

Assessing Attitudes Toward Wildlife Ownership in United States–Mexico Borderlands

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Public attitudes toward wildlife ownership represent an important and poorly studied component of biodiversity conservation. We began addressing this knowledge gap by interviewing residents along 140 km of the United States side of the farthest south-eastern border with Mexico (n = 402). After controlling for demographic variables, urban background ($\beta = 0.13$) and land ownership ($\beta = -0.19$) predicted attitudes regarding wildlife ownership ($p < .05$). Most exurban respondents considered wildlife public property (72%), and rural respondents were divided (48% considered wildlife public property). Non-Latino whites demonstrated a stronger positive correlation between land ownership and considering wildlife private property ($r_p = 0.81$) than Latinos ($r_p = 0.23$). These results suggest exurban immigrants will strengthen support for public ownership of wildlife in borderland contexts. The positive relationship between agricultural land ownership and thinking wildlife should be private property may weaken in borderland areas if Latinos regain agricultural land ownership.

Received 2 January 2009; accepted 3 October 2009.

We thank M. A. Sternberg, L. M. Bies, and M. J. Peterson for valuable constructive criticism. This effort was supported by North Carolina State University, Michigan State University, Texas A&M University, Middle Tennessee State University, the NASA Earth System Science Fellowship program, and the National Science Foundation. We owe a debt of gratitude to S. L. Peterson for her interviewing efforts, and most of all to the people of the LRGV for sharing their ideas, feelings, perspectives, and homes with us.

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Keywords borderland, Hispanic, Latino, Lower Rio Grande Valley, Mexican-American, property, public trust doctrine

Governments worldwide have used various permutations of the Public Trust Doctrine (PTD) to claim authority over wildlife management for centuries (Caspersen 1996; Horner 2000; Sax 1970). In 1970 the PTD was highlighted as the most powerful tool for natural resource management within American law (Sax 1970). At the same time, emerging markets for wildlife (e.g., the sale of wildlife or access to it on game ranches) made some wildlife species a potentially valuable asset for landowners (Geist 1988), and the Endangered Species Act (1973) made other wildlife species a potential economic liability for landowners (Clayton and Brook 2005). As wildlife gained significant positive and negative values for landowners, efforts to commodify valuable wildlife species began in earnest (Adams et al. 2000, 2004). Some scholars see wildlife privatization as the paramount threat to biodiversity conservation (Geist 1988). Others suggest wildlife commodification (e.g., species conservation banking) can alleviate costs associated with conservation that can encourage landowners to destroy endangered species habitat (Fox and Nino-Murcia 2005).

The lack of research assessing public attitudes toward wildlife ownership presents a serious research need for wildlife conservation because wildlife ownership shapes the feasibility of PTD-based wildlife management, wildlife markets, and ecosystem service markets involving biodiversity. This need is particularly acute in international borderlands that are critical for efforts to protect migratory species, species with large ranges, and species endemic to the borderland regions themselves (Chettri et al. 2007; Muhweezi et al. 2007). We began addressing this need with a survey assessing attitudes toward wildlife ownership among residents living along the southeast end of the United States–Mexico border between McAllen and Brownsville, Texas.

Development pressure and high concentrations of endangered species have repeatedly put this region's national wildlife refuge (Lower Rio Grande Valley National Wildlife Refuge) on the top 10 list of most threatened wildlife refuges in the United States (Defenders of Wildlife 2004; Schlyer 2007). The social history of this region provides some inference for other United States–Mexico borderlands (Kearney and Knopp 1995). The twin cities bounding the study area (McAllen/Reynosa and Brownsville/Matamoros) represent agricultural and port influenced cultures, respectively. These conditions are mirrored by their western counterparts of Mexicali/Calexico (agricultural) and San Diego/Tijuana (port) (Kearney and Knopp 1995). In this study we specifically assess public attitudes toward wildlife ownership, evaluate how landownership and urban background predict attitudes toward wildlife ownership, and determine how the relationship between landownership and attitudes toward wildlife ownership is moderated by ethnicity.

