

Are Population and Land Use Changes Perceived as Threats to Sense of Place in the New West? A Multilevel Modeling Approach*

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ABSTRACT The Intermountain West's rapid changes in population growth and land use may be welcome to some, but others perceive such changes as threats to sense of place. The objective of this study is to assess whether New West and Old West contextual variables predict how agricultural landowners view threats to agricultural lifestyles and sense of place. We analyze survey data collected from 2,270 agricultural landowners in Colorado and Wyoming utilizing a multilevel regression model (MLM). We posit that this analytical approach is effective for evaluating hierarchical New West or Old West economic configurations that may otherwise be difficult to observe. Our study specifically examines whether population pressures threaten agricultural lifestyles in the amenity-based New West or in Old West economic regimes with proclivity toward large-scale agricultural production. Our results show that landowners in farming-dependent counties and in high-amenity areas express greater concern than other landowners surveyed about increases in population growth that could threaten an agricultural way of life. Furthermore, we demonstrate

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that these perceptions relate to whether individuals reside in New West or Old West counties. In summary, some of the contextual variables of New West and Old West economic structures predict whether individuals perceive population growth and land use changes as threats to sense of place.

Introduction

Across the United States as well as in other postindustrial countries, rural communities are undergoing substantial transformations in land use, economic activities, and demographic composition (Friedland 2002; Gosnell and Abrams 2011). Sociologists, geographers, economists, demographers, and others exploring the implications of these changes in the western United States assert that these transformations have created “Old West” and “New West” communities (Beyers and Nelson 2000; Hansen et al. 2002; Rudzitis 1999; Winkler et al. 2007). Old West communities are typically characterized as reliant on traditional extraction and agricultural industries. New West communities are fueled by migration for amenities, and the movement of people based on the draw of natural or cultural amenities, including ranchettes and small-acreage farms (Gosnell and Abrams 2011; Nelson 2002; Power and Barrett 2001; Robbins et al. 2009; Shumway and Davis 1996; Shumway and Otterstrom 2001).

Since agricultural lands have a notable presence in both the Old and New West, this article explores the context in which population growth and land use transformations are interpreted as threats to sense of place and way of life for agricultural landowners. Place attachment and sense of place are grounded in psychological, social, and cultural processes that are embedded in larger social contexts (Brown-Saracino 2015; Manzo and Devine-Wright 2014; Molotch, Freudenburg, and Paulsen 2000; Stokowski 2013; Williams 2002). Through interaction, people form physical, emotional, and cognitive attachments to place, which then become part of personal and group identities and bonds (Brown and Perkins 1992; Low and Altman 1992; Manzo and Devine-Wright 2014). We assert that economic structures also provide mechanisms around which people bond, and form their sense of place. Research has shown that long-term prosperity is directly related to quality of life and whether the character of the economic structure can be maintained (Carruthers and Vias 2005). We posit that whether agricultural landowners view changes in land use or population as a threat to sense of place depends, at least in part, on whether they are part of a New West or Old West county or state. This implies that in order to maintain a sense of place, land protection

policies should be implemented to address land use rather than limit population growth or development. Identifying and strategically targeting geographies with these contextual characteristics (rather than particular landowners) may be a good strategy for more effective and efficient landscape conservation.

Sense of place reflects the attachment derived from practices and emotional bonds associated with activities across various spatial and temporal scales (Low and Altman 1992). Sense of place can form specifically around agriculture and gardening (Cross et al. 2011; Roseman and Royal 2016). It can reflect connections between home and work, and it may extend “like an accordion, in that it both stretches to expand outwards to distant and remote places, while also squeezing to embed people in their proximate and immediate locales and social relations” (Ralph and Staeheli 2011:524).

Agriculture and mobile settlement are highly relevant to both the Old West and New West, although perhaps in ways that have not been intuitively embraced by the public or portrayed in the media. The New West economy has been characterized by an in-migration of residents seeking environmental amenities, outdoor recreation, and “cappuccino-loving” lifestyles that buoy chic retail and service sectors (Nelson 2002). This migration is attributed to retirees, affluent second-home owners, a new wave of entrepreneurs, and employees with flexible work arrangements who are freed by technological advancements and empowered to put down new roots (Hansen et al 2002; Nelson 2002; Rasker and Glick 1994). It is also noteworthy that the geographical boundaries and coherency of “New West” have shifted around time and space as settlers sought new opportunities and joined those with long-standing ties to the land (Riebsame 1997; Robbins et al 2009).

Some scholars recognize economic and cultural tensions between New West residents and Old West landowners who have relied on natural-resource extraction and agricultural production for their livelihoods for generations (Beyers and Nelson 2000; Nelson 2002; Smith and Krannich 2000). However, attitudinal differences related to land use, environmental issues, and economic development have not yet been fully investigated. Energy development also gives rise to population booms that have been associated with social dissonance and perceived cultural conflict (Haggerty et al. 2014; Smith, Krannich, and Hunter 2001).

At times there may be overlapping interests between new and old residents who align to protect environmental and cultural attributes like open space and ranching (Brunson and Huntsinger 2008; Cross et al. 2011). The swell of rural residents has also placed pressure on

ecological resources and environmental quality in general (Hansen et al. 2002), which may bring a unified front for land protection in general or a critical parcel of land. However, once land is protected (or developed), the curious alliances formed during the process are often not maintained.

