Sense of Place on the Range: Landowner Place Meanings, Place Attachment, and Well-Being in the Southern Great Plains

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Source: Rangelands, 44(5) : 353-367

Published By: Society for Range Management

URL: https://doi.org/10.1016/j.rala.2021.07.004

SRM Society for Range Management

Sense of place on the range: Landowner place meanings, place attachment, and well-being in the Southern Great Plains

By Kiandra Rajala and Michael G. Sorice

On the Ground

- Sense of place can play a significant role in landowner well-being; yet is subjective, complex, and difficult to quantify.
- Through a regression tree analysis of mail survey responses from landowners in the US Edwards Plateau, Central Great Plains, and Flint Hills, we found landowners have diverse senses of place based on a variety of place meanings and differing levels of place attachment.
- Despite social and ecological regional differences, sense of place was similarly diverse within each region rather than specific to region.
- Personal experiences related to way of life, peace and quiet, personal legacy, autonomy, and inspiration may be fundamental meanings for place attachment and well-being on private lands.
- The potential for landowners' place meanings and attachment to contribute to their well-being necessitate including sense of place in efforts toward socially and environmentally sustainable private lands management.

Keywords: place meanings, place attachment, private lands, rangelands, regression tree, well-being.

Rangelands 44(5):353–367
doi 10.1016/j.rala.2021.07.004

Introduction

Many private landowners and the natural resource professionals who work with them intuitively know that land and land ownership matter in many ways beyond providing material resources or agricultural outputs. Consider this description from Larry and June,[i] landowners in the Flint Hills of eastern Kansas:

> *We are a third and fourth generation family farm. Our property is typical of the northern Flint Hills – a combined farm and ranch operation. As we approach retirement, our farm ground has recently been leased out. We raise cattle on our pasture ground. We look at our operation as a business, as a beloved lifestyle, and as a precious resource entrusted to us (temporarily as is the way of life) to preserve for our family, for generations to come, and for the good of mankind and our beloved earth. It is hard to financially support us and to support its future. I see the land as our co-partner in the business of raising food, supporting wildlife, and providing recreation. It works just as hard as we do.*

The wide range of sentiments Larry and June express, from their land's function as a business and agricultural resource to its symbolic value as an intergenerational legacy, give insight into the depth of their sense of place for the land they own. Sense of place can enrich the lived human experience enhancing life satisfaction, quality of life, and overall well-being.[1,2] As sense of place becomes important to a landowner, it can also become a powerful filter for how they perceive and experience changes on their land, driving both adaptive and maladaptive land management behaviors in response.[3–5] Larry and June paint a valuable picture of the elements that comprise their sense of place. However, it remains a considerable research challenge to account for private landowners' connections to their land in quantitative ways that inform natural

[i] Landowners' names have been changed to protect their confidentiality.

resource management and policy without losing the richness and complexity inherent to person-place relationships.[4,6]

In this paper, we quantitatively explore the diverse senses of place private landowners hold for their land and consider how these person–place relationships can contribute to landowners' well-being. We illustrate this by drawing from sense of place research conducted in three culturally and ecologically distinct regions of the US Southern Great Plains by Rajala et al.[7] Our objectives are to 1) conceptually highlight how sense of place can support well-being, 2) empirically examine the nature and intensity of private landowners' sense of place for the land they own, 3) identify patterns and variation in landowners' sense of place based on their region of land ownership, and 4) discuss the implications of sense of place findings for landowners' well-being. To address these objectives, we identify the sense of place individual landowners hold for their land and explore differences and commonalities in sense of place throughout the landscape.

This work adds to the growing body of research on how relational aspects of land ownership and management can contribute to people's wholeness and wellness.[8–10] Failure to understand and account for landowners' sense of place risks missing or undermining the vital ways connection to place can support landowner well-being in pressing efforts toward sustainable development, agricultural intensification, and land management demanded by societal needs and environmental challenges of the 21st century.[4,8]

How a landowner's sense of place contributes to well-being

Sense of place and well-being are the focus of diverse bodies of research. Although a variety of conceptualizations exist, we use sense of place as the umbrella term for the relationship between a person's place meanings and the place attachment that results.[4,11,12] A private landowner's sense of place is a cultural ecosystem service that emerges from characteristics of the landowner, the land, and the landowner's experiences and interactions there.[4,13] For private landowners, their land and sense of place can play a key role in their well-being through multiple pathways based on both the place meanings landowners' hold for their land, and the place attachment these meanings produce. Based on the 2005 Millennium Ecosystem Assessment,[14] we consider individual well-being as a person's freedom to pursue what they value being or doing contingent upon meeting their material needs, having security and physical and emotional health, and maintaining positive social relationships.

Larry and June describe place meanings related to the features and character of their land that make it personally significant,[4] reflecting different ways their land supports their well-being. Some of their place meanings are descriptive beliefs about their land's physical characteristics (e.g., a combined farm and ranch operation) or how it is commonly used (e.g., a business, to raise food, support wildlife, and provide recreation). These meanings reflect how their relationship with their land may support their well-being by providing for their material needs, security through access to resources, and potentially physical health through outdoor recreation.[13,15] Other place meanings represent more symbolic beliefs related to Larry and June's personal experiences (e.g., a beloved lifestyle) or considerations of other people (e.g., to preserve for our family, for generations to come, and for the good of mankind). Symbolic place meanings like these often directly convey aspects of emotional health, social relationships, and the freedom of choice and action that is necessary to achieve well-being.[3,16,17]

Larry and June's place meanings depict the nature of their connection to their land; however, the intensity of this connection, based on the meanings they hold, also has implications for their well-being. Place attachment refers to the intensity of a person's connection to place as they form emotional bonds and integrate a place into the fabric of how they view themselves.[12,18] Places that contribute to a person's identity become important for healthy psychological functioning, and place-based identities can have relational values that enhance meaning and satisfaction in life[1,10] When emotional bonds of place attachment are strong and positive, attachment can promote an individual's emotional health by providing a range of psychological benefits that satisfy core human needs such as self-esteem, the sense of a meaningful life, and belonging.[17,19]

Given their bond with the land, Larry and June may be considerably affected by changes to their land and the surrounding landscape. Their well-being may be threatened or enhanced depending on how the nature of change impacts their sense of place. Most directly, place-change can alter physical and functional conditions in ways that affect landowners' material needs, security, and physical health. However, such changes also influence a landowner's place meanings related to the physical environment and their desired land uses.[15] Place-change can also affect place meanings related to how a landowner views themselves, their family, or the character of their community, which may have substantial consequences for their emotional health, social relationships, and sense of freedom in choice and action.[20–22] Changes that disrupt people's sense of place for cherished places can cause intense emotional reactions such as grief, sadness, distress, and anger.[16,20,23,24] For example, Cunsolo Wilcox et al.[15,16] document how climate-related environmental changes impact the mental health and emotional wellness of a Canadian Inuit community, as well as their physical health and access to resources. For people whom "the land enriches the soul," place-change that inhibits traditional land uses, cultural practices, and simply alters the land they love can "impoverish the soul" (p. 22)[16] undermining well-being by threatening their meanings for and attachment to place.[15]

Study area

In the US Southern Great Plains ongoing ecological transformation of grasslands to degraded woodlands has uncertain

