Understanding Land Conservation from Diverse Stakeholder Perspectives

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ABSTRACT

In this paper, we discuss the perspectives of diverse stakeholders on the changing nature of rural communities and land conservation. We used a questionnaire derived from interviews with stakeholders in two locations near expanding metropolitan areas at the edges of the southeastern and eastern forests. Based on principal component analysis, responses were most highly correlated within three perspectives: (1) quality of life ("green"), (2) producers conserve ("rosy"), and (3) growing communities ("amber"). Mean scores of respondents varied significantly between locations for two of the three components. Correlations among the components suggest that the ways stakeholders conceptualize conservation are more complex than previously described as a simple continuum of biocentrism and anthropocentrism. We identified specific themes most likely to be problematic in shaping communication among stakeholders and discuss implications for public outreach, collaborative learning interventions and professional development programs. We recommend practitioners and academics move beyond simplistic stereotypes of "urban environmentalists" and "rural agriculturalists".

Keywords *cultural models, factor analysis, stakeholder analysis, rural communities, wildland urban interface, conflict resolution, collaborative learning, principal components analysis, working landscape*

INTRODUCTION

In North America, natural resource agencies and land trusts interact with increasingly complex constituencies in regard to the design and implementation of conservation policies (Brewer 2003; Paolisso 2006). This is especially true in agricultural and forested areas that are rapidly urbanizing (Bright and Burtz 2006; Bright et al. 2007). In this paper we analyze how stakeholders conceptualize

land conservation in urbanizing rural communities in two places: the Big Thicket of southeastern Texas (Cozine 2004; Weeks and Packard in press) and the Eastern Shore of the Chesapeake Bay in Maryland (Paolisso and Maloney 2000, Wennersten 1992). Both places are valued rural landscapes threatened due to urbanization and changing markets for their resource-based economies. Also, land conservation is recognized by a wide range of stakeholders in each place as a priority that will help maintain rural livelihoods and the regions' cultural identity and heritage. We argue that understanding the complex ways in which stakeholders conceptualize land conservation both within and between ecological and administrative regions can facilitate positive interactions between conservation professionals and local stakeholders.

Research on urbanizing rural areas has described the conflict that can arise when conservation orientations collide (Walker and Fortmann 2003; Racevskis and Lupi 2006). Not being dependent on resource extraction or agricultural production for their livelihoods, newcomers have lobbied against development strategies based on resource extraction, and in favor of non-extractive development strategies such as eco- and heritage-tourism (Walker 2003; Jobes 2000; Knott 1998). Newcomers' views can be at odds with more traditional views of the land as a resource and rural communities as producers of vital goods (Brown 1995; Salamon 2003). Consequently, conservation oriented newcomers who promote aesthetic landscapes are sometimes "viewed as political threats" by long-time residents (Walker and Fortmann 2003:469). The differences among diverse stakeholders with respect to how land is valued can be central to land conservation efforts, and the contribution of conflicting values to environmental controversy has been well documented (Yaffee 1994; Clark et al. 1994; Dietz et al. 2005).

Differences in the ways that the public conceptualizes conservation have been framed along an anthropocentric/ biocentric continuum (Steel et al. 1994; Brunson and Steel 1996). Natural resource dependent communities have been theorized as more likely to view nature in terms of its instrumental value than non-resource dependent communities (McFarlane and Boxall 2000). Furthermore, rural communities, which are often dependent on natural resource extraction, are associated with a utilitarian ethic and there is some evidence of differences between the western and eastern regions of the United States (Brunson and Steel 1996). However, an alternative paradigm that views humans and nature as interdependent has also been identified within broader global communities (Corral-Verdugo et al. 2008).

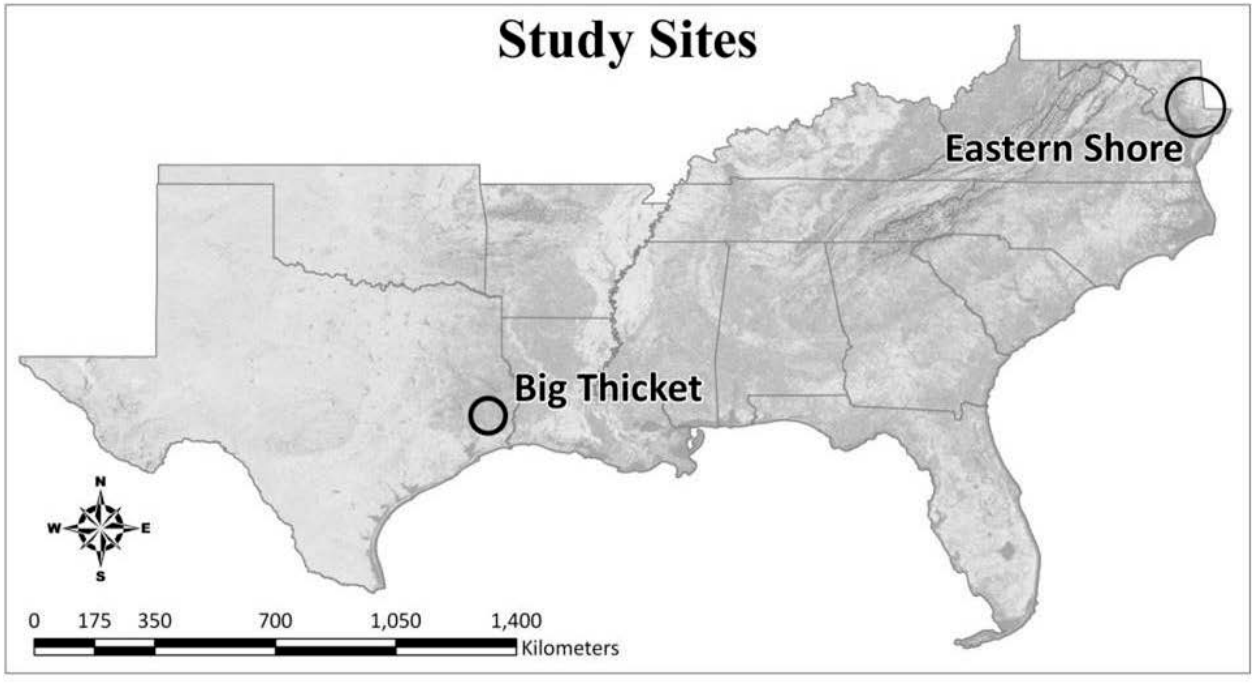
Racevskis and Lupi (2006) argue that stakeholder conceptualizations of conservation are complex and this diversity is not well represented using solely an anthropocentric-biocentric continuum. They employed a mixed qualitative-quantitative method that analyzed focus group statements for thematic content and applied frequencies to answers. The focus group discussions revolved around the topics of forest services, wildlife-forest interactions and forest management. Although Racevskis and Lupi (2006) did find support for the hypothesis that natural resource dependent communities were concerned about maintaining forest utilitarian productivity, they also found that rural communities expressed deep emotional attachment to forests that were not utilitarian in nature.