Conceptual Background

We hypothesized that land ownership type and urban background would predict attitudes toward wildlife ownership and that ethnicity would mediate those relationships. These hypotheses are rooted in both the theory of rational optimization of perceived consequences (Fishbein and Ajzen 1975) and the cognitive hierarchy model (Ajzen

and Fishbein 1980; Schwartz 2006). The theory of rational optimization of perceived consequences suggests people behave strategically to optimize consequences of their actions (Fishbein and Ajzen 1975). We hypothesized that respondents owning agricultural properties would hold more favorable attitudes toward private wildlife ownership than those owning residential properties or not owning property. Agricultural landowners are more able to capture benefits associated with wildlife and avoid costs associated with conserving species for the public's benefit (e.g., endangered species) if they own wildlife, whereas respondents owning residential properties or not owning property would gain less from wildlife privatization.

We hypothesized a negative relationship between urban background and attitudes toward private wildlife ownership. In urban areas, limiting property rights and sharing resources (e.g., water, air, and roads) often create preferred consequences for individuals. Property rights restrictions in urban areas (e.g., trash burning bans) reflect avoiding negative consequences of unlimited property rights (e.g., air pollution). The need to share resources in urban areas may translate into negative attitudes toward private wildlife ownership among exurbanites living in rural areas. Exurban migrants to rural communities have proven more tolerant to incursions on property rights than migrants from rural areas (Peterson and Liu 2008).

We hypothesized Latino ethnicity would influence attitudes toward wildlife ownership by mediating relationships between variables. In the Lower Rio Grande Valley, ethnicity shaped land ownership patterns and urban backgrounds of residents. Between 1848 and 1892, sheriff's sales, auctions at which Latino owned lands were sold to the highest bidder at unreasonably low prices, moved more than 80% of the land in the counties where this study was conducted (Hidalgo and Cameron counties, Texas) from the hands of Latinos to the hands of non-Latino whites (Montejano 1987). In the 1950s, land speculators began converting marginal lands (e.g., poor soil, within floodplains) into *colonias*, rural residential areas "along the Texas-Mexico border that may lack some of the most basic living necessities" (Texas Secretary of State 2009, 1; Ward 1999). Cheap *colonia* housing facilitated an influx of exurban migrants from both Mexico and the United States (U.S. Bureau of the Census 2001).

According to the cognitive hierarchy model, value orientations, attitudes, and ultimately behavior emerge from a social context that includes religion, politics, science, history, education, and ethnicity (Ajzen and Fishbein 1980; Schwartz 2006). Mastery value orientations toward managing relationships with the social and natural world are high in the United States (Schwartz 2006), but harmony value orientations may be higher for Latinos than for non-Latino whites. *Simpatia*, the cultural tendency to promote harmony in social relationships, has been identified as a key value among Latinos (Marín and Marín 1991). From this perspective, Hispanic ethnicity would lead to less favorable attitudes toward private wildlife ownership among respondents with different land ownership types and from different sizes of communities.

Methods

We used an in-person interview protocol because it promised higher response rates (Dillman 2007) and the potential for gaining insight into decision making and cultural dynamics of respondents. Our sampling strategy entailed administering a questionnaire to the person who answered the door of every fifth dwelling while moving northeast to southwest along the United States-Mexico border between

McAllen and Brownsville, Texas. This sampling strategy avoided potential bias associated with omitting the households that were not represented in phone records, driver's license databases, or county tax roles, and has been used in similar contexts (Nyhus et al. 2003). We bounded the study area using the Military Highway (the southernmost transportation corridor along the U.S. border), and sampled homes along approximately 140 km of the farthest southeastern border between the United States and Mexico. We included all homes that fronted directly on the highway, those that were between the highway and the Mexican border, and homes in neighborhoods connected to the highway but extending north of it. We skipped abandoned structures and a seasonally occupied community that was empty during the summer. When no one was home we noted the address and returned daily until the interview was completed. We noted the availability of Spanish translations of the survey, and when requested to do so, interviewers read the survey questions aloud to respondents.

We promoted design validity by conducting a pretest ($n = 36$), using advisers from the study area, and asking clarification questions during interviews. We used a convenience sample of residents who lived in homes within the study area for the pretest, but avoided homes that would be in the survey sample. Practical constraints limited the time investigators lived in the study area (June–August 2005 and 2006), so we relied on four advisors who grew up in the Lower Rio Grande Valley to provide additional contextual insight. The advisers were chosen based on lifelong experience addressing wildlife management and public engagement issues in the Lower Rio Grande Valley. They provided feedback regarding face validity of measures in the questionnaire and interpretations of survey results. We integrated clarification questions into both the pretest and final survey administration to assess face validity. Respondents were asked how they interpreted questions after they filled out the questionnaire to assess the degree to which their interpretation aligned with that of the researchers. We improved reliability using an assessment of interviewer effects and a forward and backward translation process for questionnaires (Marín and Marín 1991). Interviewer effects that have been identified with Latino populations relate to sensitive questions (e.g., sexual or criminal behaviors) and gender-related questions (Webster 1996). We used one male and one female interviewer and found no gender-related interviewer effects on response rate, item omission, or interview duration.

