI = .98). The unconstrained forms of Model A and Model B (i.e., the models tested in H_1) served as the references for comparison for testing the hypothesis of invariant factor loadings (H_{2a}, H_{2b}, $H_{2c)}$. Results suggested no significant difference in the pattern of factor loadings across the 3 groups as indicated by an insignificant increase of S-B χ^2 by 10.21 (Δdf = 17, p = .89) when factor loadings in Group 3 were constrained to be equal to Group 1 (H_{2a}), by 14.44 (Δdf = 17, p = .64) when factor loadings in Group 3 were constrained to be equal to Group 2 (H_{2b}), and by 27.09 (Δdf = 34, p = .79) when factor loadings in Groups 2 and 3 were constrained to be equal to Group 1 (H_{2c}) (Table 44). Similarly, no significant difference was identified in testing for invariant factor loadings across the three groups in Model B. The S-B χ^2 increased by 10.73 (Δdf = 13, p = .63) when factor loadings in Group 3 were constrained to be equal to Group 1 (H_{2a}), by 5.63 (Δdf = 13, p = .96) when factor loadings in Group 3 were constrained to be equal to Group 2 (H_{2b}), and by 19.39 (Δdf = 26, p = .82) when factor loadings in Groups 2 and 3 were constrained to be equal to Group1 (H_{2c}) (Table 45).

Table 44

Summary of invariance tests (Model A)

	S-B χ^2	df	ΔS-B χ^2	Δdf	Adjust RMSEA	Robust CFI	NNFI
Baseline Model (Group 1)	283.24	195	--	--	.054 (.031-.071)	.97	.96
Baseline Model (Group 2)	253.78	195	--	--	.042 (.012-.061)	.98	.98
Baseline Model (Group 3)	292.41	195	--	--	.054 (.033-.070)	.97	.97
H_1: Invariant Structure	828.89	585	--	--	.029 (.016-,039)	.98	.97
H_{2a}: Invariant Loadings[a]	829.49	602	10.21	17	.027 (.013-.037)	.98	.97
H_{2b}: Invariant Loadings[b]	839.30	602	14.44	17	.028 (.014-.038)	.98	.97
H_{2c}: Invariant Loadings[c]	843.07	619	27.09	34	.027 (.012-.037)	.98	.98
H_{3a}: Invariant Structural Coefficients[a]	849.73	626	4.84	7	.027 (.012-.037)	.98	.98
H_{3b}: Invariant Structural Coefficients[b]	849.84	626	6.78	7	.027 (.012-.037)	.98	.98
H_{3c} (final): Invariant Structural Coefficients[c]	860.67	633	17.00	14		.98	.98

a: Group 3 was constrained to be equal to Group 1
b: Group 3 was constrained to be equal to Group 2
c: Group 2 and Group 3 were constrained to be equal to Group 1

Table 45

Summary of invariance tests (Model B)

	S-B χ^2	df	ΔS-B χ^2	Δdf	Adjust RMSEA	Robust CFI	NNFI
Baseline Model (Group 1)	164.23	123	--	--	.047 (.018-.065)	.98	.98
Baseline Model (Group 2)	141.95	123	--	--	.37 (0-.057)	.99	.99
Baseline Model (Group 3)	181.76	123	--	--	.052 (.032-.069)	.97	.97
H_1: Invariant Structure	485.87	369	--	--	.009 (.025-.036)	.98	.98
H_{2a}: Invariant Loadings[a]	492.96	382	10.73	13	.005 (.024-.035)	.98	.98
H_{2b}: Invariant Loadings[b]	485.16	382	5.63	13	.023 (.000-.034)	.98	.98
H_{2c}: Invariant Loadings[c]	496.19	395	19.39	26	.023 (.000-.034)	.99	.98
H_{3a}: Invariant Structural Coefficients[ad]	511.56	402	15.37*	7	.022 (.000-.033)	.98	.98
H_{3b}: Invariant Structural Coefficients[b]	501.50	402	5.54	7	.023 (.000-.034)	.99	.98
H_{3c}: Invariant Structural Coefficients[ce]	521.21	409	25.02*	14	.023 (.00-.034)	.98	.98
H_3 (final): Invariant Structural Coefficient[f]	514.27	407				.99	.98

a: Group 3 was constrained to be equal to Group 1
b: Group 3 was constrained to be equal to Group 2
c: Group 2 and Group 3 were constrained to be equal to Group 1
d: β_{53} was significantly different between Group 1 and Group 2
e: β_{53} was significantly different between Group 1 and Group 3
f: β_{53} in all 3 groups were freely estimated
*$p < .05$

The S-B χ^2 values derived from testing for H_{2c} in both models were used as the references to identify if there was significant increase in S-B χ^2 values when structural coefficients were also constrained across groups in addition to factor loadings. Results of testing for invariant structural coefficients (H_{3a}, H_{3b}, H_{3c}) on Model A suggested no significant difference between Group 1 and Group 3 (H_{3a}) (ΔS-B $\chi^2 = 4.84$, $\Delta df = 7$, $p = .68$), between Group 2 and Group 3 (H_{3b}) (ΔS-B $\chi^2 = 6.78$, $\Delta df = 7$, $p = .45$), and Group 1 and Group 2 (H_{3c}) (ΔS-B $\chi^2 = 17.00$, $\Delta df = 14$, $p = .26$) (Table 44). However, testing for the same hypothesis on Model B showed that S-B χ^2 significantly increased when constraining the structural coefficients in Group 3 to equate Group 1 (H_{3a}) (ΔS-B $\chi^2 = 20.41$, $\Delta df = 7$, $p = .005$) and when constraining the coefficients in Groups 2 and 3 to equate Group 1 (H_{3c}) (ΔS-B $\chi^2 = 27.18$, $\Delta df = 14$, $p = .02$) (Table 45). More specifically, the structural coefficient that represented the causal relationship between the affective dimension of place identity and intention to change was significantly lower in Group 1 (B_{53}[19] = -.51) than in Group 2 (B_{53} = -.23) and Group 3 (B_{53} = -.26). That is, , strong affective place-identity of those who perceived deteriorating landscape conditions (Group 1) was likely to enhance a higher level of resistance to future changes to their property than those who perceived little or no deterioration (Group 2) or those who perceived improvements in landscape conditions (Group 3).

The structural coefficients and variance of latent dependent variables explained by the latent predictors that resulted from the structural model analysis of Model A are shown in Table 46. Only the results derived from the structural analysis using the overall sample are displayed because no significant difference among groups was identified for this model. Hypothesis 2 was partially supported in that commitment was a significant and positive predictor only for affective place-identity (β_{31}[20] = .29, t = 6.71). Commitment barely explained the variance in cognitive place-identity (R^2 = 2% for Group 1 and 1% for Group 2 and Group 3). This suggested that landowners'

[19] B_{xy} denotes a unstandardized structural coefficient. Unstandardized structural coefficients are used for cross group comparisons.

[20] β_{xy} denotes a standardized structural coefficient. Standardized structural coefficients are used for within group comparisons.

commitment to their interactions with the environmental and social aspects of their property primarily contributed to affective place-identity instead of cognitive place-identity. Hypothesis 3 that cognitive place-identity predicted affective place-identity was supported by the significant structural coefficient ($\beta_{32} = .77$, $t = 6.94$). That is, meanings of the structural and functional attributes of respondents' property contributed to their affective connection associated with the property. Commitment and cognitive place-identity together explained more than 50% variance in affective place-identity for the 3 groups with Group 2 ($R^2 = 78\%$) ranked the highest followed by Group 1 ($R^2 = 52\%$) and Group 3 ($R^2 = 52\%$). Cognitive place-identity was a significant and positive predictor only for behavioral investment in direct property management ($\beta_{42} = .29$, $t = 2.68$). On the other hand, affective place-identity positively contributed to behavioral investment in both direct ($\beta_{43} = .31$, $t = 3.47$) and indirect ($\beta_{53} = .32$, $t = 3.27$) property management. Hypothesis 4 that place identity was positively associated with behavioral investment in maintaining the place where individuals' place identity was embedded was partially supported in Model A from these findings. Cognitive and affective place-identity together accounted more variance in direct property management for Group 2 (37%) than Group 1 (22%) and Group 3 (30%). However, the two dimensions of place identity explained less than 10% variance in indirect property management for the 3 groups (5% for Group1, 8% for Group 2 and Group 3). The moderating effect of perception of environmental change was not supported in this model as indicated by the results of invariance testing that the relationship between the two dimensions of place identity and behavioral investment in direct or indirect property management were found to have no statistically significant difference across groups.

Table 46

Structural model analysis (Model A)

Dependent Variable	Predictor	B (SE)	β (t-value)	R^2		
				Group 1	Group 2	Group 3
Cognitive Dimension	Commitment (β_{21})	-.03 (.02)	-.09 (-1.63)	.02	.01	.01
Affective Dimension	Commitment (β_{31})	.16 (.02)	.29 (6.71)***	.52	.78	.52
	Cognitive Dimension (β_{32})	1.34 (.19)	.77 (6.94)***			
Direct Management	Cognitive Dimension (β_{42})	.75 (.28)	.29 (2.68)**	.22	.37	.30
	Affective Dimension (β_{43})	.46 (.13)	.31 (3.47)***			
Indirect Management	Cognitive Dimension (β_{52})	-.13 (.33)	-.03 (-.38)	.05	.08	.08
	Affective Dimension (β_{53})	.68 (.20)	.32 (3.27)**			

** $p < .01$; *** $p < .001$

The structural coefficients of Model B for the 3 groups that displayed different levels of perceived landscape change are shown in Table 47. Similar to the results of Model A, commitment did not significantly predict cognitive place-identity but affective place-identity ($\beta_{31} = .32$, t = 6.57 for Group 1, $\beta_{31} = .25$, t = 6.57 for Group 2, $\beta_{31} = .26$, t = 6.57 for Group 3). Hypothesis 2 was partially supported. At the same time, cognitive place-identity also significantly predicted affective place-identity in all three groups ($\beta_{32} = .71$, t = 7.04 for Group 1, $\beta_{32} = .87$, t = 7.04 for Group 2, $\beta_{32} = .71$, t = 7.04 for Group 3). This finding supports Hypothesis 3. Overall, commitment and cognitive place-identity together explained the highest variance in affective place-identity for Group 2 (77%) followed by Group 1 (55%) and Group 3 (54%).