Our inductive research further expands and refines the work of Racevskis and Lupi (2006) by extending the knowledge domain from forests to land conservation in general, expanding the sample size of stakeholders through the use of questionnaires grounded in content analysis of interviewee's discourse, and employing statistical analysis to discover the dimensions that best explain the variation in stakeholder perspectives. If the anthropocentric/biocentric continuum does not adequately describe perspectives emerging as people with urban and rural backgrounds interact in ex-urban environments, we wanted the data to tell us what would be more valid dimensions. The results reported here are part of a larger study[i] in which an inter-disciplinary team composed of natural and social scientists used qualitative and quantitative approaches to understand the relationship between shared and individual perspectives on land conservation in two locations with very different histories of urban-rural interactions– the Big Thicket of southeastern Texas and the Eastern Shore of Maryland.

Study Sites

The Big Thicket in East Texas and the Chesapeake Eastern Shore in Maryland were selected as study sites to maximize diversity in terms of land conservation efforts and types of rural stakeholders (Figure 1). Both sites are: 1) home to natural resource dependent communities; 2) near to large metropolitan areas and face heavy land development pressures; 3) ecologically important areas; and 4) working landscapes with a mosaic of protected areas (private, county, state and federal). In both regions, conservation is both supported and a subject of controversy (Cozine 2004; Paolisso and Chambers 2001; Birchard 2005).

Figure 1. This study was grounded in two sites with different histories of urban flight, BigThicket at the western edge of the southeastern forest region, and in the Eastern Shore at the southern edge of the eastern forest region.



Eastern Shore

The Eastern Shore is a broad swath of rich land in Maryland and Virginia that runs along the eastern edge of the Chesapeake Bay, within a 2-hour driving range of Washington D.C. (Wennersten 1992). Of immense importance to the ecological health of the Chesapeake Bay, 40,000 acres of the Virginia Coast Reserve was declared an international biosphere reserve in 1979. The region is characterized by wetlands, sounds, bays, near-shore islands, and creeks and rivers, valuable habitat for migratory waterfowl (Scott 1991). The marshlands and wetlands play pivotal roles in preventing agricultural nutrient runoff from entering the Bay (Ernst 2003).

Farming, forestry and fishing are still the keystones of the Eastern Shore economy, landscape and way of life. As Maryland's most concentrated agricultural region, counties in the Middle Shore area account for almost one-third of Maryland's agricultural land and produce over 50% of major crops, such as corn, soybean, wheat and barley (Eastern Shore Land Conservancy 2002). Despite this, the Eastern Shore is ranked by the American Farmland Trust as one of the most threatened working landscapes in the country; nearly 52,000 acres of farmland on the Eastern Shore were lost from 1980 to 2000 (Eastern Shore Land Conservancy 2002: 12).

Eastern Shore land conservation is implemented through a number of state-run or state-affiliated programs (Eastern Shore Land Conservancy 2002). These programs have a mix of incentives as well as local and state level regulations. County leaders are looking beyond the immediate difficulties with housing developments and are taking a regional approach, as exemplified by agreement of six counties in the Middle and Upper Shore to work cooperatively toward the goals of a regional vision (Eastern Shore Land Conservancy 2002). As the focus of our research on the Eastern Shore, these six counties have a wide range of natural resource user groups, e.g. agricultural, fishing and recreational.

Big Thicket

At the western edge of the southeastern forests characterized by mixed pine and hardwoods, the Big Thicket occupies poorly drained soils within a 2-hour driving range of Houston, Texas (Watson 2006; Gunter 1993). Settled in the 1800's by Appalachian migrants to the frontier between French and Spanish territory, this working landscape supported subsistence farming and hunting (Sitton 1995; Abernathy 1966). Waves of economic development occurred with logging and oil/gas production in the region. Farming, forestry, and the oil/gas industry still contribute substantially to the region's economy, augmented by businesses associated with expanding urban areas around Beaumont and scattered retirement communities. Otherwise, much of the region is currently sparsely populated with total county populations of fewer than 50,000 people. We focused our research on the six counties adjacent to the Big Thicket National Preserve, which was declared one of the ten most endangered protected areas (National Parks Conservation Association 2005).

Nicknamed a biological crossroads because of its location at the edge of forest, wooded grasslands and coastal plains, the Big Thicket National Preserve and international biosphere reserve

was established in 1974 to protect the remaining biodiversity in southeast Texas (Cozine 2004). The thirteen units of the Preserve are scattered among towns, small farms, timber stands, and housing developments. Originally extensive commercial forests buffered the mosaic of lands protected by private, state and federal initiatives. With global changes in markets for timber and wood products, the major timber corporations have divested the less productive timber lands as land values rose in the region[ii]. The region is on the cusp of change as suburbs are expanding into the forests and forest lands are being subdivided into lots ranging from twenty acres to several hundred acres, with implications for changes in biocomplexity (Callicott et al. 2006).

No strategic planning has been done to coordinate the decisions made by county governments in the Big Thicket area, although a strategic plan for development of the Preserve has been completed (Big Thicket Association 2006). In The Pineywoods Experience initiative led by The Conservation Fund, an informal network of county leaders has been encouraged to share information to attract tourists to the diverse activities and destinations offered all along the Neches River, a major watershed in east Texas.[iii] The persuasive argument has been that without an economic driver coupled to land conservation, there will be few incentives to maintain the natural beauty of the region, as needed to attract qualified workers and industries with a small environmental footprint. The Nature Conservancy has fostered partnerships with civic organizations, regional foundations, state and federal agencies, thereby enhancing leadership development and scientific exchange in the region. In southeast Texas, no organization has taken on a role equivalent to the Eastern Shore Land Conservancy.

In summary, the sharp contrasts in the manner in which land conservation efforts are currently being implemented in these two study sites, led us to hypothesize that together they would encompass a wide range of stakeholder perspectives. The Eastern Shore benefits from Maryland's national leadership in terms of a well-developed array of land conservation programs with different missions and implementing organizations (Eastern Shore Land Conservancy 2002). In contrast, conservation in the Big Thicket is informal, community-based, and has minimal systematic support by state and county governments.

Methods

We integrated qualitative and quantitative methods. First, in-depth interviews were conducted and content analysis was used on interview transcripts to identify key themes in interviewees' discourse on land conservation. Next, surveys were constructed which unpacked themes into their constituent statements. Third, principal component analysis was used to discover correlations among responses and the extent to which perspectives differ between locations and among stakeholder groups.

Data Collection

Design of the survey instrument was based on the qualitative analysis of themes that emerged from 100 transcripts of guided, open-ended interviews with members of the following stakeholder groups working and living in our research regions: conservation organizations, state and federal natural resource agencies, community leaders and residents, timber and agricultural producers, elected

officials and developers (economic and real estate). We worded survey items using the terms that people employed in interviews, sometimes phrasing the same idea in different terms to accommodate diverse linguistic patterns. Respondents were asked to score each of 50 items on a 4-category scale ranging from "strongly disagree" to "strongly agree". Demographic questions were also included (e.g. age, gender, ethnicity, education). The survey was in compliance with the Institutional Review Board of the University of Maryland.