We assert that the idiosyncratic and often contradictory attitudes toward land use and population growth relate to the “invisible hand” of the market and the hierarchical economic structures found in communities based on amenities and natural resource uses. In other words, it is our thesis that the apparent enmeshment between the New West culture and the economy reflects sense of place, or a nexus of multidimensional contextual variables related to both sense of place and economic structure. Population increases and land use changes may be viewed as either favorable or unfavorable, depending on whether sense of place is threatened and whether landowners are part of a New West or Old West economic structure. Since agricultural lands have been associated with both New West and Old West economies, we utilize survey data collected from 2,270 agricultural landowners in Colorado and Wyoming to evaluate this premise.

This article provides a unique contribution to the literature by using a quantitative analysis to explore whether changes in population growth and agricultural land use are perceived by rural landowners in Colorado and Wyoming as threats to their sense of place. We also develop and test a five-point threat scale that can be used to assess threats to sense of place. Like many western regions, both states have experienced rapid rural-to-urban land conversions and population in-migration into amenity-rich counties over the past 40 years. Yet the majority of the counties in each state are rural or “exurban,” essentially defined as a county that is nonadjacent to a metropolitan area with a population of less than 20,000, or a county with a population less than 2,500 and adjacent to a metropolitan area (Carruthers and Vias 2005). Mineral, energy, and agricultural production contribute considerably to the economies of both states. Each state contains counties that exhibit characteristics of New West and Old West economic structures. Several Wyoming counties, particularly in the northwestern part of the state, have also experienced in-migration linked to amenities (Shumway and Otterstrom 2001).

However, there are distinguishing socioeconomic differences between the states that we attribute to New West economic transformation. According to Carruthers and Vias (2005), relative to Wyoming, and across more counties over time, Colorado has incurred a higher rate of rural-to-urban land conversion due to migration for amenities with approximately 1.47 percent of Colorado’s land area classified as

urban (as compared to Wyoming with .2 percent urban land area). Colorado also has a larger population and more urbanized counties than Wyoming. Overall, the Colorado economy is larger and more diverse and recreation constitutes a large and somewhat recession-proof aspect of the Colorado economy (Loomis and Keske 2012). Since there are large regions within both states that exhibit aspects of New West and Old West economies, we evaluate whether there are county-level differences in perceived threats to sense of place across each state in separate models. By designating Colorado and Wyoming as New West and Old West states in our analysis, respectively, we assess whether there are quantifiable differences between how landowners perceive threats to their sense of place or agricultural way of life at the state level.

We employ multilevel modeling (MLM) to evaluate the contextual variables that contribute to New West and Old West economic structures and sense of place. MLM is a relevant approach because it can be used to study nested observations where a large number of individuals are clustered within hierarchal social structures, like counties. From a practical perspective, these far-reaching relationships may be difficult to observe through qualitative approaches like interviews because by their very nature, economic structures are widely encompassing and require a large number of observations for study. Quantitative methods to assess community context, place attachment, and sense of place are also underutilized in general (Lewicka 2011; Luke 2004); this study provides a viable quantitative approach that can be used to identify attachments or bonds that form sense of place. In summary, the study contributes to the growing literature on New West economic transformations and sense of place, and specifically questions whether population growth threatens sense of place for landowners.

Next, we present a literature review to support how we use the MLM method to identify the hierarchal clusters of economic structure and sense of place in the U.S. West. This is followed by a description of the data collection, methods, and results. In this study we present a five-point scale that can be used to assess threats to sense of place. Results from our study show that population growth is considered a threat to sense of place by agricultural landowners in farming-dependent regions high in amenities and where agricultural properties border subdivisions. We conclude that individuals are more likely to support land use policies and land conservation programs that they perceive as enhancing their sense of place and protecting their way of life. Implications from this study are that future policies should be directed toward supporting the economic structures and agricultural land uses that contribute to sense of place.

Background and Literature Review

Population change represents more than just the spatial redistribution of people. It often is an agent of change in a wide range of economic, social, cultural, political, and environmental transformations (Johnson and Fuguitt 2000; Krannich, Luloff, and Field 2011; Riebsame 1997; Rudzitis 1996). Numerous authors have noted the influx of residents to amenity-rich regions of the western United States, defined as the “New West,” thereby disposing the economic structures toward recreation, service, and industries that support aesthetically desirable, low-density development (Carruthers and Vias 2005). Some extraction-based Old West communities have also encountered population in-migration and employment increases, particularly when commodity prices are high (Haggerty et al. 2014).

Although the migration of residents to amenity-rich regions of the western United States has been observed for years, how the population growth has affected sense of place is not clear. Second home and “trophy home” developments have become increasingly common as both year-round and seasonal residents migrate for the recreational, aesthetic, and ecosystem values of the landscape (Vukomanovic and Orr 2014). However, population increases may “threaten” natural features and exurban lifestyles; not surprisingly, the number of land protection organizations has also increased, implying that there is “something” in need of protection (Keske 2008). Since the focus of conservation organizations varies considerably (from protecting wildlife habitat to protecting historical buildings), it can be inferred that what is in need of protection might be contextual in nature and the threat more complex than merely due to population pressure.

Agricultural lands are appropriate for exploring these complexities because they play an important part in both Old West and New West communities, and they also present attributes that conservation organizations seek to protect (Keske 2008). Large ranches and production agriculture are often considered emblematic of an Old West economy where residents earn a living directly from natural resources (Nelson 2002). Agriculture is viewed as a stabilizing economic sector compared to mineral and energy industries that sustain volatile price changes and respond with rapid labor force adjustments. In rural communities, any economic activity may be welcome, and agricultural production may be particularly attractive for long-term growth.