Intention to conserve property was significantly predicted by both cognitive place-identity ($\beta_{42} = .21$, t = 3.10 for Group 1, $\beta_{42} = .40$, t = 3.10 for Group 2, $\beta_{42} = .33$, t = 3.10 for Group 3) and affective place-identity ($\beta_{43} = .19$, t = 2.57 for Group 1, $\beta_{43} = .30$, t = 2.57 for Group 2, $\beta_{43} = .30$, t = 2.57 for Group 3). That is, meanings respondents attributed to the structural and functional attributes of their property and their emotional

connection to the property significantly contributed to their intention to conserve the property no matter if landscape was perceived to be worse, not changed, or improving. On the other hand, affective place-identity was the only latent variable that significantly contributed to respondents' lack of intention to change their property in the future in Group 1 (β_{53} = -.46, t = -3.63) and Group 3 (β_{53} = -.50, t = -2.97). Overall, cognitive and affective place-identity explained more variance in intention to conserve for Group 2 (45%) than Group 3 (33%) and Group 1 (14%). On the other hand, less variance in intention to change for Group 2 (17%) was explained by both dimensions of place identity than Group 3 (38%) and Group 1 (26%). These findings provide partial support for Hypothesis 5. The moderating effects of perception of environmental change on the relationship between the two dimensions of place identity and intention to conserve or intention to change the property stated in Hypothesis 5 was also partially supported by the significant difference of β_{53} across groups. The three groups were significantly different in this regression coefficient where the association between affective place-identity and intention to change was stronger in Group 1 (B_{53} = -.51) than in Group 2 (B_{53} = -.23) and Group 3 (B_{53} = -.26). More specifically, respondents who perceived that the environmental conditions of the local landscape were declining (i.e., Group 1) tended to become more resistant to make changes to their property in the future.

Table 47

Structural model analysis (Model B)

Dependent variable	Predictor	B (SE)	β (t-value)	R^2
Group 1				
Cognitive Dimension	Commitment (β_{21})	-.03 (.02)	-.13 (-1.93)	.02
Affective Dimension	Commitment (β_{31})	.16 (.02)	.32 (6.57)***	.55
	Cognitive Dimension (β_{32})	1.55 (.22)	.71 (7.04)***	
Intention to Preserve	Cognitive Dimension (β_{42})	.73 (.23)	.21 (3.10)**	.14
	Affective Dimension (β_{43})	.30 (.12)	.19 (2.57)*	
Intention to Change	Cognitive Dimension (β_{52})	-.19 (.19)	-.08 (-.93)	.26
	Affective Dimension (β_{53})	-.51 (.14)[a]	-.46 (-3.63)***	
Group 2				
Cognitive Dimension	Commitment (β_{21})	-.03 (.02)	-.08 (-1.93)	.01
Affective Dimension	Commitment (β_{31})	.16 (.02)	.25 (6.57)***	.77
	Cognitive Dimension (β_{32})	1.55 (.22)	.87 (7.04)***	
Intention to Conserve	Cognitive Dimension (β_{42})	.73 (.23)	.40 (3.10)**	.45
	Affective Dimension (β_{43})	.30 (.12)	.30 (2.57)*	
Intention to Change	Cognitive Dimension (β_{52})	-.19 (.19)	-.19 (-.98)	.17
	Affective Dimension (β_{53})	-.23 (.13)[b]	-.30 (-1.82)	
Group 3				
Cognitive Dimension	Commitment (β_{21})	-.03 (.02)	-.10 (-1.93)	.01
Affective Dimension	Commitment (β_{31})	.16 (.02)	.26 (6.57)***	.54
	Cognitive Dimension (β_{32})	1.55 (.22)	.71 (7.04)***	
Intention to Conserve	Cognitive Dimension (β_{42})	.73 (.23)	.33 (3.10)**	.33
	Affective Dimension (β_{43})	.30 (.12)	.30 (2.57)*	
Intention to Change	Cognitive Dimension (β_{52})	-.19 (.19)	-.16 (-.98)	.38
	Affective Dimension (β_{53})	-.26 (.09)[b]	-.50 (-2.97)**	

a: β_{53} was statistically lower in Group 1 than Group 2
b: β_{53} was statistically lower in Group 1 than Group 3
*$p < .05$; **$p < .01$; ***$p < .001$

4.7. DISCUSSION AND CONCLUSION

Self-interest has been frequently portrayed as a factor that may contribute to environmental degradation (Becker, 2006; Biel & Garling, 1995; Clark, 1995; Hardin, 1968; Lux, 2003). It has been suggested that individuals' rational calculation of the costs and benefits of engaging in an act may collectively lead to the deterioration of the resource quality. On the other hand, an altruistic (i.e., environmental concern based on

the costs or benefits for others) or biospheric (i.e., environmental concern based on a value for all living beings) value orientation has been found to positively predict environmental behavior or intention (Berenguer, 2007; Clark, Kotchen, & Moore, 2003; Ewing, 2001; Karp, 1996; Spash, 2000; Turner, 1999). At the same time, Mansbridge (1990b) argued that altruism as a motive for an act cannot be sustained if individuals are not benefited from engaging in the act. This study examined place identity as an intrinsic incentive for private landowners' engagement in land management that would help sustain the ecosystem goods and services in the Texas Hill Country. Place identity as an intrinsic incentive in this context is developed from a concern for landowners' self that is anchored in the meanings they ascribed to their property. Furthermore, the moderating effect of landscape change on the relationship between place identity and behavioral investment in land management and intention for land preservation/change was also investigated. Auxiliary hypotheses that tested the relationships between commitment and the two dimensions of place identity were examined as well.

The two hypothesized models that predicted behavioral investment in property management (Model A) and intention to conserve or change the property (Model B) fit well on the overall sample and three groups that were categorized based on respondents' landownership characteristics after model respecification. However, the moderating effect of perception of landscape change was significant in only Model B. The following discussions will focus on hypothesis testing on the overall sample for Model A since no significant difference was identified for this model and on the 3 groups of landscape change perceptions for Model B.

The first hypothesis was not supported as a result of the highly correlated nature of environmental and social commitment, and failure to provide evidence for discriminant validity in both models. As a result, the two dimensions of commitment were combined and the rest of the analyses included only the uni-dimensional commitment in hypothesis testing.

Hypothesis 2 was partially supported in that commitment predicted affective place-identity in the expected direction in both models as suggested by identity theory.

The positive relationship between the extensive aspect of commitment as defined in this study and identity salience has been reported (Cassidy & Trew, 2004; Serpe, 1987; Stryker & Serpe, 1982; Stryker & Serpe, 1994)[21]. However, commitment was not a significant predictor for cognitive place-identity in both models. Since literature of identity theory does not distinguish between the cognitive and affective aspects of identity, the place bonding research by Hammitt, Backlund, and Bixler (2006) provides a reference for comparison. Hammitt et al. conceptualized place bonding as comprising five dimensions, including familiarity, belongingness, identity, dependence, and rootedness. Place dependence in Hammitt et al.'s model is comparable to cognitive place-identity in the current study, and place identity to affective place-identity. In Hammitt et al.'s study, recreationists to the Chattooga River in South Carolina were categorized into the groups of beginners, visitors, locals, and veterans based on their experience use history (EUH) measured by years and frequency respondents fished in the study area. EUH represented the extensiveness of recreationists' interactions with the Chattooga River, similar to the way commitment was measured in this study. Findings of Hammitt et al.'s study showed that the locals and veterans who had a longer use history had a significantly higher score of place identity compared to the beginners and visitors who were less in use experience of the place. At the same time, the differences among the 4 groups were not as clearly distinguishable in their dependence on the place. Hammitt et al.'s study provided evidence to support the relationship between commitment and the affective aspect of place identity in the current research.

The negative associations between commitment and cognitive place-identity in both models were surprising despite being insignificant. A plausible explanation for this association may be that the more extensive respondents were connected to the social and environmental aspects of their property, the more burdens (e.g., increasing tax bases and difficulty in land management) they would need to bear to manage the biophysical and functional attributes on their property as urbanization and fragmentation moved toward

[21] Identity salience measured in these studies was different from the one in this research where place identity was operationalized as consisting of the cognitive and affective dimensions.

their way. This explanation may be examined in the future to include not only changes in the physical environment as did in this study but also changes that affect the social and economic environment on landowners' property to more correctly capture the essence of subjective perceptions of landscape change.