We assessed wildlife ownership attitudes using a 7-point rating scale with bipolar descriptions defining each end. The scale ranged from “wildlife on private property should belong to the landowner” (1) to “wildlife on private property should belong to the public” (7). We created an ordinal variable to capture the rural–urban continuum for respondents (rural, town, and urban; coded 1–3) based on two questions. First, we asked respondents, “Have you lived all your life here?,” and if they answered “yes” we coded them as rural (1; no communities in the study area exceed populations of 1,500 persons). If they answered “no,” we asked, “Where did you move from?” We then used census data to determine the population of their origin city at the date they emigrated. Respondents moving from communities with populations <5,000 were coded as rural (1), because their origin community was similar in size to those in our border study area. Respondents moving from cities with 5,000–250,000 were coded as town (2) and respondents moving from areas with >250,000 residents were coded as urban (3). The 250,000-resident cutoff for urban areas reflects the large city category in the 1972–2006 NORC General Social Survey. We chose not to break the town category into smaller increments, because few respondents moved from areas

with >5,000 residents or <250,000 residents ($n = 39$). Because we had a small sample size for the town category, and three categories, we created a dummy variable (rural versus other) for use in regression analysis. We created an ordinal variable to capture land ownership type (coded 1–4). Respondents who did not own land were coded 1 and those owning ≤ 0.40 ha (1 acre) parcels were coded 2 (small residential). We divided respondents with larger properties into two groups based on local land use practices. All landowners owning properties larger than 26.30 ha (65 acres) farmed their land, so we coded respondents owning > 0.40 ha and ≤ 26.30 ha as large residential (3), and those owing > 26.30 ha as agricultural (4).

We collected data for education (1, less than high school, to 7, graduate or professional degree), previous year's annual household income (1, $\leq 14,999$, to 9, $\geq 200,000$; U.S. dollars), age, ethnicity, and gender. We asked respondents "What is your race or ethnicity?" and let them choose from seven categories: Hispanic or Latino, White, Black or African American, American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islander, and other. We assessed household size by asking respondents, "How many people live in your household (that is, how many people share the same kitchen)?" Finally we assessed length of residency by asking respondents, "Have you lived all your life in Cameron (or Hidalgo) County?" (if respondents answered "no" we asked: "How many years have you lived in Cameron [or Hidalgo] County?").

All descriptive and inferential statistics were calculated using SPSS (Release 15.0.0, SPSS, Chicago). We compared Latino and non-Latino white respondents using independent samples *t*-tests or Kruskal–Wallis tests as appropriate. We accounted for demographic variables that might confound relationships between land ownership type, urban background, and attitudes toward wildlife ownership by incorporating age, gender, education level, and income as control variables in a regression equation. We used Sobel's test to assess whether ethnicity mediated the relationship between attitude toward wildlife ownership and independent variables (Baron and Kenny 1986).

Results

We conducted 402 interviews with a final compliance rate of 93% (sampling error $\pm 5\%$). Gender (58% female) and ethnicity (94% Latino) of respondents approximated data for census tracts that overlapped with our study area (52% female and 94% Latino; U.S. Bureau of the Census 2001). Half of the respondents (50%) were born in the rural study area. Most of the in-migrants (those moving from outside the study area; $n = 198$), however, were from urban (60%) or town (28%) areas. Latinos in our sample ($n = 375$) were younger, had lived in the study area less time, had larger household sizes, owned smaller properties, had lower incomes, and had lower education levels than non-Latino whites ($n = 25$; Table 1). We did not detect a difference between Latino and non-Latino whites regarding whether wildlife on private property should belong to landowners or the public (Table 1). The largest group (44%) of Latino respondents had annual family incomes below \$15,000. Most Latino respondents had either not completed high school (41%) or completed their education at the high school level (31%; includes GED). Most Latinos (62%) owned small residential properties (≤ 0.40 ha), with 13% not owning property, 23% owning large residential properties (> 0.40 and ≤ 26.30 ha), and only 2% owning agricultural (> 26.30 ha) properties. Few non-Latino whites (8%) did not own property, with 32% owning