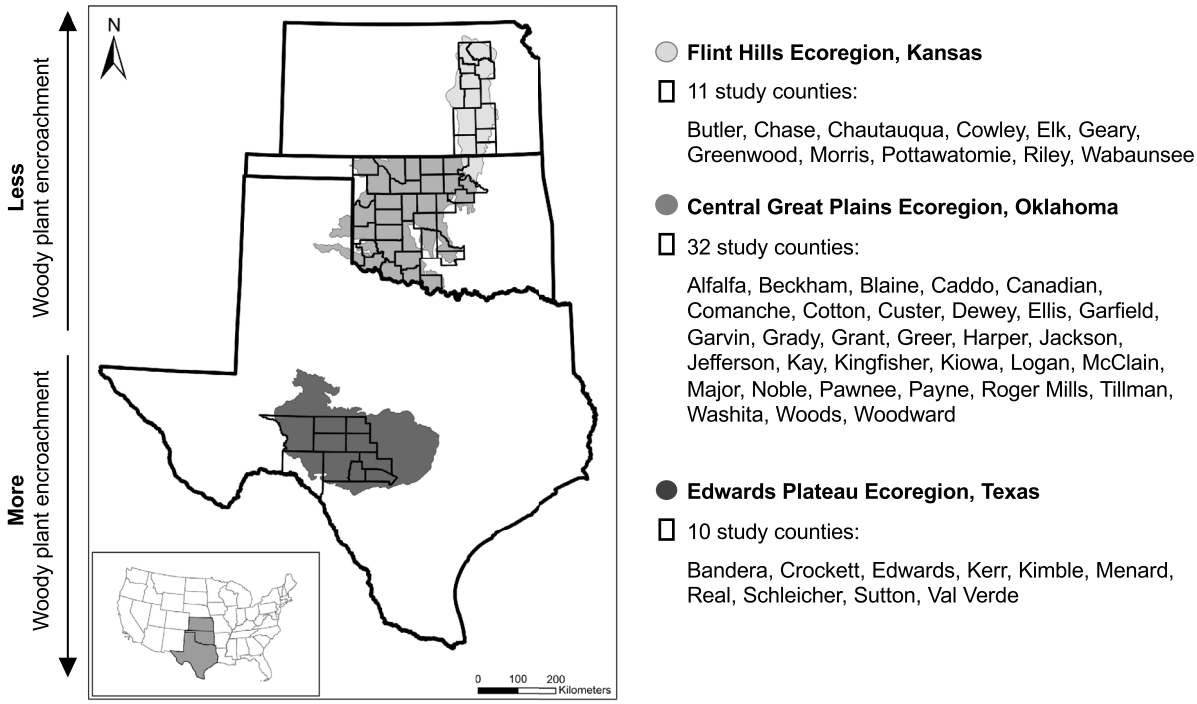

Figure 1. The 53 counties in our study area of the US Southern Great Plains reflect the US Environmental Protection Agency's level III ecoregion boundaries for the Flint Hills, Central Great Plains, and Edwards Plateau.

consequences for private landowners.[25] The loss of productive grasslands through the expansion of woody trees and shrubs may immediately threaten landowners with agricultural livelihoods dependent on grasslands. However, landowners' well-being may be positively or negatively impacted based on how compatible the transformation of grasslands to woodlands is with the place meanings that inform their sense of place. Prior research suggests that different backgrounds, land ownership motivations, and land uses may contribute to a greater diversity in landowners' sense of place.[21,22,26] Although an individual's sense of place is personal and subjective, place meanings and attachment are expected to differ systematically throughout a landscape based on patterned differences between people, experiences, and the physical environment.[4,27]

Our study was based in 53 counties across three ecoregions of the Southern Great Plains (Fig. 1). Ecological transformation of grasslands to woodlands has been most extensive in the Edwards Plateau of Texas, intermediate in the Central Great Plains of Oklahoma, and least extensive in the Flint Hills of Kansas.[25] Agricultural land uses have been dominant in the Southern Great Plains since the onset of major Euro-American colonization and settlement in the 1800s, and currently over 90% of land is privately owned.[28] However, recent trends suggest a social transition of land ownership and land use toward natural amenities. While still predominantly a working landscape, rural landowners in the Southern Great Plains may have a wide range of motivations for owning land expanding beyond agricultural production to include natural and cultural amenities such as hunting, recreation, aesthetics, and the rural lifestyle.[29,30]

Land uses related to livestock grazing are common in the Edwards Plateau; however, the sale of hunting leases and nature-based recreation and tourism enterprises have become increasingly popular.[31] In the Central Great Plains, the more rugged western rangeland is predominately used for livestock grazing, and there is more extensive crop land in the eastern and southern portions of this region. In contrast to the substantial crop production in most of Kansas, the rocky and rolling tallgrass prairie of the Flint Hills is predominantly used as range and pasture for livestock grazing.

Methods

Based on the results of a mail survey, we quantitatively identified the senses of place that landowners in the Edwards Plateau, Central Great Plains, and Flint Hills hold for their land. Although we focused on the sense of place individual landowners hold for the land they own, we considered the importance of region as the social-ecological context in which landowners form their sense of place and are spatially embedded. As we examined the configurations of place meanings and resulting attachment that comprise landowners' sense of place for the land they own, we also explored patterns and variation in landowners' place meanings, attachment, and senses of place based on their region of land ownership.

Survey design

We designed a self-administered mail survey to measure landowners' sense of place as well as a range of land ownership

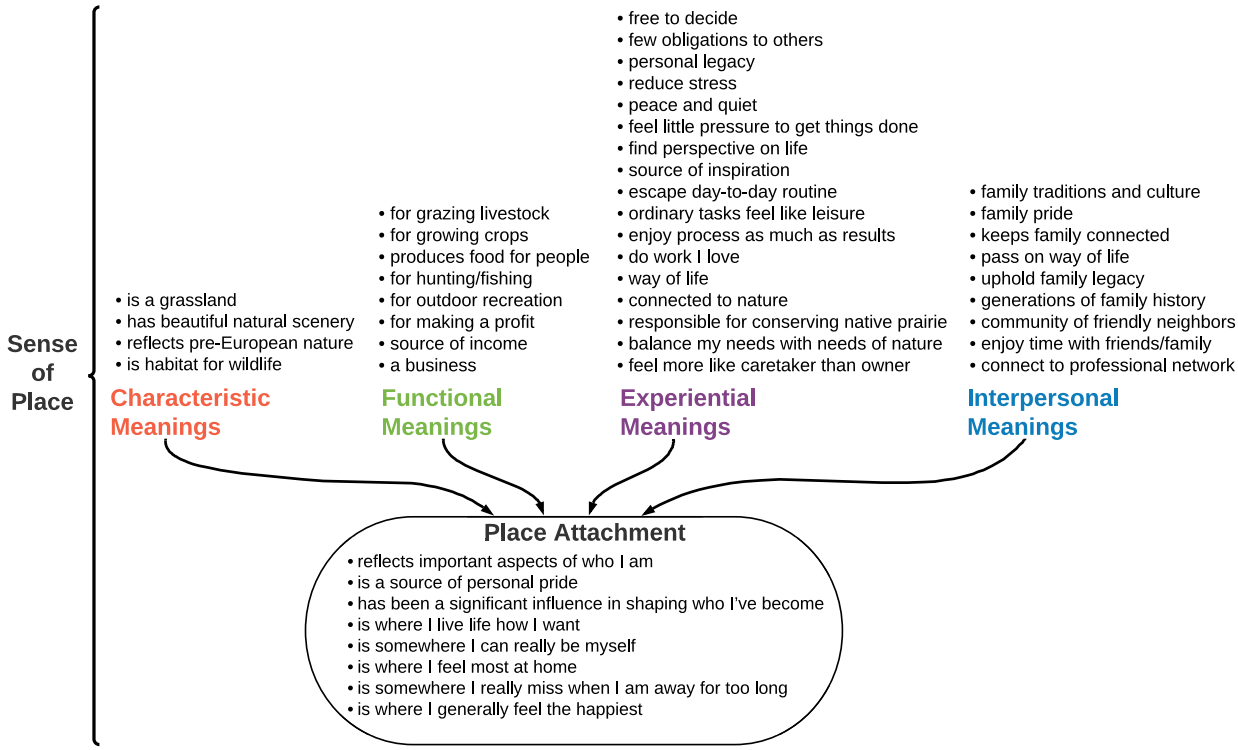

Figure 2. We conceptualize sense of place as the relationship between a person's place meanings and their place attachment. A variety of characteristic, functional, experiential, and interpersonal place meanings can contribute to place attachment. We measured place attachment as a composite of meanings related to individual identity and emotional connection. Full survey indicators are provided in Appendix A.

and land management characteristics. Landowners throughout the Southern Great Plains use a number of terms such as "ranch," "farm," "homeplace," or "place" to refer to the land they own. We based our sense of place questions on the prompt "My place…" because "place" is an inclusive and commonly understood term across the regions.[29] In this paper, we will also refer to a landowner's "place" as their "land" or "property."