Hypothesis 3 was supported in testing for Model A and Model B where cognitive place-identity was a significant and positive predictor for affective place-identity. One of the essential components, two data points in time, to determine the precedence of one variable before the other and, therefore, the causal effect of cognitive place-identity on affective place-identity was not available in this study (Kline, 2005). However, the biological and evolutionary explanations for human preferences for certain biophysical features of a landscape (Appleton, 1975; Balling & Falk, 1982; Gibson, 1979; R. Kaplan, Kaplan, & Brown, 1989; Lynch, 1960) provide a theoretical support for this casual relationship. A similar finding was reported by Vaske and Kobrin (2001). Stedman (2003a) also suggested that landscape features contributed to the positive emotional bond with a place through the mediation of the symbolic meanings of the place. Studies based on one-time point data have also examined how experiences in a place over time might affect place identity and place dependence (Bricker & Kerstetter, 2000; Hammitt, Backlund, & Bixler, 2006; Hay, 1998). However, it is not clear in these studies if the cognitive aspect of place identity (i.e., place dependence) causes the affective aspect (i.e., place identity). Further research that includes at least a second time point will help to provide more insight into this causal relationship.

Hypothesis 4 was partially supported by that both cognitive and affective dimensions of place identity positively predicted behavioral investment in direct property management (i.e., significant β_{42}, β_{43}). However, affective place-identity was the only positive predictor for behavioral investment in indirect property management (i.e., significant β_{53}). In other words, important meanings that respondents ascribed to the biophysical and functional attributes of their property and their emotional connections to the property motivated more effort being invested in direct land practices that would lead to the preservation of these meanings. At the same time, maintaining the

property through indirect measures, such as attending public hearings, landowner workshops, or seminars, was primarily driven by respondents' emotional connection to their property. However, only less than 10% of the variance in behavioral investment in activities that indirectly contributed to respondents' property management. Participation in indirect land management requires landowners to invest extra effort in addition to the responsibility born with the role of being a landowner. Other variables not included in the model, such as information about indirect land management activities of similar nature, and attitudes toward and constraints to participate in these activities may help improve the predictive power of the model. Support for the relationship between salience or importance of an identity and behavior or behavioral intention to maintain the identity has been reported in studies to examine the identity related to blood donors (Callero, 1985; Charng, Piliavin, & Callero, 1988), students (Burke & Reitzes, 1981; Stryker & Serpe, 1994), religion (Stryker & Serpe, 1982), exercise (Theodorakis, 1994), and green consumerism (Sparks & Shepherd, 1992). Since these studies did not conceptualize identity as consisting of two distinct dimensions, it is not known how different dimensions of identity may contribute to behavior. In the place research, it has been reported that the affective dimension or both the affective and cognitive dimensions of place attachment positively contributed to proenvironmental attitude or behavior (Payton, Fulton, & Anderson, 2005; Stedman, 2002; Vaske & Kobrin, 2001; Vorkinn & Riese, 2001). The moderating effect of perception of landscape change on the relationships between the two dimensions of place identity and two latent variables of behavioral investment was not evident in this model. No significant difference in the structural coefficients (i.e., β_{42}, β_{52}, β_{43}, β_{53}) in the 3 subsamples was identified as indicated by the results from invariance testing. Although the structural coefficients did not significantly differ among the 3 groups, respondents of the groups were significantly different in the efforts they invested to manage the common property resources on their property, including water, invasive species, and wildlife populations, and special places on the property. Respondents who did not perceive much landscape change invested less in these management activities compared to those who either perceived worse or improved

environmental conditions over the past years. An important implication for resource mangers from this finding is that correctly raising landowners' awareness about the changes of the environmental conditions in the area surrounding their property may motivate their engagement in proper resource management to sustain the common resource quality on their property.

Hypothesis 5 was partially supported by the significant associations between the two dimensions of place-identity and intention to conserve (β_{42}, β_{43}) across 3 subsamples, and affective place-identity and intention to change (β_{53}) in Group 1 and Group 3 in the predicted directions. Evaluation of the meanings attributed to the biophysical and functional attributes (i.e., cognitive place-identity), and emotional feelings (i.e., affective place-identity) of the property as important facilitated respondents' intention to conserve their property in the near future no matter if the environmental conditions were perceived to become worse, not changed, or improved. Cognitive place-identity was a relatively more important predictor for intention to conserve especially in Group 2 compared to affective place-identity. On the other hand, affective place-identity was the only significant predictor for respondents' resistance to change their property when landscape change was perceived to be either becoming deteriorated or improved but not when it was perceived to remain unchanged. Moreover, the association was significantly stronger in respondents who perceived the environmental qualities of the surrounding landscape to become deteriorated (Group 1) compared to those who perceived the environmental qualities of the landscape to be not changed (Group 2) or improved (Group 3).

The finding that the association between affective place-identity and resistance to change was stronger in Group 1 than in Group 2 and Group 3 was consistent with identity control theory. According to identity control theory (Burke, 1991a, 1991b, 2004), perception of environmental degradation can be viewed as interference to the process of place identity and may motivate behavior or enhance behavioral intention to conserve the identity to bring the perceived and ideal meanings defining individuals' place identity closer. Perception of declined environmental quality and, therefore, enlarged

discrepancy between ideal and perceived place identity might have forced respondents in Group 1 to become more resistant to change when their identity was charged with the emotional feeling to their property. Degradation of the environment would hinder respondents from expressing and verifying their place identity. On the other hand, an improvement in the environmental condition is less likely to create interference to the automatic process of place identity since the perceived meanings as reflected from the environment are more likely to be consistent with the ideal meanings of individuals' place identity and conducible for expressing and verifying individuals' place identity. The finding that resistance to change was predicted only by affective place-identity but not cognitive place-identity provides a further evidence to support that intention to conserve and intention to change are two distinctive constructs.

Based on the findings from hypothesis testing for Hypothesis 5, it may be suggested that different communication strategies are needed when the focus of an incentive program is to promote conserving the biophysical and functional features on landowners' property versus when the focus is on encouraging landowners' resistance to converting the property for other uses. For example, both cognitive and affective place-identity will be needed to be integrated into the promotion of incentives programs, such as Conservation Reserve Program, Brush Control Program, Water Quality Management Plan, Wetlands Reserve Program, and Wildlife Habitat Incentives Program, aimed at maintaining important features on private properties. Affective place-identity may need to be emphasized more when promoting incentive programs, such as conservation easements and purchase of development rights, to encourage landowners' resistance to developing, subdividing, or selling their property for other types of land use.

Studies have suggested that perceived risk of environmental degradation on health or concern about the environmental quality may facilitate proenvironmental behaviors (Baldassare & Katz, 1992; Kaltenborn, 1998; Sguin, Pelletier, & Hunsley, 1998) especially when the environmental problems were contextualized at the spatial scale that is most relevant to study participants (e.g., local communities or

neighborhoods) (Blake, 2001; Blake, Guppy, & Urmetzer, 1997; Cantrill & Senecah, 2001; Uzzell, 2000; Vorkinn & Riese, 2001). However, the moderating effect of different environmental conditions on the relationship between place identity or place attachment and proenvironmental attitudes/behaviors was rarely examined with few exceptions, such as Kaltenborn (1998). In the current study, the moderating effect of perception of change in the physical environmental at 3 different levels (i.e., improved, not changed, and degraded) on the relationship between place identity and behavior/behavioral intention to conserve private land was examined. However, further research to include more encompassed aspects of landscape change beyond only the physical environment and to investigate the effect of objective measures of environmental change (e.g., population growth, and changes in land use pattern and economic structure, etc.) may shed more light to the understanding of how place identity affects conservation behavior or behavioral intention.

Two more findings in the study deserve some discussions. The first is that the moderating effect of perception of landscape change was significant only in predicting behavioral intention to change property in the future but not in behavioral investment in direct and indirect property management. The discrepancy may be attributed to perceptions of landscape change during the past and expectation of the change in the future. Environmental change has been a continuous phenomenon of the area although the process has accelerated more recently. Respondents might expect that change will continue and become more intense in the future. Expectation of more urbanization and land fragmentation in the area might have reinforced respondents' lack of intention to change the property when they responded to the items measuring these two constructs. A measurement scale designed to investigate perceived change of the local landscape in the future may help clarify the puzzle.

The second point to be noted is the predictive power of place identity as an intrinsic motive for behavioral investment on property management and intention to conserve/change property was only moderate (<= 37% for behavioral investment and <= 45% for intention to conserve/change). A potentially important contributor to the

unexplained variance in the latent dependent variables is perceived barriers to engage in desired land practices that will help sustain the conditions of natural resources. As mentioned earlier, consequences of urbanization and fragmentation may include the increase in landowners' financial burden (e.g., increase in property taxes and costs for property maintenance) and difficulty for land management (e.g., more regulations, conflicts with neighboring newcomers). Extrinsic mechanisms, such as a variety of landowner incentive programs, right to farm laws, and zoning, may help landowners overcome these barriers. Extrinsic incentives and intrinsic incentives, such as place identity, together may create synergistic effects that can enhance the promotion of landowners' support for land management to conserve the public goods supported by their property. Further research to understand perceived barriers and other variables, such as family support, and knowledge about and attitudes toward different incentive programs, may help improve the predictive power of the models.

Overall, the major hypotheses were largely supported by the study findings. Based on the findings, resource management agencies in this area need to address the different aspects of landowners' place identity to promote different incentive programs for conserving the ecosystem goods and services in the area. Moreover, informing landowners about the adverse as well as positive impacts of environmental change in the area may encourage landowners' involvement in the management of common property resources on their property. It may also create a spillover effect on landowners who are highly identified with their property to support land management that will help sustain the natural resources in the area since a healthy resource condition on their property cannot be sustained without a healthy resource condition of the region. Furthermore, conservation programs and communication strategies to promote them in the area should also take account the different landowner characteristics that may influence responses to these programs. Despite of these findings, limitations and unanswered questions were identified. Future research to improve the validity of the latent constructs examined and research designs to provide evidence for the plausible explanations for the relationships not supported in this study will be needed.

