

DISSERTATION

CONCEPTUALIZING VALUES AS PART OF A  
DYNAMIC MULTILEVEL WORLD

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## ABSTRACT

### CONCEPTUALIZING VALUES AS PART OF A DYNAMIC MULTILEVEL WORLD

Humans are engaged in complex relationships of adaptation and change with the environment, each affecting one another. These relationships (i.e., feedback loops) necessitate an increased understanding of the different components of social-ecological systems. However, these systems appear to operate differently depending on the levels and scales under investigation, making it difficult to fully conceptualize these interconnected phenomena as well as raising important questions. We narrow our focus on two specific areas of inquiry in the interest of explicating factors that influence social values, which in turn lead to the attitudes and behaviors that can either drive or alleviate the many environmental challenges we face. First, how might macro processes of social change at different levels affect individual-level thought, and what might this mean for biodiversity conservation and environmental protection? Second, can internal human cognitions transform into widespread societal beliefs about how the environment, including wildlife, should be treated?

This dissertation presents two manuscripts designed to contribute to these areas of inquiry by considering how values are influenced by processes at different levels on a geopolitical scale, and how those values shape levels of cognition within individuals (an internal cognitive scale). The first chapter specifically focuses on understanding how socioeconomic advances at the county-level within the state of Washington are influencing new value priorities, and how these values lead to support for biodiversity conservation of species irrespective of human needs. For example, higher levels of income, education, and urbanization at both individual and county

levels were associated with higher degrees of mutualism, a value orientation that prioritizes the needs of wildlife as similar to the needs of humans. Indeed, we found mutualism to be positively associated with support for wolves (*Canis lupis*) recolonizing the state despite the potential for livestock predation and concern for human safety. Results also indicate that these new value priorities can lead to social conflict among different segments of the public based on beliefs about how wildlife should be managed. This work demonstrates several key findings. First, broad changes in social systems lead to a fundamental shift in social values in such a way that clearly indicates social-ecological context matters. Second, these values lead to predictable patterns of response to actions that promote biodiversity conservation. However, those patterns of response vary across the landscape, providing further evidence of cross-level and cross-scale dynamics within systems.

The second article casts social values as actors in a different, but equally important systems view complete with feedback loops. Specifically, social values are depicted as subject to the upward processes of emergence (micro-to-macro level) and the downward processes of immergence (macro-to-micro level). Our conceptualization acknowledges values as phenomena that emerge from individuals who are in turn shaped by pervasive social-ecological conditions (e.g., warfare, mass migrations, disease spread). Although processes of emergence are not directly studied in this manuscript, immergence is explored in two ways: (1) the effect of socioeconomic advances at a state level on individual expressions of postmaterialist values (values that tend to focus on the needs of others outside of self), and (2) the existence of widespread environmental attitudes associated with a prevalence of postmaterialist values. Only support for the second pathway of immergence was found, suggesting that individuals with

postmaterialist values do indeed support protection of the environment, including wildlife, even at the expense of human interests such as economic development and recreation behaviors.

In total, this dissertation is intended to provide a deeper look at the feedback loops between different levels of cognition and the world in which we live in the hopes of informing solutions to the grave environmental challenges we face.

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# I. SOCIAL VALUES AND BIODIVERSITY CONSERVATION IN A DYNAMIC WORLD

## **Introduction**

Humans are increasingly represented in social-ecological systems as active agents that influence and are affected by their surroundings in complex relationships of adaptation and change (Liu et al. 2007; Oishi & Graham 2010; Stokols et al. 2013). These relationships (i.e., feedback loops) between humans and the places in which they live necessitate an increased understanding of the social, biological, and ecological components of systems. Less understood is exactly how to address these phenomena when they operate across different scales. Cash et al. (2006) specifically describe seven scales (e.g., spatial, temporal, jurisdictional), each of which has its own levels (e.g., local to global, slow to fast, tasks to strategies). Whereas scales and levels can be defined in several ways, we subscribe here to the notion that *scales* are specific phenomena which can be measured at particular levels, and *levels* are the specific units at which we can perform analysis (Gibson et al. 2000; Cash et al. 2006). Although no model for empirically-testing every scale and level currently exists, we support the notion that studies explicitly making use of these concepts while providing experimental insights into their importance are necessary for improving the efficacy of conservation solutions (Berkes 2004; Kok & Veldkamp 2011; Guerrero et al., 2013).