Measuring place meanings and place attachment

To determine place meanings potentially relevant to our heterogeneous landowner population, we reviewed a wide-ranging body of sense of place and private landowner research and conducted iterative, qualitative interviews with landowners in the Southern Great Plains (n = 34) about the place meanings and attachment they held for their land (see Rajala et al.[7] for further detail). From this process, we developed 38 place meaning items from the following four different categories of place meanings: 1) characteristic meanings related to biophysical attributes, 2) functional meanings related to actual or desired uses, 3) experiential meanings related to individually oriented experiences, and 4) interpersonal meanings related to social interactions (Fig. 2). See Appendix A for complete place meaning items. Nearly half the place meaning items we measured in our survey were experiential, reflecting the importance and variety of individually oriented experiences in both our landowner interviews and the broad literature review.

We measured place attachment as an emotional bond with a place as well as integration of that place into one's self-identity. Our place attachment items also began with the prompt "My place…" and included eight statements as follows: "is where I feel most at home," "is somewhere I really miss when I am away for too long," "is where I generally feel the happiest," "reflects important aspects of who I am," "is a source of personal pride," "has been a significant influence in shaping who I've become," "is where I live life how I want," and "is somewhere I can really be myself." These are typical indicators for emotional connections and individual identity and may be examined individually as experiential place meanings[32,33] or combined together to represent place attachment.[7,11,12] We considered these eight items together to represent place attachment and conceptualize attachment as the outcome of other place meanings[18,34] (Fig. 2).

We employed Rajala et al.'s[7] meaning-dependence framework to measure place meanings along two dimensions—how landowners think about their land as well as their dependence on their land. For each place meaning and attachment item we asked two questions. First, we asked landowners to indicate the degree to which the item represents their beliefs about their place (representativeness). Second, we asked landowners to indicate the degree to which they rely on their place to provide the item (dependence). We measured both questions on a 5-point Likert-type scale where 0 = Not at all, 2 = Moderately, and 4 = Completely.

To understand the overall strength of each place meaning and attachment item, we summed the response to the rep-

resentativeness question and the response to the dependence question. The resulting measure of overall meaning strength is on a scale from 0 to 8 where 8 indicates maximum intensity (i.e., the statement completely represents a landowner's beliefs and they completely depend on their land to provide it). We refer to the "strength" or "level" that landowners "hold" or "believe in" each place meaning/attachment item. As is common, we created a single index for place attachment from the 8 indicators related to emotional connection and individual identity.[11]

Measuring landowner demographics, property, and ownership characteristics

We asked landowners to provide demographic information including their age, gender, race, highest level of education completed, work status, and annual household income. We also asked if landowners' primary occupation was part of, or related to, the farming/ranching industry.

We asked landowners questions about characteristics of their property such as how many acres they owned, leased in from others, and leased out to others, as well as how many acres of the land they owned were grassland and were woodland. We created variables to represent the proportion of respondents' land that was grassland and the proportion that was woodland (e.g., proportion grassland = acres grassland / acres owned). We also created a variable to represent the total number of acres a landowner managed (total acres managed = acres owned + acres leased in − acres leased out). We converted acres to hectares for the present publication.

Land ownership questions included whether landowners had inherited or acquired any of their land from their family and how many years they had owned their land. We created a variable to represent the proportion of their adult life they have owned their land (years owned land / [age − 18]). We asked if they reside on their rural land full time and how many hours per week they typically spend working on or managing their land. We asked landowners to estimate the proportion of their income that was generated from activities on their land, such as agriculture, sale of hunting leases, or tourism, but excluding oil, gas, mineral, or wind power developments. We also asked landowners to indicate how they primarily use their land from a list of 11 relevant land uses including a write-in option. For the present research, we combined predominant land uses into three binary variables to represent respondents' primary land use as either 1) farming and/or ranching, 2) rural lifestyle and/or outdoor recreation, or 3) wildlife management and/or conservation.

Sampling and survey administration

We surveyed 1,000 landowners in each region who owned at least 12 hectares (30 acres) of rural land. We selected this size threshold for inclusion in our study to involve a wide range of landowners while also ensuring that the land ownership and management sections of the survey would be relevant. Because the number of eligible landowners in each region is different, we selected participants through a random sampling scheme that was proportional to the number of landowners in each county. After US Postal Service address validation, our final sample size was 2,993 landowners across all three regions. We administered the survey between February and May of 2018 through five mailings, which included multiple reminders and one replacement survey.

Data analysis

First, we assessed the characteristics of our sample by comparing common demographic, property, and land ownership characteristics for landowners in the Edwards Plateau, Central Great Plains, and Flint Hills. For continuous variables, we conducted Kruskal-Wallis tests with Dunn's post hoc test and Bonferroni's adjustment to assess regional differences because this data was not normally distributed. For categorical variables, we used chi-square tests to compare regions and adjusted standardized residuals to examine which regions contributed to significant chi-square values. Second, we compared the place attachment and place meanings held by landowners in each region using Kruskal-Wallis tests for nonparametric data with Dunn's post hoc test and Bonferroni's adjustment to assess regional differences. We conducted Kruskal-Wallis tests and chi-square tests in Stata 15.1.

Finally, we examined the regression tree analysis conducted in Rajala et al.[7] relating landowners' place meanings to their place attachment to explore the degree to which landowners hold common senses of place. Regression trees are a multivariate technique that use a machine learning algorithm to hierarchically segment data (e.g., landowners) into increasingly similar groups based on decision rules for variables (e.g., strength of place meanings) that best predict an outcome of interest (e.g., level of place attachment).[35] These decision rules are visualized as a branching tree diagram and interpreted like a flow chart that sorts landowners into groups based on shared configurations of place meanings that relate to a similar level of place attachment. As the model segments landowners, the analysis reports a variable importance metric that indicates how much of the model's ability to predict attachment is explained by each individual meaning (i.e., the proportion of the sum of squares explained). We conducted the regression tree analysis in JMP Pro 14.0.0 using the Partition Tree algorithm with five-fold cross-validation and a minimum group size stopping rule of 10 to generate an optimal tree that balances complexity with goodness of fit.

Sense of place may be relatively uniform among landowners (e.g., a single pathway of meanings to attachment) or diverse (e.g., multiple pathways) based on regional differences in the physical environment, common land uses, and culture. With the consideration that landowners may feel attached to their land based on different sets of meanings, we emphasized the regression tree diagram along with the meanings identified as most important for understanding place attachment overall. We interpreted each pathway along the tree as a unique sense of place and examined regional variation in sense of place based on the proportion of landowners from

Table 1
Comparison of demographic, property, and ownership characteristics for landowners in the Edwards Plateau (EP), Central Great Plains (CGP), and Flint Hills (FH). The mean, standard deviation (*SD*) and median of continuous variables were compared using Kruskal-Wallis tests with Dunn's post-hoc test and Bonferroni's adjustment to assess regional differences.