Agricultural lands also have an interesting role in New West economies. Some landowners seek agricultural landscapes specifically for the amenity values brought by a rural lifestyle or from a specific property

(Keske, Hoag, and Bastian 2011), which has likely affected farm size. According to the 2012 agricultural census, which reflects the last year that data are available, the number of small farms increased during the past 10 years (up 4.4 percent and 8.2 percent for 1–9 acre farms and 10–49 acre farms, respectively), while the number of farms declined 5 percent overall (USDA NASS 2016). Rapid population growth in the New West, however, has also generated concern about the loss of production, open space, and wildlife habitat found on agricultural lands (Kline 2006; Sorensen, Greene, and Russ 1997; Theobald 2001). Attributes of agricultural lands deemed highly desirable by New West residents can arguably be threatened by rapid in-migration. Further examination is warranted to evaluate the contexts under which population growth and land use change might affect the sense of place provided by agricultural lands.

“Sense of place” can be viewed as an umbrella term for multiple dimensions such as place attachment, place dependence, and place identity, although some scholars use the terms “place attachment” and “sense of place” interchangeably (Cross et al. 2011). For the purposes of this study, we use the general term “sense of place,” acknowledging that it may comprise different dimensions. Sense of place might be disrupted whenever there is a perceived change in the social, environmental, or economic conditions in a community (Milligan 1998), although one can argue that changes in places are only disruptive when the change is unexpected or undesirable (Brown and Perkins 1992). Using this logic, we assert that sense of place will be threatened when people perceive that population growth and economic shifts in their community will create undesirable changes.

While population and land use changes are well documented in the U.S. West, it is not clear whether landowners view these changes as threats to sense of place. We posit that whether changes are viewed as a threat depends on whether they occur in the context of a New West or Old West economic structure. Contextual models are based on the premise that individual experiences and behaviors occur in larger physical and social contexts that are neither accidental nor ignorable (Goldstein 2011; Winkel, Saegert, and Evans 2009). We use the MLM to analyze the contextual variables that underlie New West and Old West economic structures and to evaluate whether these can predict threats to sense of place. As we noted earlier, MLM techniques are effective for examining clustered, hierarchal structures, such as communities (DiPrete and Forristal 1994; Qin and Flint 2010), organizations (Hox 2010), and counties (Jia, Moriarty, and Kanarek 2009). Hierarchies reflect individual units grouped at different levels, groupings that give rise to strong association.

We conduct an MLM analysis to evaluate the perceived threat to sense of place by agricultural landowners (“level 1 units”) that are nested within counties (“level 2 units”) that reflect either Old West or New West economic structures. By jurisdiction, the counties can be subsequently nested into two different states, Colorado and Wyoming, that, respectively, may reflect New West and Old West economic structures. This two-level quantitative MLM analysis of landowners in New West or Old West communities across each state reflects a unique contribution to the literature, although other studies demonstrate that an MLM is an appropriate method for studying economic structures, sense of place, and natural amenities. Cotter (2002) uses the MLM to study households that are nested in local labor markets. Hamilton, Colocousis, and Duncan (2010) apply a mixed-methods model to study the relationship between place and the environment, concluding that place affects individual levels of concern for the environment. Dolisca et al. (2009) use MLM to examine the determinants of forest conservation at the farmer level and find that conservation behavior is greatly influenced by organizational, structural, and environmental characteristics of villages.

Next, we discuss how we collect and analyze data to identify the hierarchical social structures that influence how rural landowners view potential threats to sense of place.

Data

In this section, we describe our data collection process and analytic strategy, including the hypothesis tests. This is followed by a discussion of the dependent and independent variables that are used to analyze the economic structures of New West and Old West economies and that provide the context for whether landowners perceive changes in population or land use as threats to sense of place.

The researchers generated data for the study from a mixed-methods research project intended to identify landowner and conservation organization attitudes about land protection. The notion of quantitatively assessing perceived threats to sense of place arose during the study’s qualitative research phase of focus groups with landowners and land protection organizations. The researchers conducted eight separate group interviews consisting of 59 participants in five different sets of land conservation professionals at the 2005 Land Trust Alliance meeting in Madison, Wisconsin. We identified a vector of conservation values as important to the larger objective of preserving sense of place (Keske 2008). The researchers also interviewed 44 landowners in seven

more focus groups at three agricultural conferences in the Rocky Mountain West (Keske, Hoag, McLeod, et al. 2011; Miller et al. 2011). The research team analyzed data from the qualitative phase of the project and sorted the data into themes that related to 12 dimensions of sense of place, including potential threats to sense of place. Potential threats to sense of place included population pressures, changes in customs and culture, threats to economic livelihood, and land use conversion away from agricultural production.

We identified population growth and development pressures as potential threats during each focus group; however, landowners (particularly those in remote rural communities) did not always view population growth unfavorably or as an imminent threat. In nearly every focus group there were dissenting opinions about whether population growth was considered a threat or was welcome. During one focus group interview with Wyoming landowners, the majority of the landowners commented that they would welcome population growth under specific circumstances, if it did not interfere with the landowners' economic livelihood and if the newcomers embraced the community's lifestyle and traditions. We believed that these divergent opinions about population growth and land conservation merited more in-depth study (McGaffin et al. 2013). This prompted us to develop 20 Likert scale questions about sense of place, which appeared in the seven-page 2007 Wyoming and Colorado Landowner Survey distributed to 4,935 agricultural landowners in Colorado and Wyoming respectively.

The survey was distributed anonymously by the U.S. Department of Agriculture's National Agricultural Statistical Service according to a random, stratified sample of agricultural producers in Wyoming and Colorado. The sample drawn was representative of producers in Wyoming and Colorado as a region based on the latest agricultural census proportions for acres owned and dollars of sales. Approximately 75 percent of the sample consisted of Colorado landowners and 25 percent Wyoming landowners, which is relatively proportional to the states' population distribution. Miller (2007) concluded that the sample was representative of the intended population and that nonresponse bias was not an issue. The survey response rate was 46 percent, bringing the total number of observations used in the analysis to 2,270 agricultural landowners across both states ($N = 1,737$ in Colorado and $N = 533$ in Wyoming).