Comparable networks of stakeholders were identified at each site through participant observation and interviews (e.g. membership lists of non-governmental, state, and federal organizations). Organizations who agreed to be partners in distribution of the mail-out survey, provided cover letters that were included with the questionnaire with a business-response envelope. Some organizations provided the address lists directly, others sent out the mailings from a confidential address list and one requested that we compile an address list otherwise not available (owners of taxable properties in the range of 30-100 acres at the western site). Some organizations preferred to distribute the survey on-line, and the project used Survey Monkey to collect responses.

Standard procedures were used for this mixed-mode survey, as recommended by Dillman et al. (2008). Survey results were treated as anonymous and confidential. Reminders were sent within two weeks of the initial mailing, and the window of response was closed after 4 months. Our best estimate of the response rate for the eastern site and western sites were 17% and 23%, respectively[iv]. Although the original survey design was for equal samples from both sites, the actual number of respondents was greater for the eastern site (n = 724) than the western site (n = 482). Prior to the statistical analyses described below, the database was filtered to include only cases without missing values and with a positive response to the question about willingness to participate in the study, resulting in a final data set of 746 respondents (eastern site, n = 472; western site, n = 274.

Data Analysis

Our analytical questions were: (1) What underlying dimensions or factors best describe the variation in perspectives on land conservation across the two sample locations? (2) Which specific response variables are associated with more than one component? (3) Do the respondent scores for each of these components vary independent of sample location?

We applied a hierarchical approach[v] to understand patterns of variance in responses to the questionnaire, using principal components analysis (PCA in SPSS 16.0; Pallant 2001). The variables were the 50 questions/statements in the questionnaire, which we refer to below as "item-variables". First we examined the overall percent of variation explained by unrotated factors to choose between using PCA to: (1) reduce the number of variables to a smaller set of uncorrelated (orthogonal) factor scores, or (2) discover the inherent patterns of correlations best described by linear combinations of variables (rotated principal components). We chose the latter approach because the unrotated orthogonal factors only explained 41% of the variance. Second, we used standard guidelines (Pallant 2001)to identify the least number of components needed to explain the patterns of variation in the data. Third, we interpreted these components based on the loadings of item-variables, represented by the values in the structure matrix. Finally, we exported scores for each respondent on each of three

components, and examined the effect of sample site on the mean values of the scores for each component.

We used three procedures in PCA to examine responses to 50 item-variables, i.e. statements in the questionnaire. We found the data to be suitable for PCA analysis due to (1) a high value of the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (KMO value = 0.925) and (2) a highly significant value for the Bartlett's Test of Sphericity (approximate Chi-square = 14386.55; p = 0.00). Examining the correlation matrix of item-variables, there was no evidence of singularity or lack of correlation. Only two items showed consistently low values ($r < 0.3$) across the correlation matrix: "Without active management, nature cannot live up to its potential" and "Land conservation may be a tool to preserve agricultural land but it is not a mechanism to make agriculture sufficiently viable so that farmers can continue to work the land." These two items did not meet our criteria for inclusion in results reported below in Tables 1-3.

Unrotated factor analysis yielded eigenvalues[vi] above 1.0 for nine factors. The first three orthogonal factors explained a cumulative 41% of the variance; the fourth only explained an additional 3%. These unrotated orthogonal factors were not easy to interpret based on factor loadings, the pattern of which did not correspond well to results of our qualitative analyses. Subsequently, we examined the underlying structure of the variance in the data. Two rotations were performed: (1) orthogonal (Varimax) and (2) oblique (Oblimin with Kaiser Normalization). The cumulative percentage of variance explained did not change with the orthogonal rotation. The rotated orthogonal components were correlated (C1, r=0.89; C2, r=0.80; C3, r=0.88). In the component transformation matrix, the correlation between C1and C3 ($r = 0.09$) changed less compared to the correlations between C1 and C2 ($r = -0.46$) and C2 and C3 ($r = 0.47$). Due to this high correlation among components, it was not appropriate to add the cumulative variance explained by the statistical model that we finally accepted as a best fit (i.e.the oblique rotation).

We used the structure matrix from the oblique rotation to identify subsets of item-variables that were most highly correlated and unique to each component. For example, the item-variables that loaded high (above 0.30) on only the first component were selected for interpretation of that component. Examining the component score covariance matrix for the oblique rotation, component 3 was more related to component 1 (cov = 2.13) than it was to component 2 (cov = -0.02). To better understand the variance underlying these correlations, we selected those item-variables that loaded high on two or more components. We report these subsets of items variables below (Tables 2 & 3), which we interpreted in terms of agreements and disagreements.

Finally, we used t-tests to examine the effect of location on mean scores calculated for respondents for each of the three components (oblique rotation). The independent variable was Location (eastern or western site) and the dependent variables were Component Scores (C1, C2, C3). Levene's test indicated equality of variances for C1 and C2, not for C3. The significance level for differences between means was set at $p > 0.05$.

Results

Our results illustrate that the complex nature of stakeholder conservation orientations are not sufficiently described by a single anthropocentric-biocentric continuum. Furthermore, we illustrate how un-packing conservation orientations into constituent elements facilitate the identification of those points on which diverse stakeholders likely agree and those points on which agreement will not be likely. Results are presented below in the same order as our three analytical questions: (1) principal components underlying the variation in responses, (2) correlations among principal components, described in terms of agreement and disagreements, and (3) effect of sample site on variation in responses.

Principal Components

We labeled the first three principal components resulting from the oblique rotation in terms of colors: green, rosy and amber. We used colors to provide stakeholders with implicit reference frames that intuitively make sense and are general enough that individuals could "see themselves looking through different color lenses" to better understand diverse perspectives on land conservation.

The weights of item-variables in the structure matrix were useful for interpreting the variance represented by each component (Table 1). More item-variables weighed high exclusively on the first component 1 (16 items) compared to the second (10 items) and third (4 items). Our interpretations of these components follow.

> *Green Component 1: Land conservation is important and a moral imperative because it maintains the quality of life (in terms of clean air and water, continuity in local communities, landowner equity, open spaces, a sense of place, rural identity, native species in healthy ecosystems) by protecting esthetically valuable sites from irreversible damage.*

Respondents who agreed with the statement that "Land conservation is important to maintain quality of life", also were likely to agree that land conservation provides benefits in terms of landowner equity, the character of local rural communities and the environment (clean air and water). Respondents were slightly less likely to agree that land conservation sustains a sense of place, native plants/wildlife, beauty and healthy ecosystems, by prioritizing areas threatened by development.

One value statement weighed high only on this Green Component: "it is a moral imperative to conserve land". Associated with this value were beliefs that (1) land is finite and should be protected from over-use, and (2) local governments are integral to success of land conservation, which can stem unwanted growth. Respondents were likely to believe that development should be limited to designated areas and people should be able to use the land as long as meeting the needs of their livelihood did not adversely affect the environment.