Variable	Edwards Plateau (n = 206)			Central Great Plains (n = 146)			Flint Hills (n = 183)			*Significantly different regions*		
	Mean	*SD*	*Median*	*Mean*	*SD*	*Median*	*Mean*	*SD*	*Median*			
Demographics												
Age	65.24	9.82	65.50	63.79	12.86	66	63.27	12.65	64			
Property characteristics												
Proportion of grassland*	**0.53**	**0.37**	**0.46**	**0.53**	**0.31**	**0.50**	**0.62**	**0.30**	**0.67**		***EP-FH***	***CGP-FH***
Proportion of woodland†	**0.44**	**0.38**	**0.50**	**0.11**	**0.20**	**0**	**0.11**	**0.16**	**0.04**	***EP-CGP***	***EP-FH***	***CGP-FH***
Total hectares managed†	**2968**	**8592**	**366**	**2706**	**5597**	**494**	**1772**	**4329**	**193**		***EP-FH***	***CGP-FH***
Landowner characteristics												
Proportion income from land†	**7.92**	**19.27**	**0**	**27.12**	**31.69**	**10**	**23.95**	**31.65**	**10**	***EP-CGP***	***EP-FH***	
Proportion of life owned land†	**0.39**	**0.25**	**0.36**	**0.52**	**0.29**	**0.51**	**0.50**	**0.39**	**0.48**	***EP-CGP***	***EP-FH***	
Involvement†	**14.30**	**16.95**	**7.25**	**26.02**	**24.71**	**19**	**18.18**	**20.54**	**10**	***EP-CGP***		***CGP-FH***

Variables in **bold** were significantly different based on landowners' region.
* $P < 0.05$.
† $P < 0.01$.

each region within the final groups identified by the regression tree.

Results

Landowner and land use characteristics

We received a 35% adjusted response rate to the survey; however, only respondents who indicated they were primary decision makers for their land and provided complete responses for all place meaning and attachment items were included in this analysis (N = 535). Overall, responding landowners were older (average age = 64; SD = 11.7), White (97%), and male (78%) with a high level of formal education (62% had completed at least a 4-year college degree). Half of landowners (50%) were currently working full time and just under half (44%) lived on their rural property full time. On average, landowners had owned their land for nearly half (46%) of their adult life and almost half (46%) had inherited or acquired their land from their family. Only one-third (31%) of landowners said their primary occupation was part of, or related to, farming/ranching. However, farming and/or ranching was landowners' most common primary land use (43%) followed by rural lifestyle and/or outdoor recreation (26%) and wildlife management and/or conservation (12%).

Regionally, there were few differences in landowner demographics; however, most property and land ownership characteristics varied considerably (Tables 1 and 2). Corresponding to current regional woody cover estimates,[25] landowners in the Edwards Plateau estimated that a greater proportion of their land was woodland than did landowners in the Central Great Plains or Flint Hills. In contrast, landowners in the Flint Hills estimated that a greater proportion of their property was grassland than did landowners in the Central Great Plains or Edwards Plateau.

More landowners in the Central Great Plains and Flint Hills reported that their occupation was related to farming/ranching and that they primarily used their land for farming and/or ranching than did landowners in the Edwards Plateau, where land uses for rural lifestyle and wildlife management were of greater importance. Central Great Plains and Flint Hills landowners also reported earning a greater proportion of their income from activities on their land than did those in the Edwards Plateau. However, landowners in the Central Great Plains spent more hours per week involved in managing their land than did landowners in either the Flint Hills or Edwards Plateau. Landowners in the Central Great Plains and Flint Hills had owned their land for a longer proportion of their adult life than those in the Edwards Plateau. Around two-thirds of Central Great Plains landowners had inherited their land from their family, while only one-third of Edwards Plateau landowners had. Over half of landowners in both the Central Great Plains and Flint Hills lived on their land full time, whereas fewer landowners in the Edwards Plateau did.

Place attachment and place meanings

The eight items related to individual identity and emotional connection formed a reliable index for place attachment (Cronbach's $\alpha = 0.92$). Overall, the intensity of landowners' place attachment to their land was moderate to slightly high (Mean (M) = 5.4; SD = 1.9; Median = 5.8) and did not vary based on their region of land ownership (Kruskal-Wallis: chi-square = 2.15, df = 2, P = 0.34).

In general, landowners held experiential and interpersonal meanings for their land more strongly than functional or characteristic meanings; however, the specific place meanings landowners held most strongly for their land varied between regions (Fig. 3). For landowners in the Edwards Plateau, the highest rated place meanings were "peace and quiet" (experiential; M = 6.3), "beautiful natural scenery" (characteris-

Table 2
Comparison of demographic, property, and ownership characteristics for landowners in the Edwards Plateau (EP), Central Great Plains (CGP), and Flint Hills (FH). The percent of categorical variables compared using chi-square tests and adjusted standardized residuals > |1.96| to indicate regions that significantly contributed to the chi-square value.

Variable	Edwards Plateau (n = 206) *Percent*	Central Great Plains (n = 146) *Percent*	Flint Hills (n = 183) *Percent*	*Significant regions*		
Demographics						
Sex: Male	81.00	77.78	74.58			
Race: White	98.02	97.20	96.07			
Education: ≥ 4-year college degree	64.85	60.00	60.67			
Working full time	45.32	51.37	54.75			
Annual income: > $100,000	51.06	43.17	38.69			
Farming/ranching occupation†	**18.81**	**39.73**	**36.16**	***EP***	***CGP***	***FH***
Landowner characteristics						
Primary land use: farming/ranching†	**21.95**	**63.70**	**51.38**	***EP***	***CGP***	***FH***
Primary land use: rural lifestyle†	**39.51**	**14.38**	**20.44**	***EP***	***CGP***	***FH***
Primary land use: wildlife†	**22.93**	**5.48**	**3.31**	***EP***	***CGP***	***FH***
Inherited land from family†	**30.58**	**63.45**	**48.09**	***EP***	***CGP***	
Reside on land full time†	**24.27**	**53.42**	**57.38**	***EP***	***CGP***	***FH***

Variables in **bold** were significantly different based on landowners' region.
*P < 0.05.
† P < 0.01.

tic; M = 5.9), "habitat for wildlife" (characteristic; M = 5.7), and "enjoying time with friends and family" (interpersonal; M = 5.7). In the Central Great Plains, many of the top-rated meanings were interpersonal such as "family pride" (M = 6.1), "upholding family legacy" (M = 5.7), and "passing on way of life to future generations" (M = 5.7), and "freedom to decide" also scored highly (M = 5.9). For landowners in the Flint Hills, the experiential meanings of "peace and quiet" (M = 5.8) and "freedom to decide" (M = 5.8) were rated the highest, along with being "connected to nature" (M = 5.7) and "responsible for conserving native prairie" (M = 5.6).

When considering the top 10 place meanings landowners in each region held for their land, "passing on way of life to future generations," "enjoying the process of working as much as the results," and having the "freedom to decide things for oneself" were among the top meanings in all three regions (Fig. 3A). Aspects of family identity and family heritage distinguish Central Great Plains landowners, while viewing one's place as "habitat for wildlife," somewhere to "reduce stress," and "enjoy time with friends and family" were only top 10 meanings for landowners in the Edwards Plateau. There were no unique top meanings for Flint Hills landowners; they shared "way of life," "do work I love," and "family pride" as top meanings with landowners in the Central Great Plains and "peace and quiet" and meanings related to stewardship and nature as top meanings with landowners in the Edwards Plateau. Landowners in the Edwards Plateau did not share any meanings solely with those in the Central Great Plains.