Based on this body of research and available literature, our assertion is that where land use population growth and land use changes are perceived as contradicting the current way of life, they will be viewed as a threat to sense of place. In this analysis, we test this premise. We also

test the overall effectiveness of the MLM model against a multilinear regression model that does not nest the contextual variables of New West and Old West economic structures. In summary, the MLM tests the following null hypotheses with two-tail p -values:

Ho₁: Landowners whose lands border subdivisions do not view changes in population growth or land use change as threats to sense of place or an agricultural lifestyle (Ho₁ = 0).

Ho₂: Landowners in high-amenity counties do not view changes in population growth or land use changes as threats to sense of place or an agricultural lifestyle (Ho₂ = 0).

Ho₃: Landowners in farming-dependent counties do not view changes in population growth or land use changes as threats to sense of place, or an agricultural lifestyle (Ho₃ = 0).

Ho₄: Landowners in Wyoming do not view threats to sense of place differently than landowners in Colorado (Ho₄ = 0).

Ho₅: The two-level MLM does not provide more explanatory power than the ordinary least squares (OLS) model (Ho₅ = 0).

A rejection of the null hypothesis implies that the model has explanatory power. In other words, a rejection of the null hypothesis means that the independent variables explain how landowners have been nested into a hierarchy that explains threats to sense of place. The fifth hypothesis test evaluates the overall explanatory power of a multilevel model versus an OLS regression to explain economic structures that result from New West economic transformations.

Dependent Variable—Index on Threat to Sense of Place

As previously stated, we used a factor analysis on the 20-item Likert scale sense-of-place questions from the Wyoming and Colorado Landowner Survey to construct the dependent variable, an index of perceived threats to sense of place or to an agricultural way of life (“threat to sense of place”). A principal factor extraction with varimax rotation (Comrey and Lee 1992) identified five items that could be combined into a single index to describe collective threats to sense of place as a result of population pressure. These five items clustered together into a single factor, or latent variable (Cronbach’s alpha = .84), with each having good (.55) to excellent (.71) component coefficients. Although the coherency of these five items was established through the qualitative

data analysis phase, in order to verify face validity, we repeated the analysis with different factor scale combinations. The five-item scale presented a higher Cronbach's alpha than any three-factor or two-factor combination. We scaled and centered the five-item vector around zero in order to more easily observe positive and negative effects between the independent variables in the MLM analysis. The five Likert scale components and their respective coefficients that constitute the dependent variable, threat to sense of place, are:

People moving into my community are changing its customs and culture (.71).

Agriculture land is being purchased by people who have little interest in agriculture (.62).

Population growth has led to conflicts between neighbors (.65).

Undeveloped rural and agricultural lands are being converted into housing developments (.58).

Population growth has led to more rules that threaten my livelihood (.55).

Independent Variables Presenting Economic Context

We identified independent variables that reflect economic constructs of the New West and Old West like agricultural production, amenities, and population change. We constructed the independent variables using primary data collected from the 2007 Wyoming and Colorado Landowner Survey and secondary data from sources with county-level data that could be clustered or nested to reflect Old West and New West economic structures. Table 1 presents the 11 independent variables, along with a summary of the corresponding identifiable sources of data, means, and standard deviations. Table 1 also contains the perceived threat scores from the factor analysis before and after being normalized. We used four self-reported demographic and landowner-property characteristics collected in the Wyoming and Colorado Landowner Survey to conduct a basic OLS analysis and the level 1 MLM analysis. Since the sample size from both states ($N = 1,737$ in Colorado and $N = 533$ in Wyoming) was sufficiently large to allow for the maximum likelihood estimation in the MLM modeling (Hox 2010), we used county-level secondary data from different sources to create seven independent, contextual variables. These are described below.

Migration. Data from the American Community Survey (U.S. Census Bureau 2011) are used to construct measures of percentage change

Table 1. Definitions of Independent and Dependent Variables.

Variable	Variable Definition	Source	Mean	Range	Standard Deviation
Education	Respondent's education level in years Average = 14.2 years High school = 27% Some college = 26% Vocational/technical = 10% Bachelor's degree = 20% Some graduate education = 5% Graduate degree = 12%	Wyoming and Colorado Landowner Survey	2.879	1, 6	1.69
Years	Number of years respondent has lived in Colorado or Wyoming Average years = 50.57 years 0-20 years = 8.96% 21-40 years = 19.13% 41-60 years = 40.88% 61-80 years = 26.55% 81+ years = 4.38%	Wyoming and Colorado Landowner Survey	50.24	0, 93	18.84
Acres (log)	The size of respondents' property, measured in acres, logged Average acres = 1,700.01	Wyoming and Colorado Landowner Survey	2.336	0, 5.1	1.10
Border subdivision	If respondent's property borders a subdivision; 1 = yes, 0 = no 28% of respondents = yes	Wyoming and Colorado Landowner Survey			
Migration	Average county-level in- or out-migration from 2002 to 2007	American Community Survey	0.538	-1.9, 4	1.15
Rural-urban	Scale of rural-urban; 1 if most rural, 6 if most urban	National Center for Health Statistics		1, 5	
Amenity	County-level amenity index	McGranahan (1999)	2.94	-0.91, 8.52	1.89