Table 1. Questionnaire statements most highly correlated with each component, sorted by values in the structure matrix of principal components analysis. Items that loaded high on more than one component are listed in Tables 2 & 3. Dashes represent values less than 0.30.

Item-variable: statement in questionnaire	**Component**		
	1	**2**	**3**
Loaded high only on Component 1 "Green"			
Land conservation is important to maintain quality of life.	0.79	--	--
Land conservation helps preserve the continuity of local communities.	0.77	--	--
Land conservation can preserve a landowner's equity and open spaces for environmental purposes.	0.77	--	--
Land conservation provides environmental benefits such as clean air and water.	0.76	--	--
Land conservation helps preserve a "sense of place."	0.73	--	--
Land conservation helps to preserve rural identity and character.	0.71	--	--
We should conserve lands that most people would agree are beautiful, uplifting, or unique.	0.70	--	--
Conserving land helps to maintain healthy ecosystems.	0.70	--	--
Land conservation helps to sustain native plants and local wildlife.	0.70	--	--
It is a moral imperative to conserve land.	0.67	--	--
Land conservation efforts should prioritize land that is threatened by development.	0.66	--	--
Land is finite and damage to it can be irreversible, therefore we must protect it from over-use and abuse.	0.63	--	--
Local governments are integral to the success of land conservation efforts.	0.57	--	--
Development should occur in areas designated for growth.	0.54	--	--
Land conservation can stem unwanted growth.	0.52	--	--
People should use the land to meet their livelihood needs as long as it does not adversely affect the environment.	0.35	--	--
Loaded high only on Component 2 "Rosy"			
Natural resource producers of food, fiber, and timber are the best land conservationists.	--	0.77	--
The profitable production of natural resources (food, fiber, timber) is the best way to conserve land.	--	0.76	--
Land is an economic resource, like other financial assets, that can be used to meet the short- and long-term financial needs of its owners.	--	0.66	--
If land conservation efforts are to be successful, voluntary approaches should be pursued over regulatory ones.	--	0.61	--
More land would be preserved through profitable farming than through the purchase and donation of land conservation easements.	--	0.62	--

Item-variable: statement in questionnaire	**Component**		
	1	**2**	**3**
The purpose of land conservation is to maintain the land's ability **to** provide a secure livelihood for communities now and in the future.	--	0.59	--
It is unfair to take away a landowner's development rights without adequate compensation.	--	0.57	--
More land could be conserved if land conservation programs did not require land to be preserved in perpetuity.	--	0.56	--
Preserving environmental resources is more important than preserving working lands (i.e., lands used to produce grain, livestock, timber, etc.).	--	**-0.52**	--
Mother Nature is pretty tough and if we let her alone, she will come back even after disturbances such as clear cutting, over grazing, or hurricanes.	--	0.36	--
Loaded high only on Component 3 "Amber"			
Land is a resource to allow communities to grow to meet economic and housing needs.	--	--	0.68
Development can be a net positive for the environment, if planning is adequate and appropriate technologies are used.	--	--	0.60
Wise use of land requires us to balance human needs and nature's needs.	--	--	0.57
Successful land conservation efforts cannot be accomplished unless all interested stakeholder groups are able to play an active role and participate in the decision-making process.	--	--	0.54

Rosy Component 2. Land conservation is best accomplished through voluntary actions by landowners who are engaged in profitable production of natural resources (food, fiber, timber), thereby protecting economic assets for their families and communities, now and in the future.

Respondents who agreed with the statement that "natural resource producers of food, fiber, and timber are the best land conservationists" also agreed that the best way to conserve land was through profitable production of natural resources (Table 1). They viewed the purpose of land conservation in terms of securing a livelihood for communities now and in the future.

They were likely to disagree that protecting environmental resources was more important than protecting working lands, and to agree that land was an economic asset for their families in times of crisis. An associated belief was that more land could be conserved if land protection was not "in perpetuity" and if landowners received fair and adequate compensation for relinquishing development rights. Profitable farming was preferred over purchase and donation of conservation easements.

Amber Component 3. A balance of humans' and nature's needs should guide land conservation such that it is integrated into community growth, by using adequate planning and appropriate technology to allow communities to meet economic and housing needs through active inclusion of all interested stakeholder groups in the decision making process.

Respondents who agreed that "Land is a resource to allow communities to grow to meet economic and housing needs" were also likely to agree that with adequate planning and technology, development can be accomplished in ways that are a net positive for the environment (Table 1). They were likely to agree that the balance of human needs and nature's needs should be considered in decisions about wise use of land.

Active stakeholder participation in the decision making process was a theme associated with the Amber Component 3. According to this belief, successful land conservation efforts could not be accomplished without including all interested stakeholder groups.

Agreement and Disagreement

The complex interactions among perspectives on land conservation are represented by item-variables with high weights on more than one component. We labeled those with positive weights as agreements (Table 2) and those with both positive and negative weights as disagreements (Table 3).

The positive correlation between the Green and Rosy components were reinforced by three items (Table 2): (1) land conservation should preserve working lands and open spaces, (2) the purpose of conserving some lands is production, and (3) land conservation efforts should prioritize activities that help people make a living off the land.

Items contributing to the positive correlation between Green and Amber components included (Table 2): (1) land conservation is about using resources wisely to meet varying future needs of diverse landowners and communities, and (2) lands should be conserved for recreation. Respondents agreeing with these items also were likely to agree with inclusive approaches: (1) successful land conservation efforts start with building trust and good working relationships among stakeholder groups, and (2) land conservation could be integrated into growth and development if political, social and economic systems worked as designed.

The Rosy and Amber components were linked by three reinforcing item-variables (Table 2): (1) land is a source of income in times of family crisis, (2) conservation is managing land for its highest and best use, which can change with economic and social needs, and (3) land conservation should be integrated into growth and development.

Competing perspectives were detected primarily between the Green and Rosy components (Table 3). Items that weighed positive on Green and negative on Rosy included: (1) we do not have the right to negatively impact other species, (2) land conservation efforts should prioritize activities that conserve ecologically unique or special areas, and (3) some land needs to be conserved where nature can be allowed to flourish with little or no contact from humans. In contrast, the following items weighed positive on Rosy and negative on Green: (1) land conservation limits land values, (2) land conservation may limit a landowner's ability to use his/her land in a way that is necessary to meet his/her short- and long-term needs, (3) land use decisions should be primarily governed by landowners, and (4) humans are the dominant species and meeting our needs should be a priority.

One item weighed negative on Green and positive on Amber (Table 3): "Conservation at all costs is unreasonable. Some costs cannot be tolerated." This item was positively correlated with the Rosy component in the structure but not the pattern matrix.

Table 2. Item-variables that loaded both high and positive on more than one component, sorted by loadings in the structure matrix. Items with loadings less than 0.30 on two components were dropped from this list. A dash indicates a loading less than 0.30.