Comparing the average strength landowners held each meaning for their land provides additional insight into similarities and differences among landowners based on the region in which they own land (Fig. 3B). There were no regional differences in the strength that landowners rated experiential meanings related to autonomy and freedom ("free to decide," "few obligations to others"), optimal experiences ("do work I love," "ordinary tasks feel more like leisure," and "enjoy the process of working as much as results"), "connected to nature," "way of life," "source of inspiration," and "find perspective on life." Nor were there regional differences in the strength of the interpersonal meanings "pass on way of life" and "community of friendly neighbors."

Primary regional differences in average meaning strength emerged between landowners in the Edwards Plateau and landowners in both the Central Great Plains and Flint Hills (Fig. 3B). Mirroring differences in self-reported ownership characteristics, Edwards Plateau landowners held functional meanings related to "hunting/fishing" and "outdoor recreation" more strongly than those in the Central Great Plains or Flint Hills, and agricultural and economic functional meanings were significantly lower. Across all regions, average ratings for "beautiful natural scenery," "habitat for wildlife," and "generations of family history" were significantly different. Landowners in the Central Great Plains and Flint Hills held most other place meanings at similar strengths except for "conserving native prairie" (higher in the Flint Hills) and meanings related to family identity and "personal" and "family legacy" (higher in the Central Great Plains).

Identifying multiple senses of place

The optimal regression tree explains 86% of the variance in landowners' place attachment by partitioning landowners into 33 final groups based on the combinations of their place meanings that best explain the intensity of their place attachment (Fig. 4; $R^2 = 0.86$; cross-validation $R^2 = 0.84$; $RMSE = 0.72$). Within each group, landowners' average place

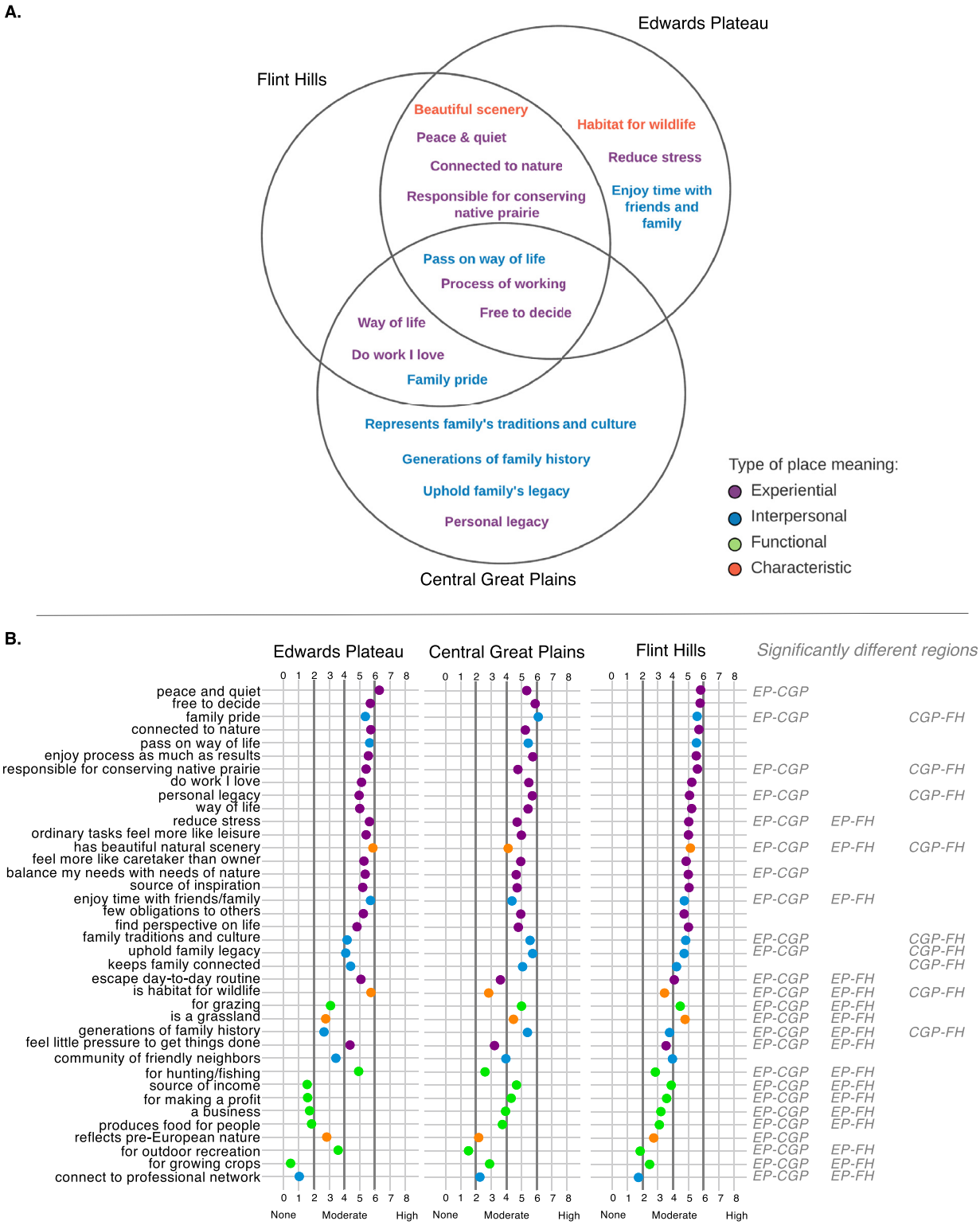

Figure 3. A, Venn diagram of the top 10 place meanings held by landowners in each region: Edwards Plateau, Central Great Plains, and Flint Hills. Overlap between regions indicates top 10 place meanings shared by landowners in multiple regions. B, Average meaning strength for landowners in each region. Place meanings are listed in order of grand mean from highest (top) to lowest (bottom). For each meaning, region pairs with significantly different meaning strength are listed in gray: Edwards Plateau (EP), Central Great Plains (CGP), and Flint Hills (FH).