CHAPTER V
SUMMARY AND CONCLUSIONS

Landscape change as a global phenomenon is impacting the ecosystem goods and services provided by open space essential to supporting the urban and rural populations in many parts of the world (Gobster, Stewart, & Bengston, 2004). Conserving open space cannot be attained without gaining public support especially in a state where most open space is owned by private entities, such as Texas. Various incentive-based programs for farmland and ranchland conservation have been applied in the State of Texas to encourage landowner involvement in conserving important open space features (TPWD, 2006). The effectiveness of an incentive-based mechanism for open space conservation can be evaluated based on its outcomes and generalizability (Cone & Hayes, 1980; De Young, 1993; De Young, 2000).

Outcome-based criteria are designed to evaluate the reliability and durability of an incentive program. Reliability of an incentive program can be measured by the percentage of a target population responding to the program and if an individual will continue to support it after being repeatedly exposed to the program (De Young, 1993). The criterion of durability is achieved when an incentive mechanism generates a desirable outcome that is long-lasting and self-sustaining.

Generalizability is determined by two factors. The first is whether the same incentive program is applicable to a different setting or context. The second focuses on each individual and examines if the individual will carry the targeted behavior to another setting or context and if other unintended behaviors are promoted that facilitate the achievement of the same conservation goal. An incentive program focusing on private land conservation is generalizable when the program also motivates landowners' engagement in conserving the resources beyond their own property (Cone & Hayes, 1980; De Young, 1993). Landowners may be motivated to engage in local open space conservation if they realize that conservation of the ecological features on their property will not be achieved without maintaining the qualities of these features in the local area.

Generalizability can also be measured by that, for example, a program aiming at conserving an endangered species on a landowner's property may also motivate him/her to voluntarily improve the habitat for other wildlife species on the property.

Nationwide, government funded incentive programs have become a commonly applied mechanism that provides monetary incentives to encourage landowner participation in farmland/ranchland protection and other resource or wildlife conservation (Geoghegan, 2002; Hellerstein et al., 2002; Hollis & Fulton, 2002; Shultz, 2005; Wilcove & Lee, 2004; Williams & Lathbury, 1996). However, several drawbacks are likely to emerge from reliance on government funding for open space conservation based on the criteria of outcomes and generalizability.

From the reliability perspective, government-funded monetary incentives may be attractive to only a limited population of landowners. For landowners who possess property on the rural-urban fringe, the financial incentives provided by these programs are likely to be too low to offset the potential gains from selling the land for development when it is only weighed for its monetary value (Hellerstein et al., 2002). In other words, the opportunity costs of not selling the land in order to maintain the property for agricultural or other less developed land uses are likely high. The reliability of continuing participation in the incentive programs may also not be easily attained. Landowners who enroll in any of the programs may choose not to renew the contract when it expires if the economic benefits derived from other land uses exceed the one provided by the programs. Such discontinuity is likely to be encountered more frequently by landowners whose property is located proximate to a fast growing metropolitan area where land values are increasing rapidly.

The problem associated with durability of monetary mechanisms for private land conservation arises when funding stops. Without financial support, landowners may stop engaging in resource conservation if they were motivated primarily by the monetary rewards provided by the incentive programs. According to Kohn (1999), tangible rewards, such as those provided by monetary-based incentive programs, promote only behaviors that are contingent on the rewards. Attitudes and emotional commitments

underlying these behaviors are less likely to be changed based on this approach. Similar arguments and empirical evidence have also been reported elsewhere (Deci, Koestner, & Ryan, 1999; Dwyer et al., 1993). Monetary incentives alone are less likely to produce a long-term effect on landowner involvement in resource conservation when rewards are only temporary. Likewise, the ability of an incentive program for conservation to be generalizable to other contexts may be diminished if funding is in short supply or unavailable. Since government funding is limited, it is unrealistic to rely solely on public funds to support private open space conservation. Moreover, it should be viewed as a mechanism to help landowners overcome the financial burden necessary to maintain their property and conserve the natural resources instead of a major force that draws landowners' enrollment in conservation programs. At the same time, mechanisms other than monetary incentives to encourage landowner participation are needed in order to create reliable, durable, and generalizable open space conservation programs.

Contrary to externally reinforced mechanisms, a conservation practice that is intrinsically motivating and consistent with the self-interest of private landowners may generate more reliable, durable, and generalizable outcomes. Scholars have suggested that incentives that are self-relevant and intrinsically motivating, such as personal development and esteem enhancement, are likely to sustain desirable behaviors (Mannetti, Pierro, & Livi, 2004; Mansbridge, 1990; Perloff, 1987; Terry, Hogg, & White, 1999). Self-related interests, such as attachment to and identity associated with working on farmlands/ranchlands, have been reported to drive landowners' continuous involvement in agricultural activities or farmland/ranchland protection (Liffmann, Huntsinger, & Forero, 2000; Ryan, Erickson, & De Young, 2003; Sanders et al., 2004). However, self-interest that is embedded in landowners' relationships with their property as an intrinsic incentive for landowner participation in conservation has not yet been adequately researched (Ryan, Erickson, & De Young, 2003). Place identity represents one such incentive.

The main purpose of this dissertation is to explore the role of place identity as a self-interest that motivates private landowners to conserve open space features whose

agricultural and ecological functions are under the threat of landscape change induced by population growth and urban development. The study was designed to address four objectives to enhance our understanding and application of place identity as an intrinsic incentive for common-pool resource conservation. The four objectives were: 1) To define place identity and identify its underlying dimensions; 2) To develop and test a place-identity scale; 3) To develop and test a conceptual framework that explains the relationships among commitment, place identity, behavior/behavioral intention to preserve or change the identity, and perception of landscape change; and 4) To draw implications to promote open space conservation and identify future research needs. Chapter II through Chapter IV each includes a study to address the first 3 objectives. Although the study findings and their implications for open space conservation have been described in each chapter, this final chapter will provide an overall summary of the findings. Implications for open space conservation and study limitations as well as future research needs are discussed following the summaries.

5.1. SUMMARY

5.1.1. Study 1- Exploring Landowners' Place Identity in the Texas Hill Country: A Qualitative Approach

The purpose of this portion of the research was to define place identity and develop a conceptual framework of the dimensionality of place-identity. Place identity was defined, based on the symbolic interactionism-based identity theory (Burke & Tully, 1977; Stryker, 1987; Stryker & Statham, 1985), as meanings that an individual ascribes to a place through his/her interactions in and with the socio-economic and biophysical environment in the place and become the defining elements of his/her self-identity. Identity control theory (Burke, 1991a, 1991b, 2004) was applied to understanding the dynamics of place identity and the effects of interruption of the identity process on one's effort invested in maintaining the identity.

A three-dimensional framework of place identity that conceptualized place identity as comprised of the structural, functional, and affective dimensions was

developed based on this theory and place-related literature (e.g., Canter, 1977; Proshansky, 1978; Relph, 1976). The three dimensions did not remain static but were likely to change through time. The dynamics of the three dimensions was referred to as the temporal dimension. This framework was examined using a convenience sample of landowners. Study informants owned a property in the Texas Hill Country where population growth and development from the nearby metropolitan areas were threatening the meanings comprising their place identity that was embedded in their property. Semi-structured interviews were implemented to understand the meanings that informants attributed to the structural, functional, and affective dimensions of their place identity, and how these meanings evolved over time and were impacted by landscape change. Literature has suggested that experiences in a place may affect the meanings individuals ascribe to an environment as well as their attitudes and behaviors toward resource management in the environment (Green et al., 1996; Gustafson, 2001; Hay, 1998; Jones, Fly, Talley, & Cordell, 2003; Nelson, 1999; Raedeke, Charles, & Rikoon, 2001; Reading, Clark, & Kellert, 1994; Relph, 1976). Interview results were interpreted by grouping informants into traditional and non-traditional landowners who differed in their experiences of interacting with their property. Traditional landowners had a larger property and longer personal and family history associated with the property. They were also more economically dependent on the property compared to non-traditional landowners.

Meanings identified by informants were categorized into the dimensions of structure, function, and affect. Most of the place meanings that informants ascribed to their property were positively evaluated. Moreover, the three dimensions of place identity seemed to be correlated with one another and evolved over time as a consequence of informants' desire to express their self-identity and impacts from landscape change. Differences in the meanings that informants ascribed to the functional and emotional dimensions of their property were identified between traditional and non-traditional landowners. More themes were identified from the functional and emotional meanings that traditional landowners ascribed to their property compared to

non-traditional landowners. At the same time, traditional landowners expressed more functional and affective meanings that were negatively impacted by landscape change. Despite all the differences of place identity between traditional and non-traditional landowners, both groups had been involved in activities and were looking for strategies to help them alleviate the adverse impacts from landscape change. However, if change continued to aggravate the environmental qualities of the property, non-traditional landowners were more likely to give up their place identity than traditional landowners.

Study findings supported the utility of identity theory to define place identity and identity control theory to understand how place identity may change when it is interrupted by landscape change and motivate effort in maintaining the identity. Meanings that consisted of Hill Country landowners' place identity of their property, the environmental qualities on the property impacted by landscape change, and strategies to cope with the change identified in this study were used to develop measurement scales for the studies described in Chapter III and Chapter IV.