Table 1. Comparison of Latino ($n=371$), and non-Latino white ($n=25$) survey respondents in the Lower Rio Grande Valley study area in 2005

Variable	Mean (SE)		t	χ^2 ^a	p
	Latinos	Non-Latino Whites			
Age	41.74 (0.845)	55.33 (3.174)	3.98		<.001
Education level ^b	2.36 (0.087)	3.92 (0.420)		15.19	<.001
Household size	4.39 (1.909)	3.40 (1.826)		6.75	.009
Income level ^c	2.22 (0.079)	4.04 (0.434)		19.18	<.001
Land ownership type ^d	2.00 (0.033)	2.76 (0.185)		20.19	<.001
Urban background ^e	1.61 (0.048)	1.72 (0.891)		0.51	.477
Wildlife ownership ^f	4.20 (0.103)	4.56 (0.366)	0.89		.375
Years resident	26.40 (1.082)	36.75 (5.118)	2.34		.020

^aKruskal–Wallis test.

^bEducation ranged from 1, less than high school, to 7, graduate or professional degree.

^cAnnual household income ranged from 1, \leq \$14,999, to 9, \geq \$200,000.

^dScale ranged from 1 (no property) to 4 (agricultural property, >65 acres).

^eScale ranged from 1 (rural, <5,000 population) to 3 (urban, >100,000 population).

^fScale ranged from 1 (wildlife on private property should belong to the landowner) to 7 (wildlife on private property should belong to the public).

small residential properties, 36% owning large residential properties, and 24% owning agricultural properties.

Among respondents, the largest group thought wildlife should be public property (39%), and roughly equal proportions thought wildlife should be private property (29%) or were neutral (33%). After controlling for demographic factors, wildlife ownership attitudes remained significantly related to land ownership type

Table 2. OLS analysis of public versus private wildlife ownership scale (7 = public, 1 = private) for survey respondents in the Lower Rio Grande Valley study area in 2005 ($n=401$)

Independent variables	Beta coefficient	t	p
Age	0.011	0.209	.834
Education ^a	0.008	0.135	.893
Ethnicity ^b	0.084	1.584	.114
Gender ^c	0.012	0.244	.808
Income ^d	0.025	0.330	.743
Land ownership type ^e	-0.194	-3.599	<.001
Urban background ^f	0.133	2.650	.008
Constant	NA	6.256	<.001

^aEducation ranged from 1, less than high school, to 7, graduate or professional degree.

^bLatino coded as 1 and non-Latino white coded as 0.

^cFemale coded as 1 and male coded as 0.

^dAnnual household income ranged from 1, \leq \$14,999, to 9, \geq \$200,000.

^eRanges from no property (1) to agricultural size property (4).

^fUrban coded as 1 and rural coded as 0.

and urban background (Table 2: $n = 401$, $F = 3.85$, $R^2 = .06$). Most non-property owners and small residential (<0.40 ha) property owners (68% and 59%, respectively) thought wildlife should be public property, but fewer (40%) large residential landowners and no agricultural landowners thought wildlife should be public property. Respondents from rural areas were less likely (48%) than respondents from town (84%) and urban (74%) areas to think wildlife should be public property. Ethnicity mediated the relationship between land ownership type and attitudes toward private wildlife ownership ($Z = -3.418$, $p = .001$). The negative correlation between thinking wildlife should be public property and owning larger properties was stronger for non-Latino whites ($r_p = -.81$) than for Latinos ($r_p = -.21$).

Discussion

This research supports the hypothesis that within United States–Mexico borderlands neither Latinos nor non-Latino whites think wildlife should be private property. One-third of respondents, however, held neutral attitudes toward private wildlife ownership. This finding could reflect the aforementioned harmony value orientation (Schwartz 2006) within Latino culture leading to a preference for moderate answers on the wildlife ownership scale (Marín and Marín 1991). The prevalence of neutral attitudes also may reflect cognitive dissonance associated with reconciling conceptions of wildness and ownership (public or private). Although respondents indicated they understood that neutral meant equal preference for public and private wildlife ownership, the possibility that neutral responses reflect rejection of ownership or any other means of control over wildlife should be addressed in future research.