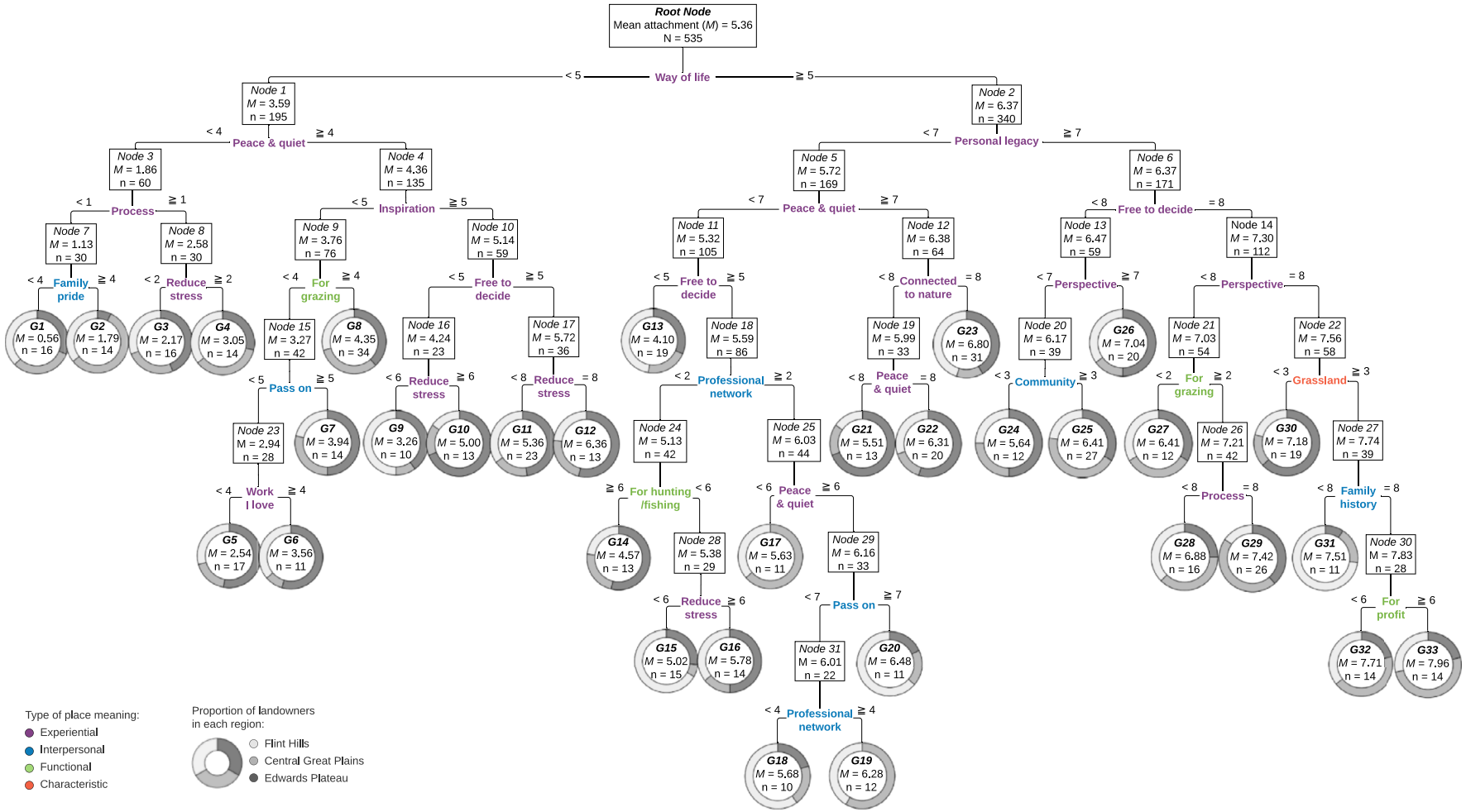

Figure 4. Optimal regression tree explaining landowners' place attachment to their land based on their place meanings. A donut chart indicates the proportion of landowners in each region within each final group.

attachment to their land ranges from very low (0.56) to very high (7.96).

Of the 38 place meanings in our study, "way of life" was the single most important place meaning for distinguishing landowners with higher or lower levels of place attachment, accounting for 55% of the regression tree's ability to explain place attachment. Along with "way of life," "peace and quiet" (18%), "personal legacy" (8%), "freedom to decide" (5%), and "source of inspiration" (4%) were the most important place meanings for understanding place attachment. Overall, these five meanings account for nearly 90% of the model's explanatory power. Although these meanings were generally highly rated by landowners in each region, they were not necessarily the strongest meanings landowners held for their land. For example, despite the overwhelming importance of "way of life" to landowners' place attachment, "way of life" was the ninth highest rated place meaning for landowners in both the Central Great Plains and Flint Hills and the 19th highest for landowners in the Edwards Plateau. There were no regional differences in the average strength that landowners held "way of life," "freedom to decide," or "source of inspiration." However, "peace and quiet" was significantly higher for landowners in the Edwards Plateau than in the Central Great Plains and "personal legacy" was significantly higher for Central Great Plains landowners than for those in the Edwards Plateau or Flint Hills.

Each pathway along the regression tree represents a unique sense of place shared among the set of landowners in each final group. The decision rules for each split in the tree indicate which place meanings, at what strength, best explain a landowner's place attachment to their land. Recall Larry and June, the Flint Hills landowners quoted in the Introduction. They were sorted into group G25 (Fig. 4). The sense of place of landowners in this group is distinguished from other landowners in the sample by a moderately high attachment to their land ($M = 6.4$) and best explained by the following place meanings: at least a moderate belief that their land represents their "way of life" (≥ 5), very strong belief that it represents their "personal legacy" (≥ 7), less than maximum strength belief for being "free to decide" things for themselves (< 8), less than very strong belief that it is somewhere they "find perspective on life" (< 7), and at least a moderate belief that their place is "part of a community of friendly neighbors" (≥ 3). Of the 27 other landowners with this sense of place, almost half (45%) were from the Central Great Plains, whereas fewer were from the Edwards Plateau (33%) and Flint Hills (22%).

In general, higher place attachment among landowners was related to a stronger belief that their land represents their "way of life." The average place attachment for landowners with a stronger belief in "way of life" (Node 2; Fig. 4) was 77% higher than the attachment of landowners with a low to moderate belief in "way of life". For landowners with a stronger belief in "way of life" (Node 2), whether or not their land strongly represents their "personal legacy" was the next best determinant of their place attachment. Place attachment among the subset of landowners with a stronger belief in "way of life" may be lower if landowners do not strongly believe that their land represents their "personal legacy" or that it is somewhere they find "peace and quiet," and if they have moderate to low "freedom to decide" (group G13). For landowners with a lower belief in "way of life" (Node 1), most combinations of place meanings result in low levels of place attachment. However, two groups of landowners with a lower belief in "way of life" had moderate to slightly high place attachment related to holding stronger beliefs for "peace and quiet," "inspiration," and "freedom to decide" (group G11 and G12).

The 33 groups identified by the regression tree illustrate diversity in landowners' sense of place. Pathways to low and high levels of place attachment are characterized by interactions of different combinations of place meanings; very low levels of attachment to one's land (e.g., groups G1 and G2; Fig. 4) are not simply the result of an absence, or mirror opposite, of meanings that lead to very high attachment (e.g., groups G32 and G33). Additionally, landowners may have the same level of attachment to their land but derive this attachment through different place meanings. For example, groups G12 and G27 have the same level of moderately high place attachment ($M = 6.4$) as Larry and June in group G25. Landowners in G12 expressed a lower belief in "way of life" but higher beliefs in their land as a "source of inspiration," somewhere they have the "freedom to decide," and a place they completely believe in and rely on to "relieve their stress." Landowners in groups G25 and G27 shared higher beliefs in "way of life" and "personal legacy"; however, they differed based on "freedom to decide." Neither group of landowners held "finding perspective on life" at very high or maximum levels. Group 25 was further distinguished by at least a moderate belief that their land was "part of a community of friendly neighbors," whereas Group 27 did not believe that their land was "for grazing livestock."

For some landowners' sense of place, place meanings demonstrate a nonlinear relationship with place attachment. In some cases, splits in the regression tree were determined based on whether landowners held a meaning at all or at very high strengths. Consider the landowners who did not hold "way of life" or "peace and quiet" as at least moderate place meanings (Node 3; Fig. 4). Those who "enjoy the process of working as much as the results," to any degree (≥ 1), have place attachment that is more than twice as high (Node 8) as landowners who did not at all "enjoy the process as much as the results" (Node 7). Conversely, for landowners with the highest levels of place attachment a number of meanings such as "freedom to decide," "perspective on life," and "family history" are not merely high, but are at maximum strength ($= 8$). For all but one group (G14) and one place meaning ("for hunting/fishing"), landowners who held the meaning more strongly had a higher level of place attachment.