5.1.2. Study 2- Testing the Dimensionality of Place Identity: A Quantitative Approach Using Covariance Structure Analysis

A common critique about research of place identity and other place-related constructs is the lack of conceptual clarity (Devine-Wright & Lyons, 1997; Hidalgo & Hernández, 2001; Krupat, 1983; Lalli, 1992). While most of the qualitative-based place research has conceptualized place identity as consisting of multiple dimensions (e.g., Gustafson, 2001; Korpela, 1989; Twigger-Ross & Uzzell, 1996), this concept has been operationalized and examined as a unidimensional construct subsumed to place attachment by research employing a quantitative approach (e.g., Jorgensen & Stedman, 2001; Kyle, Graefe, & Manning, 2005; Williams & Vaske, 2003). The purpose of this study was to compare a framework of place identity as comprising the dimensions of structure, cognition, and affect, with three other plausible conceptualizations that have been examined in the related research, including 1) a single factor model that comprises one dimension of place identity; 2) a first-order model where two dimensions (i.e.,

cognitive and affective dimensions) of place identity were correlated; and 3) a second-order model where three first-order factors (i.e., structural, functional, and affective dimensions) loaded onto a single second-order factor (i.e., place identity). Moreover, differences of place identity between traditional and non-traditional landowners identified from the previous study were quantitatively tested based the best fit model from the four competing models.

Confirmatory factor analysis (CFA) and mean and covariance structure analysis (MACS) were applied for model comparison and testing for group differences, respectively. Data were collected from a random sample of landowners who were managers or owners of a property of at least 10 acres in Hays, Blanco, and Gillespie County in the Texas Hill Country. Results of CFA indicated that the one-factor model provided the worse fit among the four competing models. At the same time, the three-dimensional framework of place identity and the second-order model fit the data well, but failed to provide evidence for discriminant validity. The two-dimensional model, on the other hand, fit the model well and attained convergent and discriminant validity and two indicators of internal consistency, including composite reliability and Cronbach's alpha coefficients. The two-dimensional structure of place identity resembles the construct of place attachment conceptualized as being comprised of cognitive place-attachment (i.e., place dependence) and affective place-attachment (i.e., place identity). This conceptualization of place attachment has been widely adopted in recreation and natural resource management literature (Williams & Roggenbuck, 1989; Williams & Vaske, 2003). A major difference between the two-dimensional model of place identity and place attachment commonly adopted in the recreation and natural resource research is that, in addition to functional meanings, meanings of the biophysical features of places are included in the cognitive place-identity. The two-dimensional model of place identity was used in MACS analysis to compare latent mean differences of cognitive and affective place-identity between traditional and non-traditional landowners.

Results of MACS showed that traditional and non-traditional landowners

significantly differed in the observed means of their evaluation of special places on the property. Both groups also differed in the latent means of affective place-identity. Specifically, traditional landowners attributed a higher level of importance to the meanings of special places and the dimension of affective place-identity that was measured by four items compared to non-traditional landowners. Traditional landowners' larger property, longer history of association with the property, and higher dependence on the property for income generation might have contributed to these results. The relationship between these landownership characteristics and strength of place identity was further examined in the study described in Chapter IV based on the conceptualization of place identity as a two-dimensional construct.

5.1.3. Study 3: Place Identity on a Fragmenting Landscape- An Intrinsic Incentive for Open Space Conservation?

Identity theory suggests that individuals' commitment to an identity or the social connections associated with the identity contributes to the salience of the identity to him/her, which in turn influences the effort that he/she invests in maintaining the identity (Stryker, 1980, 1987). At the same time, identity does not remain static. Identity control theory (Burke, 1991a, 1991b) suggests that discrepancy between one's perceived identity and the ideal identity that he/she holds for him/herself may motivate him/her to reduce the discrepancy and the psychological discomfort induced by the discrepancy. The purpose of the study described in this chapter was to apply identity theory and identity control theory to addressing two research gaps: 1) the lack a theoretical explanation for a motivating effect of place identity on behaviors (Korpela, 1989; Sarbin, 1983; Twigger-Ross, Bonaiuto, & Breakwell, 2003); and 2) the lack of research that examines the dynamics of place identity and how it may motivate behaviors to preserve or change the identity when the place where the identity is embedded is threatened with change (Davenport & Anderson, 2005; Rogan, O'Connor, & Horwitz, 2005).

Two structural models were developed based on identity theory and identity control theory. Model A hypothesized the relationships among commitment, cognitive

place-identity, affective place-identity, and behavioral investment that would lead to the preservation of place identity. Two types of behavioral investment were tested in Model A, including land practices directly applied to respondents' property to maintain the resource qualities, and participation in activities to enhance the ability for land management and control over local resource development. Model B hypothesized the relationships among commitment, cognitive place-identity, affective place-identity, and behavioral intention to preserve or change the identity in the future. Moreover, perception of landscape change was predicted to influence the hypothesized relationships between the two dimensions of place identity and behavioral investment in Model A, and the relationships between the dimensions of place identity and behavioral intention in Model B. Invariance testing based on covariance structure was applied to examining model fit and testing the moderating effects of perception of landscape change on the relationship between cognitive/affective place-identity and behavior/behavioral intention. The same set of data from the previous study was used for the analyses.

Results showed that the two models attained acceptable model fit. Both convergent and discriminant validity were achieved after model respecification. Internal consistency was also attained in most latent constructs. The hypothesized relationships among the latent constructs were generally supported. In model A, respondents' commitment to their property and cognitive place-identity positively contributed to their affective place-identity. Behavioral investment in management practices that respondents directly applied to their property was predicted by both cognitive and affective place-identity. On the other hand, the amount of behavioral investment that involved attending public hearings or workshops to enhance respondents' ability to manage the property and control resource development in the area was predicted only by respondents' affective place-identity. Results also indicated that perception of landscape change had no effect on the relationship between cognitive/affective place-identity and behavioral investment in either direct or indirect property management. Twenty-two to thirty-seven percent variance in behavioral investment in direct property management

was explained by cognitive and affective place-identity for three groups that perceived improved, deteriorated, or steady environmental qualities of their property as a consequence of landscape change. On the other hand, only 5 to 8% of the variance in behaviors related to indirect property management was explained primarily by affective place-identity for the three groups.

Similar to the results from testing for Model A, testing for Model B showed that commitment and cognitive place-identity were positive predictors for affective place-identity. Intention to conserve the property in the future was positively predicted by both cognitive and affective place-identity. However, intention to make changes to the property was negatively predicted only by affective place-identity. In other words, the higher the affective place-identity, the higher the resistance to changing the property where respondents' place identity was rooted was reported. At the same time, perceived landscape change exhibited a moderating effect that influenced the relationship between affective place-identity and intention to change. Specifically, the negative relationship between affective place-identity and intention to change was enhanced when landscape change was perceived to lead to deteriorated environmental qualities compared to when it was perceived to improve or have no effect on the environmental qualities of respondents' properties. Cognitive and affective place-identity together explained as high as 45% variance in behavioral intention to conserve the property for Group 2 that perceived no change in the environmental qualities, 33% for Group 3 that perceived improved environmental qualities, and 14% for Group 1 that perceived deteriorated environmental qualities. Variance in intention to change was primarily explained by affective place-identity with 38% of which explained for Group 3, 26% for Group 1, and 17% for Group 2.

Overall, study findings support the utility of applying identity theory and identity control theory to explaining the effect of cognitive and affective place-identity as intrinsic incentives that motivate behavior and enhance behavioral intention to conserve one's place identity with which landscape change may pose potential threat to its integrity. However, the low to moderate variance in the dependent variables explained by

the two place-identity dimensions suggests that other variables not included in the models may also play an important role in determining one's behavior or behavioral intention to conserve or change his/her place identity when threat to the identity is present.

5.2. DISCUSSION

As stated in Chapter I, this research was aimed at addressing the gaps in place research, including 1) the lack of conceptually clear and unambiguous definition (Devine-Wright & Lyons, 1997; Hidalgo & Hernández, 2001; Krupat, 1983; Lalli, 1992); 2) insufficient theoretical underpinnings that explain the mechanism underlying the motivating function of place identity for behavior (Korpela, 1989; Sarbin, 1983; Twigger-Ross, Bonaiuto, & Breakwell, 2003); 3) the need for a theoretical understanding of individuals' place identity and behavior to preserve or change the identity under the pressure of environmental change that may threaten the identity (Davenport & Anderson, 2005; Rogan, O'Connor, & Horwitz, 2005). To achieve these aims, this research performed a series of procedures from defining place identity, developing a place-identity scale and examining the performance of the scale, to testing for the structural models that hypothesized the relationships among commitment, place identity, behavior/behavioral intention, and perception of landscape change.

The research started with applying the symbolic interactionism-based identity theory to defining place identity. Defining place identity as meanings embedded in a geographic location provided a clear conceptualization of the construct and useful start point to integrate literature from environmental psychology and human geography that have examined meanings of the physical environment (e.g., Canter, 1977; Proshansky, 1978; Relph, 1976). It also facilitated the identification of the three latent dimensions of place identity, including structure, function, and affect. Although the three-dimensional framework of place identity was rejected, due to the lack of discriminant validity between the structural and functional dimension, study findings provide support for conceptualization of place identity as consisting of a cognitive and affective dimension

similar to the way place attachment has been examined in much of the recreation and natural resource research (Bricker & Kerstetter, 2000; Vaske & Kobrin, 2001; Williams, Patterson, Roggenbuck, & Watson, 1992; Williams & Vaske, 2003).