Table 1. Continued

Variable	Variable Definition	Source	Mean	Range	Standard Deviation
New West	1 = yes, 0 = no	Jackson-Smith, Jensen, and Jennings (2006)			
Agricultural importance (AI)	County agriculture importance indicator; 1 = yes, 0 = no	Economic Research Service (USDA ERS 2015)			
Farming dependent (FD)	County ERS farm dependent indicator; 1 = yes, 0 = no	Economic Research Service (USDA ERS 2015)			
Change in agricultural land	Percentage of county land converted out of agricultural production, from 2002 to 2007	American Community Survey (U.S. Census Bureau 2011)			
Perceived threat scores			18.06	5, 25	5.19
Perceived threat (scaled and centered)			0	-2.5, 1.34	1

N = 1,707 in Colorado; N = 533 in Wyoming; total N = 2,270.

in migration for the years 2002 to 2007. In order to calculate an interannual change, each year in succession is subtracted from the previous one. The five yearly scores are averaged to develop a single score measuring change from 2002 to 2007. The average annual change between 2002 and 2007 is calculated by dividing annual values by the total county population for each year.

Rural and urban influence. The National Center for Health Statistics uses U.S. Census Bureau data (2010) to construct a six-level urban-rural classification scheme for 3,141 U.S. counties and uses county equivalents to evaluate land use transition at the urban-rural fringe (Ingram and Franco 2012). The six levels for counties include four for metropolitan (large central, large fringe, medium, and small metro) and two for nonmetropolitan (“micropolitan” and “noncore,” with noncore representing the most rural). Ingram and Franco (2012) assert that this typology does a better job of capturing the dynamics on the urban-rural fringe than other measures. We incorporate the center’s rural-urban influence scheme, but reverse code the measure as a Likert scale so a one-unit increase indicates moving from rural to urban. Each county has a score from 1 to 6, where 1 is most rural and 6 is most urban.

Amenity index scale. McGranahan’s (1999) natural amenity scale index incorporates data on natural and scenic amenities such as warm winter, winter sun, temperate summer, low summer humidity, topographic variation, and water area by county. The data for both the original and standardized scores are available for counties in the lower 48 states (USDA ERS 2015). Based on amenity characteristics, each county received a score from 1 to 7, where 7 indicates high amenities and 1 indicates low amenities (USDA ERS 2015).

New West. “New West” counties are coded using criteria from Jackson-Smith, Jensen, and Jennings (2006) that consider seasonal use and housing, high investment, and high-amenity attributes. If a county ranks high on two of the three indicators it is labeled a “New West” county. New West counties are coded “1” and non-New West counties are coded “0.”

Farming-dependent and agriculturally important counties. Nonmetropolitan counties are defined by the USDA Economic Research Service (USDA ERS 2015) as “farming dependent” if either ≥ 15 percent average annual labor and proprietors’ earnings was derived from farming during 1998–2000 or ≥ 15 percent or more of employed residents worked in farm occupations in 2000. However, farming-dependent counties do not necessarily involve high levels of agricultural production. The agricultural importance (AI) indicator developed by Jackson-Smith and Jensen (2009) is used to complement the farming-dependent (FD)

score. According to Jackson-Smith and Jensen (2009), farming-dependent places have an unusually low amount of nonagricultural activity, rather than an unusually high level of farming activity. This suggests that these areas represent intensively agriculture areas that are isolated from urban influences. AI counties also reflect the market value of agricultural products sold (total commodity sales). Based on Jackson-Smith and Jensen (2009), there is reason to believe that an agriculturally important county is qualitatively different from a county that is farming dependent. We consider both FD and AI counties. We code these as 1 for FD counties or 0 for non-FD counties and 1 for AI counties and 0 for non-AI counties.

Change in agricultural land. Agricultural land conversion data collected from the American Community Survey are standardized in a similar manner to the migration data. For each year from 2002 to 2007 we estimate the percentage of land in agricultural use and divide the acres of agriculture by the total county land area (acres). For each year in succession we subtract the previous year by the latter year to arrive at a score indicating a change from one year to the next. We average these scores for the five years to derive one score for change in agricultural land.

Methods

We use an MLM analysis to assess whether landowners group into a hierarchy of the New West or Old West. We also test the assertion that Old West or New West economic structures (reflected by seven contextual independent variables) affect how landowners perceive threats to sense of place (illustrated by the dependent variable, an index of perceived threats to sense of place). We expect that population growth would be considered a threat to sense of place to landowners in Colorado in counties of high amenity value. Growth at the edge of a subdivision may be perceived as a threat to sense of place for these same reasons. Residents in “farming-dependent” counties defined as having low levels of economic activity would not perceive population growth as a threat to sense of place, as residents in these counties may welcome any economic activity.

We first conduct an OLS procedure in order to evaluate the explanatory power of New West economic variables. If the coefficients are significant, then there is justification to investigate whether these variables, as a group, form the context for explaining how landowners perceive threats to sense of place. As shown in Tables 2 and 3, OLS results show that several independent variables are statistically significant from $p < .1$ to $p < .001$, which motivates the MLM analysis.

Table 2. Least Squares (OLS) and Maximum Likelihood Estimations (Multilevel Model) Results for Colorado.