We also note that many conservation challenges (e.g., human-wildlife conflict, climate change, environmental degradation) facing social-ecological systems worldwide are depicted as being driven by social forces, including human behavior (Millennium Ecosystem Assessment 2005). Conservationists predominately link behaviors with people's attitudes and beliefs (e.g., Kansky et al. 2014), indicating that behaviors (an effect) are predicted by internal cognitions (a

cause) on a scale recognized in the social science literature as the cognitive hierarchy (e.g., Bennett & Roth 2015). Although Cash et al. (2006) overlooked this scale, the same fundamental questions proposed by these authors apply here: representing human thought and behavior on a cognitive scale would allow for an examination of the extent to which important cross-scale and cross-level dynamics influence complex systems. Macro-level processes associated with societal change (e.g., modernization, value shift) and ecological change (e.g., re-introduction of an extirpated species, drought) may shape individual behavior *in addition to* the fundamental thought processes that operate within humans. In order to effectively respond to the demands of today's conservation challenges, we need more comprehensive analyses of these processes that move beyond simple cause-effect relationships (House 1981; Abel & Stepp 2003; Erez & Gati 2004; Galvin et al. 2006; Guerrero et al., 2013; Manfredo et al. 2014).

In response to this charge, our focus is two-fold: (1) to describe the impact of widespread social process on individual thought and behavior across different levels within two particular scales (spatial and cognitive), and (2) to investigate those processes within a precise conservation context. Contextualizing the individual at different levels within and across scales is important to the success of conservation initiatives, because such initiatives often depend on human support or action (Schultz 2010). Conservationists may aim to rally public backing for particular conservation actions (e.g., endangered species protection); understand the effects of actions on stakeholders after implementation of conservation decisions (e.g., barring human access to a protected area); or coerce humans to stop performing particular behaviors of conservation relevance (e.g., reduce overharvesting of imperiled species). Understanding the processes that influence human attitudes and behavior can help to answer a large array of questions, including what shapes those thoughts and actions in the first place, how attitudes and behaviors change

over time, and what are the implications of such change for social-ecological systems. In short, we need more information on what processes shape human thought and behavior in the context of cross-scale and cross-level dynamics.

### ***Contextualizing the role of social forces in complex social-ecological systems***

One social phenomenon identified by researchers as influencing human thought and behavior is referred to as “modernization” (e.g., Inglehart & Welzel 2005). Inglehart (1990, 1997) describes modernization as a process of cultural change arising out of specific socioeconomic advances, including greater wealth, education and urbanization. The theory indicates that modernization operates across several scales (e.g., jurisdictional, temporal, cognitive), raising the question of how can we effectively model social processes across levels and scales in social-ecological research. Tenets of modernization theory have been tested on 85% of the world’s population (Inglehart & Welzel, 2005); however, the theory has largely been applied in research at the level of nation with implications for general beliefs about environmental protection. Furthermore, the theory is not without critics who argue that cultural change, especially democratization, can occur irrespective of socioeconomic development (e.g., Hadenius & Teorell 2005; Jackman & Miller 2005). Rather than engage in this debate, we employ modernization theory to facilitate discussion of the social changes that arise from socioeconomic advances in a system in which they have occurred to better understand the implications of that change for biodiversity conservation.