Scholars have suggested that individuals are not aware of their place identity until changes in the physical environment are perceived (Brown & Perkins, 1992; Feldman, 1990; Relph, 1976; Williams & Stewart, 1998). Some have reported that dependence and/or emotional attachment to a place may motivate pro-environmental attitude or behavior (Payton, Fulton, & Anderson, 2005; Stedman, 2002; Vaske & Kobrin, 2001; Vorkinn & Riese, 2001). However, how changes in the physical environment affect the association between place identity and pro-environmental behavior that may lead to conservation of the important meanings of the place and place identity has not been thoroughly theorized and tested. In this research, identity theory (Stryker, 1980, 1987) was used to theorize cognitive and affective place-identity as self-interested motivations that predicted behavior and was predicted by commitment. Identity theory provided a theoretical explanation for the motivating effect of place identity on behavior/behavioral intention when no interruption on the identity was present. Moreover, identity control theory (Burke, 1991a, 1991b, 2004) was adopted to model the effects of perceived landscape change on the relationships between cognitive and affective place-identity, and behavior/behavioral intention. Identity control theory offered the theoretical underpinning for the motivating effect of place identity on behavior/ behavioral intention when interruption, such as environmental change, on the identity was present.

Study findings supported most of the hypothesized relationships. Commitment influenced place identity only on its affective dimension. The way commitment was defined here was similar to the experience use history (EUH) concept in the recreation research. Positive relationship between EUH and individuals' affective attachment to a recreation setting has been reported (Hammitt, Backlund, & Bixler, 2006).

Findings of this research also supported the positive association between cognitive/affective place-identity and behavioral investment in direct property

management and behavioral intention to preserve respondents' place identity. In addition to research in the place literature, the positive relationship between self-identity as a unidimensional construct and behavior/behavioral intention to maintain the identity has been reported in identity research (Callero, 1985; Charng, Piliavin, & Callero, 1988; Stryker & Serpe, 1994) and environmental studies (Mannetti, Pierro, & Livi, 2004; Sparks & Shepherd, 1992; Terry et al., 1999). On the other hand, affective place-identity was the only place-identity dimension that predicted behavioral investment in indirect property management and behavioral intention to change respondents' property. The study by Payton, Fulton, and Anderson (2005) that suggested a positive effect of emotional place-attachment but insignificant effect of functional place-attachment on respondents' investment of their time, effort, and resources to civic activities to support a wildlife refuge is consistent with the finding presented here.

Overall, findings reported here have addressed some of the gaps in place research and provided implications to engaging private landowners in open space conservation where landscape change is threatening the qualities important to Hill Country landowners. This research has also raised more questions that are of theoretical and practical interests and deserve further explorations. Implications of the study findings for open space conservation and study limitations as well as future research needs are described next.

5.3. IMPLICATIONS FOR OPEN SPACE CONSERVATION

The findings that some of the relationships hypothesized in the two structural models were corroborated and that landowners differed in the importance they attributed to the meanings of their property provide some practical information for resource management of the Texas Hill Country. Firstly, the findings that both cognitive and affective place-identity contributed to the amount of effort invested in direct property management suggested that promotion of resource conservation needs to address these two aspects of landowners' place identity. Promotion of a conservation practice, be it voluntary or sponsored by external sources, will need to convince landowners that how

the practice may help conserve or how the lack of the practice may adversely impact the cognitive and affective meanings important to their place identity. For example, the practice of managing the overgrown brush species, such as Ashe Juniper and Mesquite, helps stablize soil, improve water quality, maintain habitat for wildlife species, and keep the aesthetic quality of the land by maintaining a certain amount of openness from being blocked by overgrown brush. All these biophysical attributes, aesthetic quality, as well as the feelings and memories accompanied with all these features may be important to landowners' place identity. These elements may be included in resource management program and communication strategies to encourage this resource practice. Likewise, the positive associations between cognitive/affective place-identity and intention to conserve property suggest that any effort to encourage landowners to maintain their property through keeping the current features, and activities and functions supported by the property may need to address both aspects of place identity.

Secondly, the finding that affective place-identity was the only place-identity dimension that contributed to behavioral investment in indirect property management also deserves some attention. Practices, such as attending public hearings or participating in resource management workshops or seminars require landowners to invest extra effort in addition to the routine property management. However, indirect practices, such as public hearings, provide a venue for landowners to express their concern about regional development and bring landowners together to collectively help maintain the open space quality of the area. Attending natural resource workshops or seminars to acquire appropriate resource management knowledge or skills helps landowners build the capacity to better cope with environmental change. To encourage landowner participation in these activities resource agencies and NGOs may need to target landowners' emotional connection with their property and how participation in these activities may help them continue this connection into the future. Furthermore, according to the findings that traditional landowners reported a higher level of affective place-identity than non-traditional landowners, traditional landowners may be more likely to participate in these activities. Promotion of these activities may target this

landowner population when an immediate response from landowners is needed. Since respondents reported only less than some effort invested in property management of this nature, understanding the barriers that prevent both traditional and non-traditional landowners' involvement in these activities may facilitate their participation.

More study findings that are of practical interest include that landowners who perceived environmental qualities on their property deteriorating due to landscape change in the area were likely to invest more effort to manage common-pool resources, such as water, invasive plants, and wildlife on their property. At the same time, the same group of landowners was also more resistant to changing their property in the future through subdividing their property or moving somewhere else. Based on these findings, resource management agencies or NGOs may raise landowners' awareness about landscape change and how the change may affect the property meanings important to their place identity to enhance their engagement in common-pool resource management and resistance to change. More effort may be needed to convey the information about the adverse impacts of development on the qualities of landowners' properties located in especially places where development is an immediate threat.

Another practical implication from the study findings is that landowners responded differently to intention to conserve and intention to change their property in the future. Incentive programs varied in promoting conservation of specific natural resources (e.g., Conservation Reserve Program, Wetland Reserve Program, Wildlife Habitat Incentive Program) or discouraging the conversion of a farmland/ranchland for other land uses (e.g., Grasslands Reserve Program, Conservation Easements) may need to emphasize different aspects of place identity in the communication with landowners. Specifically, incentive programs aimed at encouraging the conservation of specific natural features may need to address both cognitive and affective place-identity. On the other hand, incentive programs aimed at encouraging landowners to keep their lands for less developed purposes may focus more on their affective place-identity.

The findings that respondents differed in their affective place-identity suggest that landowners are not a homogeneous group. Designing and implementing

conservation programs and their communication strategies need to take into account this difference. The positive association between commitment and affective place-identity suggests that Hill Country landowners can be segmented into traditional and non-traditional landowners based on property size, length of interaction with the property and family ownership, and number of relatives living in the local area. Resource management programs may need to be designed differently for landowners who are more committed to their property as reflected in the larger size of their property, longer history of interaction with the property and family ownership, and higher economic dependence on the property (i.e., traditional landowners) and landowners who are less committed through these four components (i.e., non-traditional landowners). Resource management programs to target traditional landowners may emphasize more on how an incentive program aimed at conserving open space features helps conserve the special places on their property that are of natural or historical meanings. Moreover, awareness may be raised to traditional landowners that different programs and organizations are available to help them conserve the natural and historical places on their property. Furthermore, conservation programs may also emphasize how the affective connections between traditional landowners and their property may be sustained through appropriate practices. Landowners' affective place-identity may be expressed in terms of the aesthetic quality of the property, and the feelings of home and meaningfulness of the property to them, the property as part of their self-identity, and their spiritual connection to the property.

To non-traditional landowners, resource management programs may equally emphasize the cognitive and affective meanings. These two aspects of place identity are likely to contribute to non-traditional landowners' involvement in maintaining the important biophysical features and functions of their property, and also their intention to conserve the property.

Behavioral investment in direct and indirect property management, and behavioral intention to conserve and to resist to change may help landowners to build their resilience to landscape change, such as land fragmentation. The ability of an open

space and a community of landowners in a geographic region to withstand landscape change can be explained using the concept of resilience. Resilience was first used by ecologists to assess the amount of change or disruption that an ecosystem can absorb before the quality of the system, including the ecological processes and structures, become rearranged or transformed (Holling, 1973; Peterson, Allen, & Holling, 1998). Recently the concept has been applied to understanding the adaptability and vulnerability of the social-ecological systems[22] to change. Three elements characterized resilience of an ecological or a social-ecological system are (Resilience Alliance, 2007): 1) the amount of change or disturbance the system can absorb without losing control of its function and structure; 2) the degree to which the system is capable of returning to the original status of structure and process without importing energy from an external system; and 3) the ability of the system to build and increase the capacity for leaning and adaptation. The relationship between landscape change as an externally generated interruption to the process of place identity and landowners' resilience to environmental change may be illustrated by the two graphs shown in Fig. 15.

The graph with solid line (i.e., High PI) represents landowners who identify highly with their property. When the interruption of landscape change on their place identity is not perceived, their resilience to the change is likely to remain at the same level until the change and interruption from the change continues to grow to the level where awareness of the change is induced. At this point (i.e., threshold of inertia), the discrepancy between perceived self-meanings and ideal self-meanings has become so large to cause the feeling of anxiety and distress. As a consequence, the discrepancy is brought into awareness. Since these landowners are highly identified with their property, perception of deteriorating environmental qualities due to landscape change is likely to enhance their resistance to changing the ideal meanings that comprise their place identity. The increase in resistance to change is likely to contribute to landowners' resilience to landscape change of the region. Landowners' resilience to landscape change may be actualized by employing certain coping strategies with available resources. These

[22] Using the term of social-ecological systems instead of social and ecological systems is to emphasize the inter-dependence of the human-natural relationships (Berkes, Colding, & Folke, 2003).

resources may include landowners' ability to manage the property, information about landowner assistance programs, financial supports from different agencies, opportunities to participate in civic activities related to local development, and other social capital[23] available to the landowner community. Landowners may continue to explore and apply available resources to cope with the change as long as the costs of searching for and applying these coping strategies are lower than the cost of losing their place identity. At the same time, agency or organizational supplies of these resources may also enhance landowners' resilience capacity. If landscape change continues to grow and reaches the threshold of adaptability, landowners may not have sufficient resources to adapt to the change. At this point, the costs of searching for and applying available resources to cope with the impacts of landscape change on their property identity exceed the cost of giving up the identity. When landscape change goes beyond the threshold of adaptability, landowners may modify the ideal meanings of place identity to accommodate or assimilate[24] the new meanings resulted from landscape change (Breakwell, 1986). It is also possible that landowners may completely give up the identity by selling the land and moving to a new place.