Item-variable: statement in questionnaire	Component		
	1	2	3
High loadings on Components 1 and 2			
The purpose of conserving some lands is to provide income from food, fiber, and timber production.	0.38	0.41	--
High loadings on Components 1 and 3			
Land conservation is about using resources wisely so that they will be available to meet the varying future needs of diverse landowners and communities.	0.62	--	0.38
It is important to conserve lands for recreation.	0.57	--	0.32
Land conservation could be integrated into growth and development if political, social, and economic systems worked the way they were supposed to.	0.42	--	0.59
Successful land conservation efforts start with building trust and good working relationships among stakeholder groups.	0.50	--	0.51
Land conservation should be integrated into growth and development.	0.45	--	0.53
High loadings on Components 2 and 3			
Land is a source of income in times of family crisis.	--	0.47	0.36
Land conservation efforts should prioritize activities that help people make a living off of the land.	--	0.53	0.36
Conservation is managing land for its highest and best use and that can change according to economic and social needs.	--	0.44	0.56

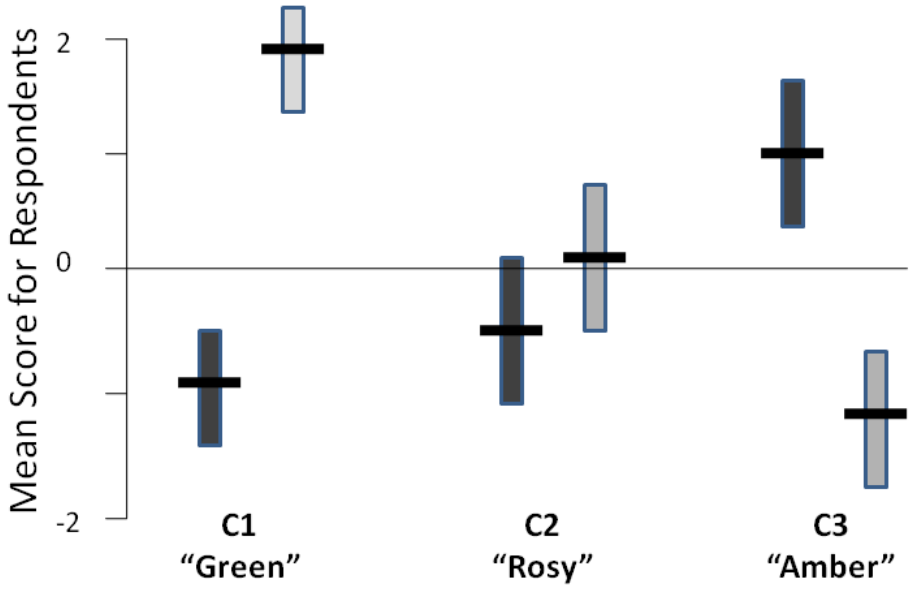
Table 3. Questionnaire statements that loaded high on two components with a negative sign for at least one, sorted by the pattern of positive and negative loadings in the structure matrix. A dash indicates a loading less than 0.30.

Item-variable: statement in questionnaire	Component 1	2	3
Disagree/Agree/Agree			
Conservation at all costs is unreasonable. Some costs cannot be tolerated.	**-0.36**	0.44	0.36
Agree/Disagree			
Some land needs to be conserved where nature can be allowed to flourish with little or no contact from humans.	0.61	**-0.42**	--
Land conservation efforts should prioritize activities that conserve ecologically unique or special areas.	0.63	**-0.36**	--
Land is finite and damage to it can be irreversible, therefore we must protect it from over-use and abuse.	0.65	**-0.32**	--
We do not have the right to negatively impact other species.	0.48	**-0.39**	--
Preserving environmental resources is more important than preserving working lands (i.e., lands used to produce grain, livestock, timber, etc.).	0.34	**-0.53**	--
Disagree/Agree			
Humans are the dominant species and meeting our needs should be a priority.	**-0.38**	0.64	--
Land use decisions should be primarily governed by landowners.	**-0.35**	0.72	--
Land conservation limits land values.	**-0.38**	0.47	--
Land conservation may limit a landowner's ability to use his/her land in a way that is necessary to meet his/her short- and long-term needs.	**-0.33**	0.35	--

Response Patterns Varied between Sample Locations

The variation in the response patterns was not independent of location. Mean respondent scores differed significantly between sample sites for two of the three components (Figure 2). On the average, the scores of respondents from the Eastern Shore were significantly lower on the Green Component 1 ($t = -3.604$, $p = 0.000$) and higher on the Amber Component 3 ($t = 3.013$, $p = 0.003$) compared to the Big Thicket. For the Rosy Component 2, mean scores did not differ significantly between sample sites ($t = -0.671$, $p = 0.503$).

Figure 2. Mean respondent scores varied significantly between the Eastern Shore sample (dark bars) and Big Thicket sample (light bars) for the first and third components (t = -3.604, p = 0.000; t = 3.013, p = 0.003, respectively, but not the second component (t = -0.671, p = 0.503).



In summary, response patterns were not random, but they also did not conform to distinct clusters of variables on three components that could be used to summarize a high portion of the variance. The three components with meaningful interpretations reflected complex interactions among patterns of agreement and disagreement with item statements in the questionnaire. The labels we chose represented shades of meaning that were both competing and reinforcing, as documented in the patterns of items that were correlated with more than one component. Risking oversimplification, we interpreted the components as representing: nature priority (Green C1), human priority (Rosy C2) and balanced human/nature priorities (Amber C3). It is important to remember that nature priority, for example in component one, does not mean human exclusion. We assert that it is the complexity of each of these perspectives that opens the door for collaborative learning.

Discussion and Implications

The results of this inductive study contribute to a fuller understanding of diverse perspectives about the complex relations between humans and the environment, associated with land conservation. Although the perspectives of stakeholders responding to our questionnaire were not crystallized in terms of dichotomies (e.g. biocentric vs. anthropocentric), the variation in responses was correlated with three components we labeled as green, rosy and amber. These

components were useful in measuring statistical differences between two locations that differed qualitatively in the history and complexity of institutional structures supporting land conservation efforts. The principal components analysis was useful in identifying statements likely to elicit agreement across diverse perspectives as well as specific themes most likely to be problematic in shaping communication among stakeholders. Here we discuss implications for public outreach, collaborative learning interventions, professional development programs and further research.

Public Outreach

In the design of public outreach materials describing land conservation efforts, professionals make decisions about who is their audience. Previous assumptions about the constituents of formal and informal outreach programs may need to be reexamined, based on the results of this study. For example, outreach materials previously designed to appeal to producers in rural areas may no longer resonate with audiences influenced by the demographic shifts associated with urban flight and resettlement of workers due to changing rural economies. In other words, outside rapidly expanding metropolitan areas, it may hard to pigeon-hole people in terms of urban environmentalists vs. rural agriculturalists. There is complex variability in the ways that people make sense of land conservation, and these beliefs and values are active factors in discussions, planning and policy development. Urban environmentalist and rural agriculturalists are certainly two labels that are used, but probably even the labelers know these two categories are overly simplistic.