Several longitudinal research programs indicate that this described modernization process has significantly impacted the composition of social values worldwide (e.g., Inglehart 1997; Schwartz & Sagie 2000). Specifically, Inglehart (1997) proposes that modernization has led to a global shift in values from those rooted in the fulfilment of basic physiological needs to values

focused on higher-order needs (Maslow 1943). These basic physiological needs, emphasized by “materialist” values, include economic security and an ability to obtain food, clothing and shelter. In contrast, post-materialist or “self-expression” values emphasize higher-order needs, including belongingness, self-esteem and self-actualization (e.g., morality, creativity). A society centered on self-expression values would be more likely to focus on individual expression through avenues such as voting, consumer choices and other civic actions (Inglehart & Welzel 2005). Schwartz and Sagie (2000) further support the notion of value shift due to modernization by demonstrating that socioeconomic development worldwide leads to greater emphasis on values similar to self-expression values and less emphasis on values related to materialism.

Other researchers have applied this theory of modernization to specific contexts of conservation relevance. In particular, our research group (e.g., Manfredi et al. 2009; Teel & Manfredi 2010) has investigated the influence of modernization on fundamental values in relation to thought centered on the treatment and management of wildlife. Manfredi et al. (2009) describe a trajectory of modernization forces and value shift within the western United States (U.S.) similar to the aforementioned global value shift, indicating that advanced socioeconomic development at the state-level led to individuals prioritizing self-expression values. These self-expression values are strongly associated with a mutualist value orientation that considers the needs of animals as similar to the needs of humans (Manfredi et al. 2009; Teel & Manfredi 2010). Mutualism is concomitant with support for protection of habitat and non-game animals, and decreased support for traditional wildlife management techniques that harm or kill wildlife (e.g., Teel & Manfredi 2010; Dietsch et al. 2011). In terms of wildlife-related recreation behaviors, people exhibiting a mutualist value orientation are more likely to participate in wildlife observation and bird watching, and less likely to participate in hunting and trapping.

The question remains as to whether or not socioeconomic advances (“modernization”) have an influence on social values at levels other than state or nation, and what cross-level and cross-scale interactions might exist. Our investigation relies on the idea that people are nested within multiple, multilevel scales. For example, a geographic scale can be broken into nation, state, county and individual levels, whereas the cognitive scale within individuals can be divided into values, attitudes and behaviors (Figure 1.1). Each level has its own properties of which we have only provided a few as a starting point. As one illustration, the cycle of adaptation to change at the level of nation appears to be slow and widespread geographically in contrast to processes happening at the individual level. Gunderson and Holling (2002) have described this perceived mismatch in scale dynamics and the importance of modeling such processes. We have also described above an example of “modernization” affecting value change at the national level across generations (e.g., Inglehart 1997; Schwartz & Saige 2000). In contrast, the individual level adaptation cycle appears to be quick with the impacts of decisions being more localized. For example, the operation of values through ephemeral attitudes and behaviors appears to occur almost daily, suggesting that levels within individuals also operate at different speeds.

By identifying how processes occur at different levels and across multiple scales, we can begin to more accurately reflect how our dynamic world operates (Gunderson & Holling 2002). We specifically adopt the view that value shift will have significant effects on social-ecological systems through the ongoing enactment of human attitudes and behaviours. As an illustration in the conservation arena, public support (or lack thereof) for various wildlife management actions, such as wolf recolonization or lethal control of errant animals, may translate into those actions being realized (or not). The direct results of these actions if realized will then have myriad direct

and indirect impacts on the system to which they are introduced, creating a network of potential cross-level and cross-scale interactions within systems.

This theory of modernization and value shift raises several questions. First, can we detect evidence of value shift due to modernization within a more precise social-ecological context than nation? A large body of research already exists on the influence of modernization on values at the national level, but greater exploration of this topic within nations is still needed (Davis 2000). Understanding how modernization operates at different levels can help to address the question of how cross-level interactions between people and the local context in which they live may occur. Additionally, theoretical justification of why values may differ within a particular place has applications for conservation practitioners. Related to this, we pose our second question: does value shift lead to increased support for biodiversity conservation, and if so, what kinds of conservation actions can be expected? Researchers have demonstrated that linkages exist between postmaterialism and broad beliefs about environmental support (e.g., Gelissen 2007; Franzen & Meyer 2010; Jorgenson & Givens 2013), but less attention has been focused on specific applications relevant to the conservation of wildlife. We specifically focus our attention on wildlife value orientations as reflections of broad social values because of their relevance to biodiversity conservation.