From low to high place attachment across the regression tree, there does not appear to be strong regional concentrations in the senses of place landowners held for their land. Landowners in each region are found throughout almost every final group although the prevalence of landowners from

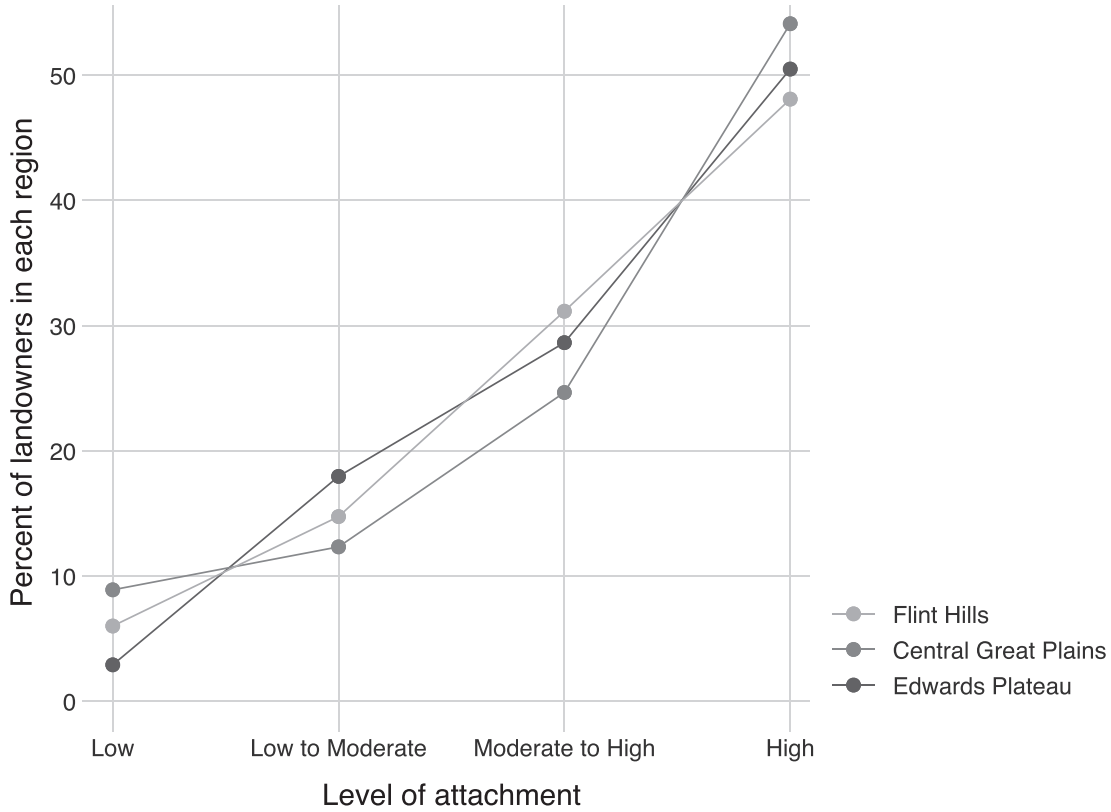

Figure 5. The percent of landowners in each region grouped by low (< 2), low to moderate (2-3.99), moderate to high (4-5.99), or high (≥ 6) place attachment to their land based on the final groups in the regression tree.

each region varies. Although the sense of place identified for landowners in groups G17 and G19 is unique to landowners in the Central Great Plains and Flint Hills, some Edwards Plateau landowners had similar senses of place distinguished by a difference in only a few meanings (Groups G18 and G20; Fig. 4). Although there is notable diversity in the place meanings that inform attachment, regional trends in landowners' level of place attachment are quite similar (Fig. 5). In all three regions, around 50% of landowners were highly attached to their land, and only a small portion had low place attachment.

Discussion

The place meanings and attachment that comprise landowners' sense of place for the land they own provide rich insights about the myriad ways rural rangelands are integrated into landowners' lives and how landowners, in turn, are embedded in rural landscapes. Considering the overall strength of landowners' place meanings and attachment through measures of representativeness and dependence improves the application of sense of place to private landowners and working lands.[6] The regression tree analysis delivers complementary information about the diversity of pathways that lead to place attachment along with the meanings most important for attachment. In a changing landscape like the Southern Great Plains, understanding the meanings and attachment that inform landowners' sense of place and the potential contributions of sense of place to landowner well-being have important implications for human welfare.

Diverse and complex senses of place

We found differences across landowners in the Edwards Plateau, Central Great Plains, and Flint Hills based on a variety of landowners' property and ownership characteristics as well as the strength at which they held many place meanings. In general, Edwards Plateau landowners in our sample had less personal and family history with their land, and their land uses and place meanings reflected the importance of the rural lifestyle and natural amenities such as wildlife habitat, hunting, and outdoor recreation. Landowners in the Central Great Plains and Flint Hills were more agriculturally oriented, and Central Great Plains landowners were further distinguished by their strong familial connections to their land.

Through a regional lens, many of landowners' place meanings for their land echoed trends in property and ownership characteristics; however, neither the level of landowners' place attachment nor the pathways of place meanings to attachment appear to be dictated or constrained by landowners' region. Instead, we found similar diversity for each region in the configurations of place meanings that informed landowners' place attachment to their land. This lack of regional concentration in senses of place is remarkable given differences in regional character and the degree of grassland conversion to woodlands. However, meanings and attachment occur, and

may differ, for places at multiple spatial scales. The diversity of landowners' sense of place at the individual property scale within each region does not preclude shared sense(s) of place among landowners at larger community or regional scales.[31,36]

Irrespective of region, multiple configurations of place meanings explain why different groups of landowners do or do not feel attached to their land. Although the specific combinations of meanings differ, experiential meanings reflecting individually oriented experiences were the predominant drivers of attachment. Within and across regions, experiential meanings were also many of the strongest meanings landowners held for their land. This parallels the importance of personal experiences in the developmental interviews for this study and in previous sense of place literature.[3,15–17,31,33,34,37] However, the relative lessor importance of characteristic and functional meanings, both in their overall strength and their relationship to attachment, is surprising in a private lands context that contains significant portions of agricultural working lands. Traditional landowner archetypes based solely on land use, such as "rancher," "farmer," or "lifestyle landowner," do not emerge as defining characteristics of a person's attachment to their land. This is in line with prior research that place meanings and attachment often differ within the same resource users or social groups and can be surprisingly similar across seemingly disparate groups.[22,36]

Although place characteristic and functional meanings were not primary predictors of landowners' place attachment, meanings related to the land's physical characteristics and a person's desired outcomes are still relevant to landowners' sense of place. Although some place meanings relate primarily to either the person or the place, many meanings are dynamically created through a person's interactions and experiences with a place.[17] For instance, environmental conditions (e.g., grassland) can facilitate activities (e.g., grazing livestock) that enable certain experiential meanings to develop (e.g., way of life).[27] Maintaining a place to provide valued meanings may further shape environmental characteristics of the place to support and sustain important meanings.[38] Rather than the processes of forming or maintaining sense of place, however, our research focused on a cross-section of sense of place at a moment in time. When different aspects of sense of place are considered through the lens of place meanings, there may be a hierarchy by which experiential and interpersonal meanings are most closely related to attachment, but are influenced by characteristic and functional meanings. That is, specific characteristic and functional place meanings may be necessary but not sufficient for landowners to form certain emotional and identity-based connections to their land.