By examining the themes that were correlated with each of the components identified in this study, designers of outreach materials have more information about how to appeal to specific audiences. For example, if a brochure were to be designed around the salient theme that "land conservation is associated with quality of life" (i.e. green component) it would likely appeal to people who agreed that quality of life is a mix of (1) the sense of place found in local communities, (2) landowner equity and (3) the environmental benefits provided by open space, clean air and water. To reach an audience that agrees with the statement "producers are our best conservationists" (i.e. rosy component), salient themes to be considered would include economic benefits of caring for land such that it continues to produce, provide financial assets, and motivate voluntary approaches to protect natural resources. For an audience that talks more in terms of "community growth" (i.e. amber component), appealing themes would include achieving a net positive outcome by planning to balance the needs of humans and nature using appropriate technology.

For mixed audiences, designers of outreach programs may pay more attention to the themes that correlated with more than one component identified in this study. For example, in communicating about the uncertainties associated with future change, a theme phrased in terms of "land conservation is about using resources wisely so that they will be available to meet the varying future needs of diverse landowners and communities" would be more likely to appeal to people who agreed with the statements correlated with both the green and amber components. Rephrasing the idea in terms of "conservation is managing land for its highest and

best use and that can change according to economic and social needs" would be more acceptable to people who agreed more with the rosy and amber perspectives.

Unless the desired outcome is to spark conflict, themes that loaded positive on one component and negative on another should be avoided in outreach activities for mixed audiences. For example, although people who agree with the statements correlated with the green component may see nothing wrong with the statement "some land needs to be conserved where nature can be allowed to flourish with little or no contact from humans," this is likely to be a flash point for people who agree with the items in the rosy component. Likewise, although people who agree with the rosy perspective may agree that "humans are the dominant species and meeting our needs should be a priority," the same statement may elicit strong disagreement from those with a more green perspective.

We argue that analysis of one component in isolation is insufficient, and that analysis of the complex interactions among components in belief systems enhances the success of problem-solving approaches to implementation of conservation outreach programs. Where ecological boundaries do not map onto social and political boundaries, these insights can enhance how scientists and natural resource managers interact with their constituents. Because variation exists within and across geographic regions, a management approach that is acceptable in one region might meet with resistance in another region. Being sensitive to geographic differences in perceptions about land conservation could lead to more effective adaptation of general national policies to meet specific local needs, as administered through statewide organizations.

Collaborative Learning Interventions

Our results have important implications for collaborative learning approaches to help diverse stakeholders work together on "fuzzy" problems. By collaborative learning interventions, we refer to structured learning activities through which participants are encouraged to learn more about diverse ways that stakeholders frame natural resource problems (Daniels and Walker 2001; Pahl-Wostl 2006; Smith and MacGregor 1992).

One contemporary approach to solving the complex problems associated with watershed management includes formation of advisory committees representing diverse stakeholder groups (Hermans et al. 2007). However, when stakeholders with diverse perspectives are brought to the same table, facilitators run the risk of miscommunication that can derail productive problem solving (Walker and Hurley 2004). Paolisso (2006) suggested a cultural models approach to collaborative learning that could help to open communication between groups as diverse as fisheries scientists and watermen of Chesapeake Bay. For example, in a collaborative learning workshop, both groups discovered that they shared a common love for the bay and they realized that they both made a living off of the bay – it produced knowledge for one and seafood for the other. After explicitly acknowledging this implicit commonality, they were better able to communicate about the threats to the resources they both valued.

Shifts in the ways stakeholders perceive problems has been related to willingness to consider options for solutions otherwise not on the table (Gray 2003). Conversely, resistance to reconceptualizing problems has been related to a low degree of collaboration (Gray 2004). The theoretical basis for research on how framing influences conflict is rich (Dewulf et al. 2009) and beyond the scope of this paper. However, understanding that perspectives on land conservation are composed of several ideas about the relations between nature and people can aid in cooperative learning interventions because it can lead to re-framing of issues in a manner that reinforces the commonalities among seemingly diverse perspectives. A good example of this are programs that aim to preserve the functions of ecosystems while at the same time protecting the resilience of a particular group's way of life within a working landscape.

For facilitators designing collaborative learning interventions for diverse stakeholder groups, additional understanding of the variation in cultural models of land conservation could be useful. For example, if the aim of an activity is to enhance understanding of a different viewpoint, the items that correlated exclusively with one of the components in this study (Table 1) might be chosen in design of the learning task to clarify the differences between and similarities within cultural groups. Conversely, if the aim is to understand how one group defines their own identity in opposition to another group, then the statements correlated positively and negatively on two components (Table 2) might spark lively discussion. An activity with the goal of helping participants discover commonalities might draw on the statements that correlated positively with two components (Table 3).

Ultimately, we are interested in how shared learning experiences (e.g. cooperative learning workshops) influence willingness to understand environmental problems from a perspective different than the one an individual came to the table with. Theoretically, by solving a cooperative learning task together, diverse stakeholders share an experience that may help them to understand how their own cognitive framework compares to other stakeholders with different life experiences.

Professional Development Programs

We recommend integrating knowledge about diverse perspectives on land conservation, such as provided in this study, into professional development programs. Professionals who have worked with diverse constituencies for a long time are likely to have an intuitive knowledge of the complexities documented (Weeks and Packard 1997). However, agencies are undergoing demographic shifts as aging cohorts retire. Our research provides scientific documentation, making it easier to talk about what otherwise may remain implicit knowledge of cultural diversity that is lost from institutional knowledge in the process of employee turnover.

Adaptive programs such as the Wildlands Urban Interface initiative of the U.S. Forest Service have been designed to respond to changing constituencies resulting from demographic and geographic shifts in populations. An important component is the professional development curriculum that aims to help employees learn social skills to interface effectively

with increasingly more diverse stakeholders, with whom the "new foresters" are likely to interact. A set of 23 case studies is provided within the southeastern region's curriculum, illustrating both the place-based nature of the challenges facing foresters and the complex interactions among diverse stakeholders engaged in finding innovative solutions.

Initiatives for professional development can be very effective in encouraging employees to reflect on their own perspectives about land conservation and how that relates to others in their workplaces and to the communities that they serve. As administrative mechanisms to implement federal programs through statewide networks become more sought after, other organizations are likely to recognize and respond to professional development needs for both incoming and mid-career employees. For example, The Conservation Fund has partnered with U.S. Fish and Wildlife Service in offering professional development courses serving the conservation communities.

The information provided in this study could be useful in training activities encouraging employees to look at a given case through the lenses of diverse stakeholder groups. For example, a professional more comfortable with the amber than the green perspective might be asked to explain the perspective of a citizen who agrees with the statements correlated with the green component in Table 1. Professionals could be encouraged to learn to listen for key phrases correlated with each perspective and to ask questions to better understand each citizen's unique cognitive model before jumping to erroneous assumptions based on stereotypes with limited validity.