	OLS			MLM Interim			MLM Contextual		
	Estimate	Standard Error	Confidence Interval 95%	Estimate	Standard Error	Confidence Interval 95%	Estimate	Standard Error	Confidence Interval 95%
Border subdivision	0.401***	(0.059)	[0.285, 0.516]	0.438***	(0.006)	[0.324, 0.553]	0.039***	(0.006)	[0.278, 0.508]
Acres (log)	-0.042**	(0.024)	[-0.089, 0.005]	-0.004*	(0.006)	[-0.088, 0.006]	-0.004	(0.002)	[-0.085, 0.009]
Education	-0.043*	(0.015)	[-0.072, -0.013]	-0.004**	(0.001)	[-0.068, -0.009]	-0.004**	(0.001)	[-0.070, -0.012]
Years	-0.002**	(0.001)	[-0.004, 0.001]	-0.0002	(0.000)	[-0.005, 0.001]	-0.0001	(0.0001)	[-0.004, 0.001]
Migration	0.121***	(0.024)	[0.073, 0.169]				0.013***	(0.003)	[0.061, 0.190]
Amenity	0.077***	(0.019)	[0.040, 0.114]				0.008***	(0.0002)	[0.035, 0.129]
New West	-0.080	(0.091)	[-0.259, 0.100]				-0.009	(0.011)	[-0.313, 0.126]
Change in agricultural land	-0.004*	(0.002)	[-0.007, 0.000]				-0.0003	(0.0002)	[-0.007, 0.002]
Rural-urban	0.031	(0.022)	[-0.013, 0.075]				0.003	(0.003)	[-0.025, 0.088]
Agriculturally important (AI)	0.055	(0.061)	[-0.065, 0.174]				0.008	(0.008)	[-0.075, 0.240]
Farming dependent (FD)	-0.288***	(0.077)	[-0.439, -0.138]				-0.032***	(0.003)	[-0.508, -0.125]
Constant	-0.180	0.133	[-0.442, 0.081]	0.013	0.012		-0.021	(0.015)	
Observations				1383			1369		
Resquared	0.2044								

* $p < .1$; ** $p < .05$; *** $p < .001$.

Table 3. Least Squares (OLS) and Maximum Likelihood Estimations (Multilevel Model) Results for Wyoming.

	OLS			MLM Interim			MLM Contextual		
	Estimate	Standard Error	Confidence Interval 95%	Estimate	Standard Error	Confidence Interval 95%	Estimate	Standard Error	Confidence Interval 95%
Border subdivision	0.319***	(0.091)	[0.141, 0.497]	0.031***	(0.009)	[0.133, 0.486]	0.030***	(0.009)	[0.123, 0.478]
Acres (log)	-0.027	(0.036)	[-0.098, 0.044]	-0.002	(0.004)	[-0.093, 0.048]	-0.002	(0.004)	[-0.088, 0.054]
Education	-0.022	(0.025)	[-0.072, 0.028]	-0.002	(0.003)	[-0.070, 0.030]	-0.002	(0.003)	[-0.071, 0.029]
Years	0.000	(0.002)	[-0.004, 0.005]	0.0001	(0.000)	[-0.004, 0.005]	0.00003	(0.0002)	[-0.004, 0.005]
Migration	0.072	(0.071)	[-0.067, 0.212]				0.005	(0.009)	[-0.123, 0.221]
Amenity	0.078**	(0.039)	[0.001, 0.154]				0.007*	(0.005)	[-0.027, 0.162]
New West	0.070	(0.334)	[-0.587, 0.726]				0.014	(0.038)	[-0.609, 0.892]
Change in agricultural land	0.002	(0.004)	[-0.007, 0.010]				0.0001	(0.0005)	[-0.009, 0.011]
Rural-urban	-0.031	(0.068)	[-0.164, 0.102]				-0.005	(0.009)	[-0.227, 0.133]
Agriculturally important (AI)	-0.040	(0.105)	[-0.247, 0.167]				-0.005	(0.014)	[-0.331, 0.232]
Farming dependent (FD)	-0.038***	(0.176)	[-0.385, 0.308]				-0.013	(0.029)	[-0.609, 0.353]
Constant	-0.066	(0.258)	[-0.573, 0.441]	0.008	0.018	-0.2672	-0.002	(0.029)	[-0.596, 0.558]
Observations				455			455		
R-squared	0.05								

* $p < .1$; ** $p < .05$; *** $p < .001$.

The MLM process deliberately relaxes the OLS assumption that error terms are uncorrelated (Luke 2004; Qin and Flint 2010) in order to demonstrate the circumstances under which the dependent variable (the threat index) can be explained by contextual independent variables. In order to demonstrate unbiasedness, the independent variables (for all observations) would need to be independent of the error term. Instead, the MLM model effectively mixes fixed and random effects to control for groupwise correlated errors in order to ensure that the independent variable and error term remain uncorrelated for a given observation addressing the inefficiency issue that would exist in OLS estimates. Thus, the estimators do not need to be unbiased if they can be established as consistent through a least squares estimator. The analysis controls for contemporaneous correlation across cross-sectional data and the MLM model is estimated via maximum likelihood estimation. The asymptotic maximum likelihood procedure requires a fairly large sample size at all levels to produce estimates that are efficient for the MLM model (Griffiths, Hill, and Judge 1993). These criteria are satisfied by the large samples obtained in the Wyoming and Colorado Landowner Survey. Moreover, if the contextual variables prove to be warranted, the MLM model addresses omitted variable bias that would exist in models including only individual variables rather than also including contextual variables as defined above.