The graph with dash line (i.e. Low PI) represents the relationship between resilience to landscape change of landowners who identify less with their property and perceived interruption from landscape change (Fig. 15). Since this group of landowners identify less with their property, they are likely to exhibit a lower level of resistance to change their property upon the growing interruption from landscape change. Unlike landowners who have strong identity with their property, interruption from landscape change is less likely to increase this group's resistance to change. Moreover, this group is more likely to give up their place identity at a lower level of interruption because of its lower level of resistance to change. Therefore, the threshold of adaptability to landscape

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[23] Social capital is referred to the different "aspects of social structure and organization that act as resources for individuals, allowing them to realize their personal aims and interests" (Pretty & Smith, 2004, p. 633).

[24] According to Breakwell (1986), assimilation is the process of integrating new components into identity. Accommodation adjusts the salience or importance of the identity and rearranges the placement of the identity in the identity hierarchy.

change in this group is lower than the other group.

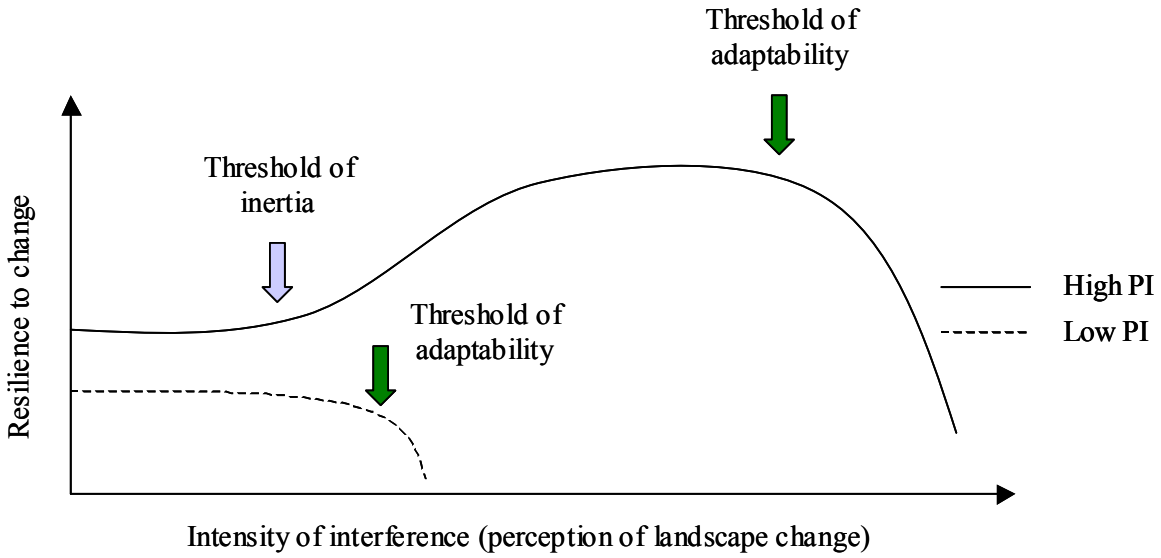

Fig. 15. Relationship between perceived interruption from landscape change and resilience to change

Based on the study findings, landowners who own a larger property, have a longer history with the property through their personal interaction and family ownership, and depend more on the property economically are more likely to have a higher level of affective place-identity than their counterparts. Non-traditional landowners or newcomers who have a lower level of commitment to their property are likely to have a lower level of affective place-identity and, therefore, a lower level of resilience capacity. It will probably easier for resource agencies and NGOs to work with traditional landowners to build up their resilience capacity by providing the necessary resources to help them cope with landscape change. However, it is the growing number of non-traditional landowners or newcomers who are buying the land because of their identification with the natural environment of the area that is contributing to the rising land prices and fragmentation. Without being able to build the stewardship with

non-traditional landowners and their resilience to landscape change, land fragmentation is likely to continue. Resource agencies and NGOs need to work with both groups of landowners, understand their barriers of participating in resource programs that will enhance their ability to cope with landscape change, and strengthen their resilience capacity by providing the necessary support and resources to alleviate the problem of landscape change on open space conservation.

5.4. STUDY LIMITATIONS AND FUTURE RESEARCH NEEDS

One of the major study limitations is the low average variance extracted estimate (AVE) of cognitive place-identity as one of the three indictors for internal consistency. This result indicated that measurement error contributed to more variance in the latent construct of place-identity than the measurement items for the construct. Future research will be needed to improve the measurement scale to capture the other meanings of the biophysical and functional attributes of landowners' property that contribute to the cognitive dimension of place identity. Furthermore, study findings related to the qualitative examination of place identity described in Chapter II revealed that non-traditional landowners seemed to place a higher value on the natural aspect of meanings they ascribed to their property. Traditional landowners seemed to value both the natural and socio-economic meanings of their property. Future research may need to distinguish meanings that comprise cognitive place-identity into natural and socio-economic aspects. If results do show significant differences, then resource managers may use this information to better target different landowner populations to promote resource management programs. That is, resource programs that target non-traditional landowners will need to put more emphasis on how a resource program will help conserve the natural aspect of their property. Both natural and socio-economic aspects need to be emphasized when the target audience is traditional landowners.

Another concern of the study described in Chapter IV was the low variance in behavioral investment through indirect property management that was explained although related activities play a key role in sustaining the open space resources in a

larger spatial scale. Future research may include other factors, such as information about the activities that enhance landowners' ability to control development in the area and manage their properties, and attitudes toward and constraints in participating in these activities to better explain why some landowners participate in related activities and others do not.

Studies have suggested that programs to promote environmental behaviors can achieve better results when multiple incentive mechanisms, including intrinsic (e.g., the value bases of self-interest, altruism, and biospherism) as well as extrinsic incentives (e.g., economic benefits), are applied simultaneously (De Young, 2000; Hunecke, Blöbaum, Matthies, & Höger, 2001; Kalinowski, Lynne, & Johnson, 2006; Stern, 2000). The research in this dissertation examined only the effect of place identity as an intrinsic mechanism for open space conservation. Further analyses may simultaneously examine the effects of place identity as an intrinsic mechanism and attitudes toward extrinsic mechanisms, such as government funded land improvement programs simultaneously, on landowners' participation or willingness to participate in these programs.

Another area that deserves more exploration in the future is the interaction between place identity at the individual level and place identity at the regional level. This dissertation focused entirely on place identity at the individual level, that is, landowners' place identity associated with their property. Landowners' place identity associated with their property may motivate their engagement in conservation of selective features that they value. However, conservation of common-pool resources of open space can only be attained through collective effort of landowners. Maintaining healthy native plant communities, wildlife populations, and water resources will require collective actions from landowners whose properties are located in the same ecological region. At the same time, sustaining the common-pool resources at an ecosystem scale may help ensure that important open space features on individual landowners' property will be conserved.

Identifying the important meanings that are ingrained in the biophysical, functional, and emotional aspects of the regional landscape shared by landowners may

facilitate the formation of a group identity that is built on landowners' common interest to maintain these meanings. Group identity may motivate individual landowners to shift the focus of resource management from benefiting themselves to benefiting the group with which they identify (De Cremer & Van Vugt, 1999) and enhance a sense of trust among the group members (Kramer & Goldman, 1995). The geographic area and meanings shared by its residents define the boundary of group identity. This group identity may facilitate the within group reciprocal interactions when there is a common goal pursued by all the group members. At the same time, formation of a group identity also facilitates the establishment of social norms and common rules that ensure that group members will act based on the best interest of the group and those who do not follow the rules will be sanctioned. Trust, connectedness, reciprocity/exchanges, and norms/common rules/sanctions, have been suggested as essential elements for successful common-pool resource management (Dietz, Dolŝak, Ostrom, & Stern, 2002; Ostrom, 2003; Pretty, 2003; Pretty & Ward, 2001). Understanding of the interactions between place identity at the individual and collective levels and how they may influence landowners' engagement in conserving open space features may provide valuable information for resource management at an ecosystem scale.

Place identity at the individual and landscape levels may enhance landowners' resilience to environmental change and encourage the formation of a group identity that facilitates common-pool resource management. All of these are likely to increase the adaptation of the system to withstand disruption induced by inevitable changes. Future research may be devoted to understanding how place identity at different spatial scales help build resilience of a social-ecological system to landscape change.