We infer from the results of this study that the diverse perspectives stakeholders express about land conservation are not easily reduced to the polar opposites of popular stereotypes such as environmentalists vs. developers. If this had been the nature of the variation in our database, we would have expected a few orthogonal factors to be the best statistical model fitting the data. For example, Berninger et al. (2009) defined three independent criteria (environmental, economic, social) to measure regional differences in cultural models about sustainable development along a continuum of industrial to small-producer communities. Application of the cultural models approach in other knowledge domains (Paolisso 2006, Paolisso and Chambers 2001) would suggest that understanding how people share in the ways they put ideas together in their heads may be more productive after documenting such diversity exists.

Conservation professionals may have a lot to learn from applied anthropologists who use the cultural models approach to reach a deeper understanding of the complexities underlying surface behaviors. Although current debates in the literature about the relative merits of a protectionist vs. a people-first approach to conservation have focused more on developing countries, the resulting understandings may be very relevant to under-developed frontiers in the developed world.

Further Research Needs

We need a more complete qualitative analysis of the items in this database to better understand how statements fit together in the cognitive models that people construct to make sense of the complex phenomenon called "land conservation". Although philosophers may draw clear lines between the preservationist approach of a John Muir and the conservation approach of Gifford Pinchot, clearly these lines were not clear in the minds of the diverse stakeholders who responded to this questionnaire.

This initial application of principal components analysis to understand how responses to statements were correlated is useful in deconstructing some of the parts of the whole. However, it does not help us understand how the pieces fit together in the minds of real people in the real world contexts where decisions affecting land conservation are being made on a daily basis. To the extent that peoples' responses were correlated in this database, there is something "cultural" about the way their shared experiences contribute to the similarities and differences in their perspectives. However, the fluidity of population movements across geographically and socially defined groups is likely to result in ephemeral associations that may not be stable across larger scales in time and space.

As Paolisso (2006) suggests, the cultural models approach has a lot to offer in better understanding the gaps between what people say and what they do. The cognitive schema or stories that people build in their own minds may offer more explanatory power. However, understanding to what extent these stories are the result of idiosyncratic personal experience and to what extent the stories are shared, reinforced and rejected through social learning processes may ultimately be the key to designing effective interventions to help groups work together toward desirable solutions.

We also need to better understand the variation among stakeholder perspectives within study sites to advance knowledge about the variations between regions. For example, by digging deeper into the implicit cultural models of farmers and watermen, Paolisso and Maloney (2000) were better able to provide insight regarding the barriers to compliance with water quality standards enacted to protect natural systems in the Chesapeake Bay. Complementary approaches need to be applied to better understand the interactions among governmental and non-governmental conservation initiatives in southeast Texas.

Summary

The issues to be addressed at the interface of urban expansion into rural areas are becoming more complex and constituencies more diverse. Diverse stakeholder perspectives on land conservation are not sufficiently described along a simple continuum of biocentric/ anthropocentric; three dimensions that better describe perspectives of participants in this study were interpreted as: (1) quality of life (green), (2) producers conserve (rosy) and (3) community growth (amber). Mean scores on two of these three dimensions varied significantly between two study sites with socio-economic histories and institutions as divergent as the

Eastern Shore of Maryland and the Big Thicket of Texas. Further results from integrated quantitative and qualitative analyses should provide a scientific foundation for design of interventions such as targeted public outreach, collaborative learning programs and professional development.

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References

Abernathy, F. 1966. *Tales from the Big Thicket*. Austin: University of Texas Press.

Berninger, K., D. Kneeshaw, and C. Messier C. 2009. The role of cultural models in local perceptions of SFM - Differences and similarities of interest groups from three boreal regions . *Journal of Environmental Management* 90(2):740-751.

Big Thicket Association. 2006. A Big Thicket Association Strategic Plan for the Stewardship of the Big Thicket National Preserve. Saratoga, TX: Big Thicket Association.

Birchard, B. 2005. *Nature's Keepers: The remarkable story of how The Nature Conservancy became the largest environmental organization in the world*. San Francisco: Jossey Bass.

Brewer, R. 2003. *Conservancy: The land trust movement in America*. Hanover: University Press of new England.

Bright, A. D., and R. T. Burtz. 2006. Creating defensible space in the wildland-urban interface: The influence of values on perceptions and behavior. *Environmental Management* 37(2):170-185.

Bright, A. D., P. Newman, and J. Carroll. 2007. Context, beliefs, and attitudes toward wildland fire management: An examination of residents of the wildland-urban interface. *Human Ecology Review* 14(2):212-222.

Brown, B. A. 1995. *In Timber Country: Working people's stories of environmental conflict and urban flight*. Philadelphia: Temple University Press.

Brunson, M. W., and B. S. Steel. 1996. Sources of variation in attitudes and beliefs about federal rangeland management. *Journal of Range Management* 49:69-75.

Callicott, J. B., M. Acevedo, P. Gunter, P. Harcombe, C. Lindquist, and M. Montincino. 2006. Biocomplexity in the Big Thicket. *Ethics, Place, and Environments* 9(1):21-45.

Clark, T., R. Reading, and A. Clark. 1994. *Endangered Species Recovery: improving the process*. Washington D.C.: Island Press.

Corral-Verdugo, V., G. Carrus, M. Bonnes, G. Moser, and J. B. P. Sinha. 2008. Environmental beliefs and endorsement of sustainable development principles in water conservation - Toward a New Human Interdependence Paradigm scale. *Environment and Behavior* 40(5):703-725.

Cozine, J. J. J. 2004. *Saving the Big Thicket: From Exploration to Preservation, 1685-2003*, *Number Four in the Temple Big Thicket Series*. Denton, TX: Big Thicket Association, University of North Texas Press.

Daniels, S. E., and G. B. Walker. 2001. *Working through environmental conflict: The collaborative learning approach*. Westport, CT: Praeger.

Dewulf, A., B. Gray, L. Putnam, R. Lewicki, N. Aarts, R. Bouwen, and C. van Woerkum. 2009. Disentangling approaches to framing in conflict and negotiation research: A meta-paradigmatic perspective. *Human Relations* 62(2):155-193.

Dietz, T., A. Fitzgerald, and R. Shwom. 2005. Environmental values. *Annual Review of Environment and Resources* 30:335-372.

Dillman, D.A. , J.D. Smyth, and L.M. Christian. 2008. Internet, Mail, and Mixed-Mode Surveys: The Tailored Design Method. New York: John Wiley & Sons

Eastern Shore Land Conservancy. 2002. Eastern Shore 2010. A Regional Vision for the Eastern Shore, edited by C. C. Report Presented to the Commissioners and Councilpersons for Caroline County, Dorchester County, Kent County, Queen Anne's County and Talbot County. .

Ernst, H. R. 2003. *Chesapeake Bay Blues: Science, politics and the struggle to save the bay*. Oxford, UK: Rowman & Littlefield Publishers, Inc.