Attitudes towards wildlife ownership may relate to sociocultural history of environmental entitlements (Leach et al. 1999; Wilson and Mitchell 2003) and private property ownership (Hann 2007; Peterson and Liu 2008). Because most respondents in this transboundary region were of Mexican descent, their attitudes toward wildlife being public property or not being property may relate to the *ejido* system in Mexico (Valdez et al. 2006). Any influence from the *ejido* system may wane over time because the 1992 privatization amendment to Article 27 of the Mexican Constitution ended land redistribution to landless rural communities and created a market for selling *ejido* lands.

Although our respondents were more likely to have positive attitudes toward wildlife being private property if they owned larger parcels of land, the relationship was stronger for non-Latino whites. This finding supports the hypothesis that ethnicity served as a proxy for mastery–harmony value orientations (Schwartz 2006) toward managing relationships with the natural world for agricultural landowners. The mediating effect of ethnicity also may reflect the relationship between household size and property size. In areas where public land is scarce (only 3% of land in Texas is public), larger household sizes for Latinos than non-Latino whites, particularly when standardized by property size, would create more demand for access to wildlife through familial networks, thereby reducing opportunity to sell access to wildlife. To the extent acculturation occurs in United States–Mexico borderlands it may weaken the mediating effect of ethnicity. Further, if Latinos in these regions reestablish their traditional agrarian lifestyles by reacquiring land, the current positive relationship between agricultural land ownership and favorable attitudes toward wildlife as private property may weaken. As migration to the United States from Mexico continues,

these findings may apply in borderland cultures that develop further from the political border between the United States and Mexico (Fuentes-Berain 2004). Support for private wildlife ownership among non-Latino white landowners has led to the de facto privatization of white-tailed deer (*Odocoileus virginianus*) in some areas of Texas, beginning as early as 1925 (Geist 1988). The relationship between land ownership and supporting private wildlife ownership has important implications in other areas because at least 31 states and 7 Canadian provinces allow breeding and sale of elk (*Cervus elaphus*) and/or white-tailed deer.

The tendency for respondents with urban backgrounds to support public wildlife ownership more than respondents with rural backgrounds supports the hypothesis that experience with constraints on property dictated by high human population density in urban areas may explain greater preference for limitations on private wildlife ownership when exurbanites move to rural areas. Since those in urban areas or recently emigrated from them tend to hold attitudes more in line with major environmental organizations, their attitudes toward wildlife ownership also may reflect the environmental organizations' tendency to support public ownership of natural resources (Mertig et al. 2002; Peterson et al. 2007). Future studies should consider the relationship between environmental values on attitudes toward wildlife ownership. Hypothetically, people with mutualism value orientations toward wildlife (Manfredo et al. 2009) or ecological paradigms (Dunlap et al. 2000) would hold negative attitudes toward private wildlife ownership.

This study suggests wildlife managers face a difficult balancing act in many borderland areas. In the Rio Grande Valley the educational deficits and deep poverty of rural Latino communities ultimately relate to historical dispossession of Latino lands and the resulting destruction of agrarian communities (Pulido 1996). When most citizens of a region have been dispossessed of land during historical wars and land grabs, it may be tempting to ignore their voices and work with landowners who control large properties needed for conservation efforts. Conservation efforts in similar borderlands, however, also should consider majority voices to avoid violating social justice principles and marginalizing a majority group with economic and political influence over the current success of conservation efforts (Brockington et al. 2006; Chan et al. 2007).

The systematic sampling approach used in this study provides one method for assessing public opinion in other borderland contexts (e.g., Kashmir, Costa Rica–Nicaragua borderlands) where traditional sampling frames (e.g., phone records or tax records) are inadequate. This study highlights at least two questions for future research in borderlands and beyond. First, what are the perceived conservation costs and benefits associated with privatizing wildlife? Research addressing this question should address how public attitudes toward wildlife species change when the species involved become personal property. Second, do the direct effect of land ownership type (e.g., size of property, uses of property) on attitudes toward wildlife ownership and the mediating effect of ethnicity on that relationship operate in other contexts? Future studies should consider the effect of species (e.g., charismatic versus pest species) on attitudes toward wildlife ownership. In this study respondents indicated they equated common species (e.g., deer, coyotes, song birds) with wildlife, and people may hold different views about privatizing charismatic megafauna, endangered species, or pest species. Finally, future studies should explore additional explanatory variables to improve model fit such as indicators of ability to profit from wildlife privatization.

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