One of the ways in which conservation efforts are affected is through public support for or resistance to those efforts. Therefore, we also examine how a shift to mutualist values would affect geospatial patterns of social conflict over conservation actions. Social conflict, or conflict among different segments of the public or between the public and authorities who manage common pool resources such as wildlife, can stymie the success of conservation initiatives through decreased public support for or trust in decision-making. Evidence of such challenges to

conservation governance in the U.S. exists in the form of increased law suits, ballot initiatives and other types of public protest against wildlife management decisions and agencies (Jacobson & Decker 2008). Information about the geographic distribution of values, therefore, can help in anticipating and responding to place-based social conflicts over conservation decisions, and serve as baseline information from which to assess system change over time.

### **Hypotheses**

To explore the questions we pose above related to value shift and its impacts for biodiversity conservation, we used data from Washington state (U.S.) that were collected as part of a broader multi-state investigation. The overall research project had two primary aims: (1) to develop and test a spatially-explicit approach for collecting and displaying social science information, and (2) to explore how wildlife value orientations and wildlife-related attitudes and behaviors are distributed across the landscape at different degrees of resolution (e.g., region, county, census block group). Data collected in Washington met our needs for testing the hypotheses described below:

- *Modernization hypotheses (spatial scale)*
  - $H_1$ : Forces of modernization, as indicated by county-level income, education and urbanization, are positively associated with a mutualism value orientation and negatively associated with domination.
  - $H_2$ : Forces of modernization, as indicated by county-level income and education, has a greater association with individual-level thought than will individual-level sociodemographics.
- *Conservation hypotheses (cognitive and spatial scales)*

- *H<sub>3</sub>*: A mutualism value orientation is positively associated with support for actions that promote biodiversity conservation. In contrast, domination is negatively associated with attitudes towards conservation actions that restrict human interests.
- *H<sub>4</sub>*: Greater prevalence of mutualism at the county-level is associated with less social conflict over actions promoting the recovery of controversial wildlife. For example, more mutualists in a given county would result in less social conflict over wolf recovery.

## **Methods**

### ***Data Collection***

Data were collected via a mail survey administered to a sample of Washington residents during the fall of 2009. Samples were stratified by county and purchased from Genesys Sampling (Horsham, Pennsylvania). We used standard procedures for survey administration consisting of two full mailings of the survey and cover letter, and a reminder postcard (Dillman 2007). To test for nonresponse bias, we phoned a sample of nonrespondents in each county following data collection. The phone survey contained several questions from the mail survey, including items that could be used to assess wildlife value orientations, attitudes toward wildlife management actions, participation in wildlife-related recreation and sociodemographics.

### ***Measurement***

For our sociodemographic indicators related to modernization, we asked respondents to self-select their level of income (annual household income before taxes), education (highest level of education achieved), and sex (male or female) from fixed-response options. We obtained



county-level urbanization data from U.S. Census (2010); individual-level data for this variable were not collected or available for use.

We measured domination and mutualism wildlife value orientations using composite scales consisting of items representing beliefs about human-wildlife relationships. Items focused on desired end states and modes of behavior (Teel & Manfredi 2010), and were developed following domain sampling procedures of scale construction (Nunnally & Bernstein 1994). Beliefs about hunting and appropriate uses of wildlife indicated a domination orientation, while beliefs about caring for and social affiliation with wildlife indicated a mutualism orientation. Respondents rated their level of agreement with fourteen belief items on a scale ranging from 1 (strongly disagree) to 7 (strongly agree) (Table 1.1).