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APPENDIX A

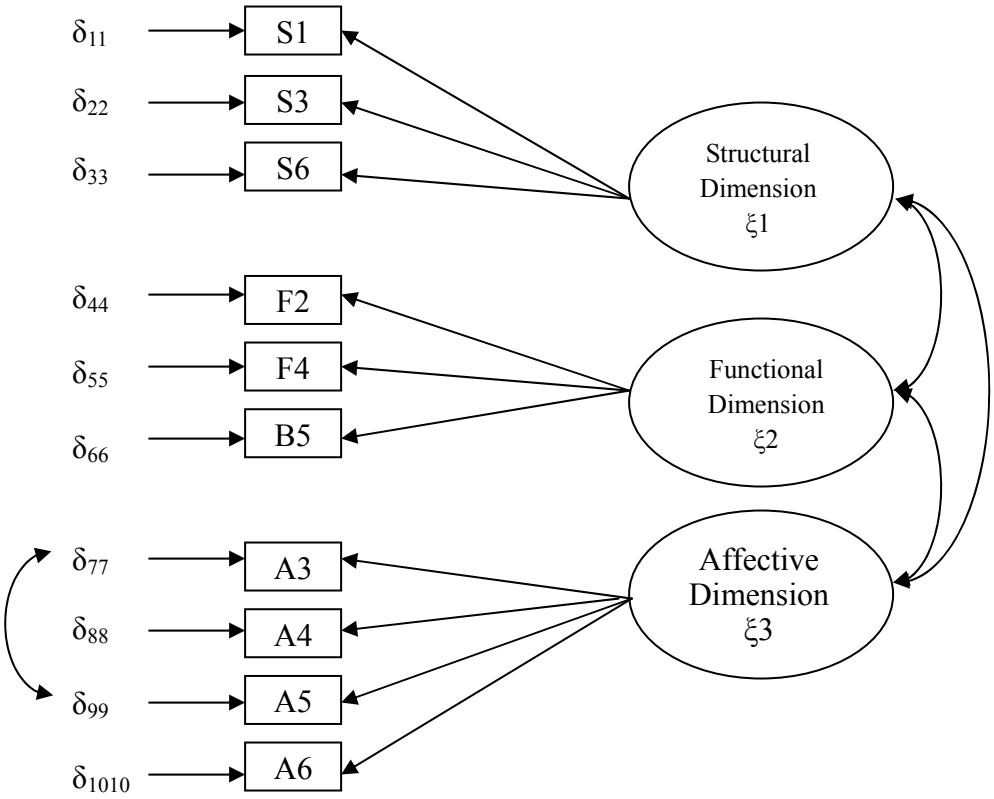

Fig. A1. Model A (final form)

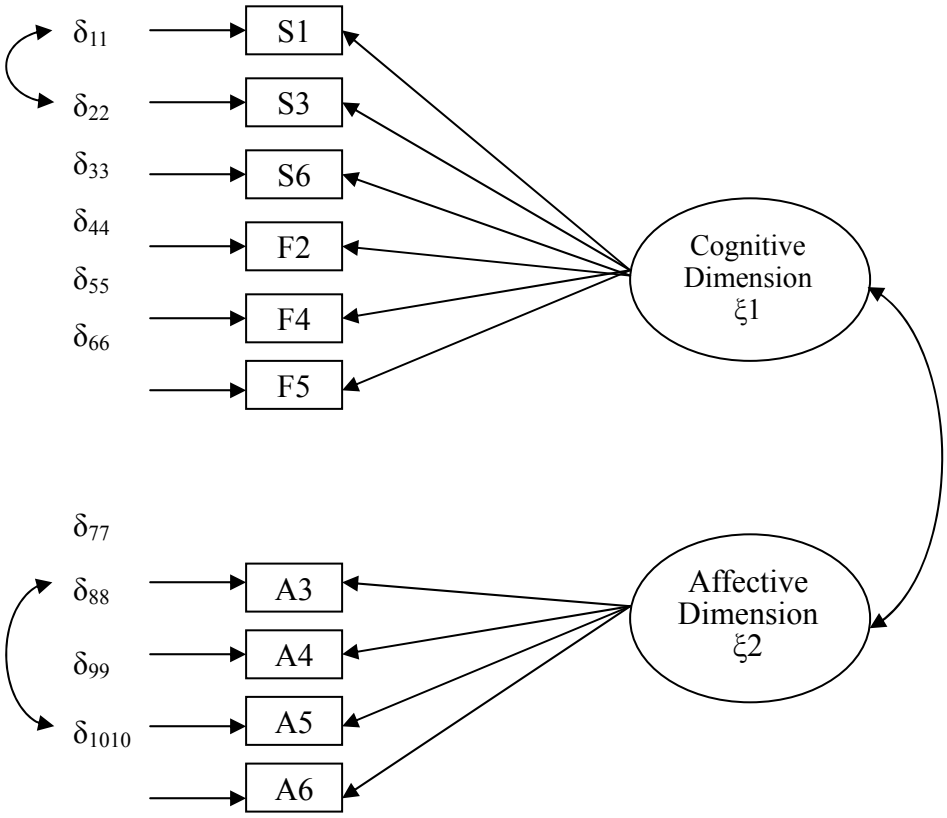

Fig. A2. Model B (final form)

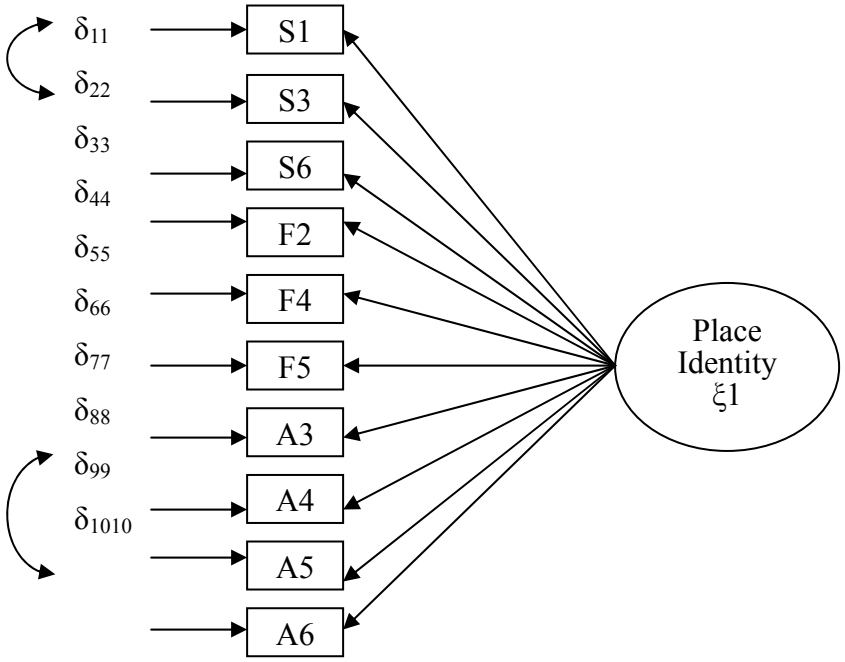

Fig. A3. Model C (final form)

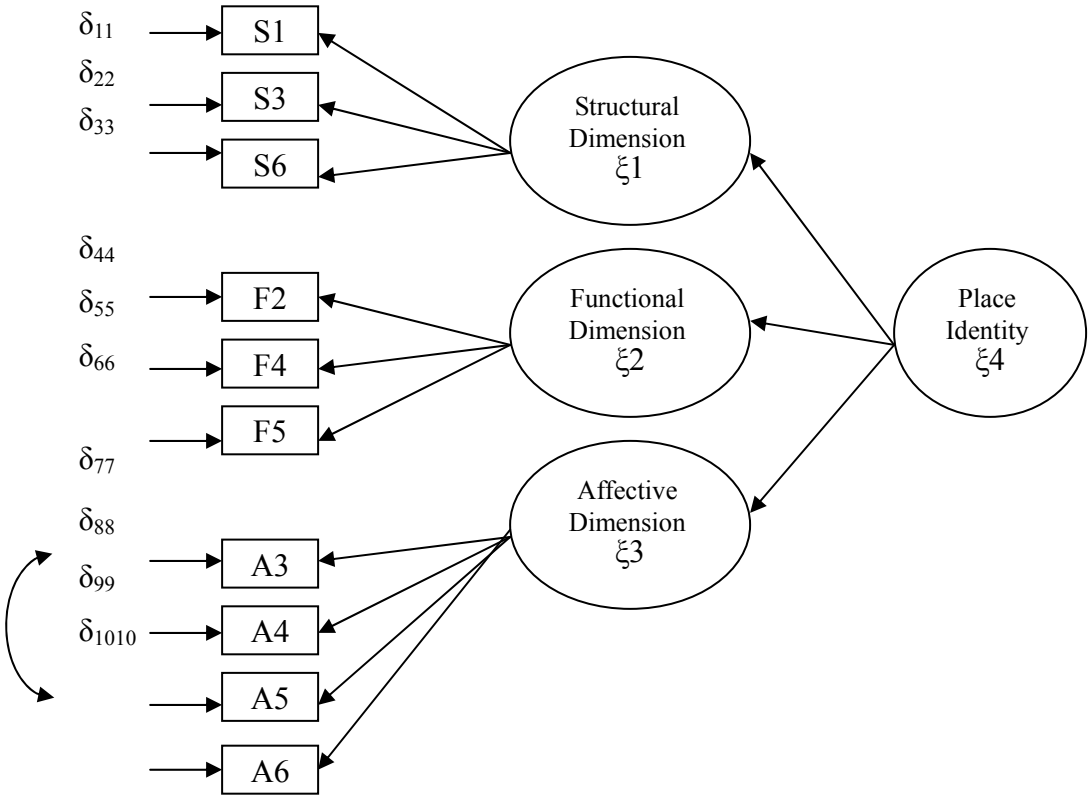

Fig. A4. Model D (final form)

VITA

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