Sense of place and well-being

Landowners' sense of place was characterized by place attachment spanning from nonexistent to a maximum intensity indicating very strong emotional and identity-based connections to their land. Although low attachment is not necessarily indicative of low well-being, the strong and positive emotional bonds and place identity inherent to high place attachment can provide a range of psychological benefits that promote well-being.[19] Attachment to one's residence as well as natural environments that provide recreation or psychological restoration can play a large part in well-being[17,26,37] and for private landowners, their land may fulfill these multiple roles. Given the potential significance of place attachment to emotional and psychological health, however, landowners with high attachment are also more vulnerable to adverse effects of place-change that threatens the meanings that inform this attachment.[4,5]

Although the pathways in the regression tree support prior research that place attachment increases as the salience of meanings for a place increase,[34] our results also indicate that specific meanings matter most for place attachment on private lands. In our study, the five most important meanings identified for landowners' attachment to their land were "way of life," "peace and quiet," "personal legacy," "freedom to decide," and "source of inspiration." Although the specific ranking of meanings may differ in another landowner sample, we are confident that these five meanings would be among the most important predictors of place attachment in similar samples based on an additional bootstrapping technique conducted by Rajala et al.[7] The contribution of these meanings to landowners' attachment makes them inherently, albeit indirectly, important to aspects of mental and emotional health that support well-being. Additionally, these place meanings can contribute directly to dimensions of landowners' well-being.

The place meaning "way of life" may relate to multiple aspects of a landowner's material needs, security, social relationships, physical and emotional health, and freedom of choice and action. "Way of life" can encompass a person's occupation, livelihood, daily lifestyle, and general preferences[39] and may be indicative of a wide range of other strongly held experiential and interpersonal place meanings, including "freedom to decide," "personal legacy," and "source of inspiration."[7] For agricultural landowners, "way of life" is commonly contrasted with a business or financial focus[40]; however, "way of life" has received less attention as a primary concept in private landowner research.[7] Future research would benefit from an explicit focus on how landowners define their "way of life," and the ways it contributes to their well-being, regardless of their involvement in agricultural production.

"Peace and quiet" can contribute directly to landowners' emotional health by supporting psychological restoration when distractions are eliminated and people are able to clear their mind.[41] People commonly attribute "peace and quiet" and meanings related to solitude to their favorite places, which are often the natural settings where they recreate.[37,42] Although "peace and quiet" has been identified as a primary reason why nonproduction-oriented landowners choose to live in rural areas,[43] our results suggest that it may be a more universal experiential meaning that supports the well-being of private landowners in general.

"Personal legacy" is not clearly tied to any of the 2005 Millennium Ecosystem Assessment's[14] dimensions of individual

well-being; however, it does align with findings from Bentley Brymer et al.[8] that a sense of purpose contributes to how people define their own well-being. A "personal legacy" is a tangible or intangible mark of one's life, the idea of which can ease innate human fears about death and prompt goals and actions that enhance the sense of a meaningful and purposeful life.[44,45] For landowners, the land they own may be a material legacy as well as a legacy of the personal, social, and cultural values they hold dear.[44] A landowner's well-being may be enhanced when their sense of place includes a sense of purpose tied to the legacy of their land.

"Freedom to decide things for one's self" represents the self-directed aspect of autonomy and may be a direct expression of the freedom in choice and action considered necessary for personal well-being.[14] Autonomy is widely recognized as a basic human need and component of psychological well-being.[45,46] When landowners are able to pursue their authentic interests, private land ownership can foster autonomy and well-being through facilitating self-determined pursuits and outcomes.[46]

Where "peace and quiet" relates to restoring one's emotional health from a depleted mental state, "inspiration" reflects an invigorated state that can enhance emotional health and a landowners' sense of purpose in action. "Inspiration" is considered a motivation that energizes creative, spiritual, or activity-based endeavors that transcend the ordinary, leading to fulfilling experiences that can enhance well-being.[47,48] "Inspiration" is often attributed to experiences on public lands but is less common in private lands literature. However, "inspiration" can be generated through solving problems and overcoming challenges,[49] which may be recurrent among private landowners contributing to their well-being.

Implications

The diversity of landowners' sense of place has mixed implications for how landowner well-being may be affected by social and ecological changes to rangelands and rural communities. Differences in sense of place can explain why the consequences of place-change are not equally or uniformly experienced.[4,5] For instance, grassland conversion to woodlands[25] directly impacts ranchers' access to grazing resources and consequently threatens their financial security. For some, this landscape change may have an even greater psychological impact on their well-being by interfering with their way of life and place attachment. Landowners not engaged in livestock production may or may not perceive grassland transformation as a threat based on how compatible this change is with their suite of place meanings.[20] We continue to explore how a landowner's sense of place relates to their stewardship of grasslands and perceived threat of woody encroachment.

In tandem with its importance to personal well-being, understanding landowners' sense of place can provide natural resource managers and policy makers with key insights into a suite of rangeland management issues. As both place meanings and place attachment can support crucial aspects of well-being, programs and policies involving private landowners should consider ways to foster, and not impede, landowners' sense of place. Sense of place can drive individuals' land management behaviors and desired outcomes.[31,32] When important place meanings are threatened, strong place attachment can motivate place-protective responses.[4,20] For place-change that is generally considered detrimental, such as the transformation of grasslands to woodlands, place-protective land management behaviors that sustain grasslands may be socially desirable. Conversely, for place-change generally considered beneficial, such as transitions to renewable energy, place-protective responses that inhibit transformation may be socially undesirable.[50]

Sense of place also can play a role in broader place politics and perspectives about contentious place-change. The diversity we found in landowners' sense of place for the land they own is not inherently problematic. But, differences in sense of place can increase conflicts over desired natural resource conditions for an area, reducing community cohesion and the capacity for collaborative management.[21,22] On the other hand, the absence of specific sense(s) of place restricted to regional areas or mirroring certain land use archetypes suggests there may be greater similarities among private landowners than more general land use or landowner characteristics might suggest. For cooperative and collaborative management initiatives, early and direct engagement with landowners about their sense of place may enhance participant experiences and improve collective efforts toward conservation outcomes. Although the full scope of place meanings landowners hold for their land likely differs, the meanings fundamental to why landowners' feel attached to their land may reveal common ground transcending geographic areas, land uses, and ownership histories.

Returning to Larry and June, their characterization of their land as an agricultural business and cherished lifestyle that provides them with a sense of stewardship and connection to their family's past and future is evidence that sense of place is personal and complex. Their land, and connection to it, unquestionably plays a key role in their quality of life. This is true for many landowners although bonds may form for different reasons, which we quantitatively illustrate within a large, geographically dispersed sample of landowners across the Southern Great Plains. Because landowners' sense of place is not simple or uniform, integrating sense of place into rangeland management will not be simple or uniform. Rangelands are complex social-ecological systems and our work highlights one aspect of this complexity through how people connect to place. Considering and incorporating landowners' sense of place into rangeland management and policy can enhance socially and ecologically sustainable outcomes, but first requires the effort to understand,[4,6] which has been the focus of this research. Both place meanings and place attachment can support landowner well-being. The potential for experiential meanings important to landowners' attachment to provide direct well-being benefits ultimately strengthens the idea that sense of place can be integral to personal well-being.

Declaration of Competing Interest

None.

Acknowledgments

We sincerely thank all landowners who participated in this study. We are grateful to S. Fuhlendorf and U. Kreuter for support with fieldwork and survey implementation, and J. Arredondo for assistance with Figure 1. This research was approved by the Virginia Tech Institutional Review Board (IRB # 17-156; # 17-1124). This research was funded by the U.S. National Science Foundation (no. DEB-1413900), USDA-NIFA Award 2019-68012-29819, the USDA Natural Resources Conservation Service Conservation Effects Assessment Project (CEAP), and the Long-Term Agroecosystem Research (LTAR) network. LTAR is supported by the United States Department of Agriculture.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.rala.2021.07.004.

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