Gray, B. 2003. Framing of environmental disputes. In *Making sense of environmental disputes: Frames and cases*, ed. R. J. Lewicki, B. Gray and M. Elliott. Washington, DC: Island Press.

———. 2004. Strong opposition: Frame-based resistance to collaboration. *Journal of Community & Applied Social Psychology* 14(3):166-176.

Gunter, P. 1993. *The Big Thicket: An Ecological Reevaluation*. Denton: University of North Texas Press.

Hermans, C., J. Erickson, T. Noordewier, A. Sheldon, and M. Kline. 2007. Collaborative environmental planning in river management: An application of multicriteria decision analysis in the White River Watershed in Vermont. *Journal of Environmental Management* 84(4):534-546.

Jobes, P. 2000. *Moving Nearer to Heaven: The illusions and disillusions of migrants to scenic rural places* CT: Praeger.

Knott, C. H. 1998. *Living with the Adirondack Forest: Local perspectives on land use conflicts*. Ithaca: Cornell University Press.

McFarlane, B. L., and P. C. Boxall. 2000. Factors influencing forest values and attitudes of two stakeholder groups: The case of the Foothills Model Forest, Alberta, Canada. *Society & Natural Resources* 13(7):649-661.

National Parks Conservation Association. 2005. State of the Parks: Big Thicket National Preserve. Washington D.C.: National Parks Conservation Association.

Pahl-Wostl, C. 2006. The importance of social learning in restoring the multifunctionality of rivers and floodplains. *Ecology and Society* 11(1):10 [online] URL: http://www.ecologyandsociety.org/vol11/iss1/art10/

Pallant, J. 2001. SPSS Survival Manual. Philadelphia:Open University Press.

Paolisso, M. 2006. Chesapeake Environmentalism: rethinking culture to strengthen restoration and resource management. College Park: Maryland Sea Grant Publication.

———. 2007. Taste the traditions: Crabs, crab cakes, and the Chesapeake Bay blue crab fishery. *American Anthropologist* 109(4):654-665.

Paolisso, M., and E. Chambers. 2001. Culture, politics, and toxic dinoflagellate blooms: The anthropology of Pfiesteria. *Human Organization* 60(1):1-12.

Paolisso, M., and R. S. Maloney. 2000. Recognizing farmer environmentalism: Nutrient runoff and toxic dinoflagellate blooms in the Chesapeake Bay region. *Human Organization* 59(2):209-221.

Racevskis, L. A., and F. Lupi. 2006. Comparing urban and rural perceptions of and familiarity with the management of forest ecosystems. *Society & Natural Resources* 19(6):479-495.

Salamon, S. 2003. *Newcomers to Old Towns: Suburbanization of the Heartland*. Chicago: University of Chicago Press.

Scott, J. 1991. *Between the Ocean and Bay: A Natural History of Delmarva*. Centreville, MD: Tidewater Publishers.

Sitton, T. 1995. *Backwoodsmen: Stockmen and Hunters along a Big Thicket River Valley*. Norman: University of Oklahoma Press.

Smith, B. L., and J. MacGregor. 1992. What Is Collaborative Learning? In *Collaborative Learning: A Sourcebook for Higher Education*, ed. A. Goodsell, M. Maher, V. Tinto, B. L. Smith and J. MacGregor. Philadelphia: National Center on Postsecondary Teaching, Learning, and Assessment at Pennsylvania State University.

Steel, B. S., P. List, and B. Shindler. 1994. Conflicting values about federal forests: comparison of national and Oregon publics. *Society & Natural Resources* 7:137-153.

Walker, P. 2003. Reconsidering 'regional' political ecologies: toward a political ecology of the rural American West. *Progress in Human Geography* 27:7-24.

Walker, P., and L. Fortmann. 2003. Whose landscape? A political ecology of the 'exurban' Sierra. *Cultural Geographies* 10:469-491.

Walker, P., and P. Hurley. 2004. Collaboration derailed: the politics of "community based" in resource management in Nevada County. *Society and Natural Resources,* 17:735-751.

Watson, G. E. 2006. *Big Thicket Plant Ecology: an Introduction*. Denton, TX: UNT Press.

Weeks, P., and J. M. Packard. 1997. Acceptance of scientific management by natural resource dependent communities. *Conservation Biology* 11:236-245.

———. in press. Feral hogs: invasive species or nature's bounty? *Human Organization*.

Wennersten, J. 1992. *Maryland's Eastern Shore*. Centreville, MD: Tidewater Publishers.

Yaffee, S. 1994. *The Wisdom of the Spotted Owl*. Washington, D.C.: Island Press.

[i] Additional information about this multi-institutional, interdisciplinary study is available at: http://wfsc.tamu.edu/jpackard/conservation, http://harc.edu and http://www.bsos.umd.edu/ANTH/Chesapeake/home.htm (accessed May 26, 2009).

[ii] More information about events and trends in the region has been documented in the Big Thicket Reporter, available at: http://bigthicket.org (accessed April 15, 2009).

[iii] See http://pineywoodsexperience.org for more information (accessed April 15, 2009).

[iv] Several factors differed between sites, which influenced our estimates of response rates. Recognizing the social, political and economic differences between and within sites, we decided early in the design of the study to do what was culturally most appropriate at each site. Our justification was that we wanted as broad a diversity of respondents as possible, while remaining within the standard procedures of a mixed modality survey. Whenever a decision had to be made, we asked our partners what would be considered culturally appropriate. We identified the following factors that may have influenced response rates differentially between sites: (1) mail returned as "non-deliverable" was included in the calculation of "no response" (non-deliverable addresses were more likely in the western than the eastern sample), (2) those questionnaires that were returned with the box checked " I do not agree" in response to the statement of willing participation (required by the Institutional Review Board) were tallied in the category "no response" (more frequent in the western than eastern sample, (3) certain members of our partner organizations expressed different levels of trust regarding the research institutions (more distrust in the western than eastern sample), and (4) accurate calculation of the rate of return from email lists was problematic (more sampling was done by email in the eastern than western site).

[v] In multivariate statistical analysis, a hierarchical approach examines the patterns of variation inherent among variables at several levels of abstraction (Pallant 2002). In this application, we first extracted the linear combinations of variables that best represented the underlying variation (i.e. components). Second, we calculated scores for each respondent based on the loadings of variables on each principal component. Third, we examined the effects of demographic variables on factor scores.

[vi] In principal component analysis, the eigen value is the sum of squared component loadings for each variable. Components with an eigen value greater than 1 are interpreted as contributing significantly to explanation of the variance in the data set. The term "orthogonal" also means "perpendicular" as in the axes of a 3-dimensional graph. Orthogonal components are considered independent, in contrast to oblique components that are correlated. A component is a linear combination of variables that describes a pattern of variation in those variables, and may also be referred to as a "factor" or "dimension". Component scores for each case in a database (respondents in this application) are calculated from the values for each variable, weighted by the variable loadings on the component.