A general specification of the MLM model is:

$$Y_{ij} = Y_{00} + u_{0j} + r_{ij}$$

where

i = individual level 1 unit

j = group level 2 unit (county)

0 = all observations in the null group, without the nested structure

Y_{ij} = dependent variable "threat index" reflecting landowner's perceived threat to sense of place when the landowner is part of j groups

Y_{00} = intercept that reflects the grand mean across all counties without nesting

u_{0j} = group- (or county-) dependent variation without nesting

r_{ij} = variance of the residual representing the variation of the individual i landowner perceived threat scores around the mean score within each county (grouped at level j)

In order to control for the error correlation between groups, we take a stepwise regression approach, followed by maximum likelihood

estimation that incorporates the assertion that respondents are nested within the counties in the study region. There are 23 counties in Wyoming and 64 counties in Colorado. MLM relaxes the basic independence assumption of OLS models and allows for potential correlated errors of observations (Luke 2004), but contemporaneous correlation is controlled across cross-sectional data in the MLM models estimated via maximum likelihood. The level 1 MLM interim step estimates the individual level model clustered by landowner characteristics using level 1 explanatory variables that could potentially account for perception of threat. In the level 1 analysis, the residual errors are assumed to have a normal distribution with a mean of zero and a common variance in all groups (Hox 2010). This is specified as:

$$Y_{ij} = \beta_{0j} + \beta_{1j}(X_{ij}) + r_{ij}$$

where

- Y_{ij} = dependent variable for the i th individual in group j
- X_{ij} = the level 1 explanatory variable for the i th individual in group 1
- β_{0j} = random effect variable representing random differences between the null group 0 and group 1
- β_{1j} = regression coefficient common to group 1 for the j th group

The level 2 analysis includes a county-level model and estimates the relationship between the county-level characteristics and landowners' perceived threat. This indicates whether the level 2 units (counties) differ from each other and the dependent variable, the perceived threat index. In the level 2 analysis, the residual errors are assumed to be independent from the lowest level of errors and to have a multivariate normal distribution with a zero mean. At the county level, variation between counties is modeled as:

$$\beta_{0j} = Y_{00} + Y_{01}(w_j) + u_{0j}$$

where

- w_j = vector of level 2 (county) explanatory variables
- Y_{01} = effect of county variables w_j on β_{0j}
- u_{0j} = random term for the null hypothesis in the j th group

We estimated a separate two-level model for each state and identified results as "MLM Interim" and "MLM Contextual" in the table of results.

Results

Tables 2 and 3 present results from the OLS stepwise regression model and MLM maximum likelihood models for Colorado and Wyoming, respectively. Variances and confidence intervals are shown in parentheses. Since OLS coefficients are significant, there is justification to investigate whether these variables, as a group, form the context for explaining how landowners perceive threats to sense of place in the MLM analysis. The MLM analysis is used to investigate whether landowners being nested into hierarchical social structures of the New West and Old West can explain the independent variables. In other words, through the MLM, we obtain additional insight into whether the economic structures influence how landowners in both states view threats to sense of place.

Results from the MLM county-level contextual variables confirm that landowners coalesce into New West and Old West structures. Coefficient sizes are relatively small because the dependent variable was centered and scaled around zero, in order to better demonstrate rate positive and negative effects. Several economic contextual variables are significant, with both similarities and differences occurring between Colorado and Wyoming, and so merit discussion. We believe these results support our premise that how landowners view population change depends on whether they reside in a New West or Old West state, which we now describe in greater detail.

As expected, our results show that migration and natural amenities are significant predictors in Colorado of potential threats to sense of place, which supports our premise that an amenity-based economic structure will influence how landowners view such threats. Not unexpectedly, population and land use changes on lands that border a subdivision are viewed by both Colorado and Wyoming agricultural landowners as threats to sense of place. This finding presents internal validity with research findings showing that agricultural lands that border subdivisions are indeed at greater risk of conversion to nonagricultural uses (Plantinga, Lubowski, and Stavins 2002).

On the topic of agricultural lands, in this analysis, farming dependency retains a large, negative significant effect in Colorado at the $p < .001$ level of significance. This reflects an overriding effect that agricultural landowners view economic activity from long-term stabilizing industries like agriculture as nonthreatening. Thus, even landowners located in New West economies with high amenities and in-migration are less likely to feel their sense of place is threatened if there is a significant agricultural influence in the economy. Lands that border a

subdivision also tested positive and significant in Wyoming at the $p < .001$ level of significance. We attribute the lack of threat in Wyoming farming-dependent counties to the fact that the state has lower overall population density and has not experienced the same rates of population increases as Colorado during the past several decades (Caruthers and Vias 2005). This finding is also consistent with the findings presented in the qualitative phases of the research study, when landowners indicated that they may welcome population growth under specific circumstances (Miller et al. 2011). In fact, Wyoming agricultural producers may welcome additional growth, as it may present a sense of permanent residency and stability. Authors have also demonstrated that metropolitan areas are drivers of a state's overall economy. Rural regions of western states benefit significantly from economic activity in a consolidated metropolitan center (Power and Barrett 2001). Moreover, additional growth in a metropolitan area may be viewed as contributing to economic prosperity, without threatening economic development from productive mineral extraction, energy development, or agricultural production (important industries in the Old West) taking place in rural regions (Soini, Vaarala, and Pouta 2012). In summary, we find that trends in population growth for the study period may not threaten this sense of place for Wyoming landowners and their agricultural lifestyle.

Overall, the effects of level 2 predictors show the same pattern between the MLM and OLS models, which indicates consistency between the models. However, the MLM contextual analysis shows that Colorado landowners view threats to sense of place differently from Wyoming landowners. While contextual economic variables create significant differences in perceived threats to sense of place, the two-level MLM analysis demonstrates that landowners sort themselves into county- and state-level hierarchical social structures that may reflect the New West and Old West. In summary, we reject the null hypothesis for all five hypothesis tests. Adding the context of New West economic transformation affects whether landowners view changes in land use and population as a threat to their sense of place or agricultural way of life.

Discussion and Conclusions

The MLM analysis provides quantitative evidence of the hierarchical, nested nature of individuals within New West and Old West socioeconomic structures. The quantitative methodology allows us to analyze large groups of data that help us to identify encompassing social structures, like economies. From a practical perspective, data on these large

social structures may be infeasible to gather through qualitative methods like focus group interviews. We also illustrate that the MLM analysis provides results that are beyond what can be observed in a basic OLS regression of demographic variables available in the 2007 Wyoming and Colorado Landowner Survey. While others before us have discussed these economic transformations, we present an analytical process for evaluating the contextual variables that form these economic structures. We assert that New West and Old West contextual variables impact a “sense of place” around which bonds have formed. It follows that population and land use changes may be perceived as a threat to sense of place if these threaten the structure of a New West or Old West economy.

We demonstrate that knowledge of New West and Old West contextual variables are important for understanding how landowners might perceive population growth and land use transitions. For example, our study shows that Colorado agricultural landowners might find population in-migration as threatening sense of place under more circumstances than Wyoming agricultural landowners. Although there are a number of contextual factors at play and one cannot be fully certain about whether changes will be viewed positively or negatively, we show that the economic structure of the county across each state provides predictive power. This knowledge may provide policymakers with information so that they may undertake democratic deliberation efforts to consult with communities about land use and environmental policy decisions.

It is interesting to note the complex relationship with agricultural production within Old West and New West communities. Our results provide evidence that additional agricultural activity would be welcome in farming-dependent counties. Agricultural production is consistent with Old West economic structures and may be viewed as a stabilizing factor, but significant presence of agricultural activity may lessen concerns about threats to sense of place in amenity-based New West communities. It is well documented throughout the literature that individuals associate the development of open space with a decline in environmental amenities, and that natural landscapes, views, wildlife, and recreational opportunities influence sense of place attachment (Brehm, Eisenhauer, and Krannich 2004).

We find that Wyoming landowners in farming-dependent communities do not perceive changes in land use or population as a significant threat to sense of place, which suggests that they may be more open to economic development, in general. This supports the distinction, first introduced by Jackson-Smith and Jensen (2009), between

agriculturally important and farming-dependent communities. In the Jackson-Smith and Jensen study, farming-dependent counties had the highest rates of loss in farm numbers, the most rapid loss in farm sales, and the lowest rates of farm entry, implying that any type of development is welcome because few other economic options are available. Agriculturally important counties often have higher levels of agricultural diversity, are located closer to metropolitan areas, and contain a disproportionate share of both small-acreage and low-sales hobby farms.

Our results indicate distinct differences in the perceived threat index, depending on the general context of living in either Wyoming or Colorado. Colorado has larger population base, a major metropolitan area, and a more diverse economic base. Generally, Colorado residents have experienced a history of population and land-use change patterns that are different from that of Wyoming. One interesting finding is the effect of migration in Colorado and the lack of a similar effect in Wyoming. Based on the broad literature on differences between old-timers and newcomers and their effects on community social dimensions, we would expect the in-migration of people with different socioeconomic backgrounds, values, and perspectives to contribute to heightened social conflict in communities (Smith and Krannich 2000), thus threatening landowners' sense of place. Some might conjecture that agricultural landowners in Wyoming would be even more sensitive to in-migration than those in Colorado given the general nature of the economies within each state. Our results do not seem to support this, however, possibly due to an overarching need to increase economic activity.

Perhaps there is a more nuanced explanation, as migration patterns (in- or out-) display complex temporal and spatial characteristics. One possible explanation is simply that migration statistics reflect changes in out-migration (Fulton, Fuguitt, and Gibson 1997). While the migration variable is not significant in Wyoming, there is a large positive effect between agricultural lands that border a subdivision and perceived threat to an agricultural lifestyle. This supports the thesis that it is not necessarily the influx of new people that leads to conflict, but rather the changes in land use and the loss of open space associated with those changes in land use that create conflict (Gilg 2009; Kline 2006; Theobald 2001). We assert that there is opportunity for additional study of the relationship between net in-migration and sense of place in New West and Old West economic structures. Likewise, there are several cultural dimensions to the New West and Old West that merit more analysis than we provide in our study. However, we believe that

the MLM process would prove useful for examining these cultural nuances. We also believe that the perceived index might be utilized elsewhere to evaluate threats to sense of place.

Our results make an important contribution to several debates relating to land-use and conservation efforts such as strategic conservation planning, landscape conservation, or projects relating to extraction and agricultural production. Several authors note that environmental protection pays off for safeguarding goods that are considered synonymous with sense of place (Devine-Wright and Howes 2010; Flora and Flora 1996). Our findings validate the idea that in New West economies with significant agricultural influence, conservation planners may be better served to engage in protecting these amenities provided by agricultural lands, as less conflict may occur. Authors have suggested that population growth is endogenously related to economic transformation in the New West, where exurban residential housing development has risen from residents seeking recreation, dramatic natural scenery, and lifestyles (Carruthers and Vias 2005). We concur. If we keep this in mind, agriculturally related activities and residential development do not necessarily seem to be significantly at odds with the sense of place or lifestyles of Old West agricultural landowners. This may be indicative of a *laissez faire* approach to planning that provides less potential for conflict than in more densely populated areas. However, due to the often irreversible nature of land use transitions, it is possible that an undesirable threshold might eventually be reached once in-migration and residential development gain momentum, thus rendering the approach ineffective.

Overall, our results indicate that contextual factors may also strongly influence sense of place, perception of landscape change, and perceived threat to social and ecological changes. Identifying and strategically targeting these contexts (rather than particular landowners) may be a good strategy for more effective and efficient landscape conservation. Results suggest that certain groups related by various contextual influences may be more or less open to open space and natural amenity conservation. Thus, land-use policymakers may benefit by recognizing that context matters and the perceived risk and importance of losing certain landscape qualities may vary across those contexts. Better understanding of these contexts across different groups or landowner types within communities should illuminate opportunities or barriers to motivating desired political action and ultimately achieving conservation and social objectives in New West and Old West communities.

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