We also asked respondents to rate their level of agreement with, acceptability of and importance of various wildlife-related issues or management actions. The following issues and actions were grouped a priori and measured on different scales (Table 1.2):

- Acceptability of management actions
  - Items ranged from 1 (highly unacceptable) to 7 (highly acceptable)
- Wildlife acceptance capacities
  - Items ranged from 0 (eliminate this species) to 3 (remain at current level) to 5 (increase greatly)
- Attitudes toward salmon recovery efforts
  - Items ranged from 1 (strong disagree) to 7 (strongly agree)
- Importance of agency services
  - Items ranged from 1 (not at all important) to 5 (extremely important).

We used wildlife acceptance capacity as an additional indicator of support (or lack thereof) for biodiversity conservation; these measures assess residents' thoughts about whether population levels of various species should increase or decrease (Decker & Purdy 1988).

We specifically test a hypothesis related to wolf recovery, because of the social controversy associated with conserving this predator species within Washington and, more broadly, elsewhere in the U.S. We measured responses to two attitudinal items regarding wolf recovery on a scale of 1 (strongly disagree) to 7 (strongly agree). The first item assessed attitudes toward wolves returning to Washington unassisted by the state fish and wildlife agency, and the second item measured responses toward agency involvement in wolf recovery with active translocation of wolves to boost population numbers within the state.

### ***Analyses***

We examined the structure of value orientation scales using reliability analysis in SPSS (version 22.0; Chicago, Illinois) to confirm scale consistency with previous findings (e.g., Manfredi et al. 2009). We assigned value orientation scores by computing means of corresponding belief dimension items. We tested for spatial autocorrelation using ArcGIS 10.2 at a distance band of 208,170 feet (the distance calculated when 8 neighbors were specified), which proved to be insignificant for all relationships: mutualism (Moran's  $I = -0.78$ ,  $p = 0.533$ ); domination (Moran's  $I = 0.073$ ,  $p = 0.553$ ); income (Moran's  $I = -0.041$ ,  $p = 0.742$ ) and education (Moran's  $I = -0.082$ ,  $p = 0.510$ ). We next conducted multi-level modeling using the mixed command of SPSS for hypothesis testing to allow for a determination of individual- and aggregate-level (e.g., county) effects on an individual-level outcome. We performed analyses for our first and second hypotheses ( $H_1$  and  $H_2$ ) using random-coefficient regression models for continuous outcomes while additionally controlling for the individual-level effect of sex (i.e., a

female is more likely than a male to have mutualist values; Zinn & Pierce 2002). To begin, we specified null models to assess variance within and between counties, and to calculate the intraclass correlation (ICC) for our dependent measures (value orientations). Next, we assessed the impacts of modernization variables using contextual effects analysis (Raudenbush & Bryk 2002). The effect of covariates measured at the individual level was decomposed into within-county (individual-level) and contextual effects. A contextual effect assesses the effect of a county's average level of a covariate (e.g., education) on an individual's score for an outcome variable (value orientations) net the effect of the individual's own score for the covariate. For all models, we tested random intercepts and slopes. We retained the random slope when statistically different from zero, which occurred in one model: the effect of education on domination.

We assessed our third hypothesis ( $H_3$ ) following several steps. PCA is sensitive to scale differences (Jolliffe 2002), so we first conducted four separate principal components analyses (PCA) on our a priori attitudinal groupings to determine if additional dimensions existed within these groupings. We confirmed dimensions resulting from the PCA through reliability analysis, including Cronbach's alpha when scales consisted of more than 2 items and Spearman-Brown (split-half) coefficients when scales consisted of 2 items only (Eisinga et al. 2012). Next, we used correlation analyses (Pearson's  $r$ ) to assess the strength of relationships between wildlife value orientations and our resultant attitudinal dimensions.

To assess our final hypothesis ( $H_4$ ), we calculated potential for conflict index (PCI) scores at the county-level using equations introduced by Manfredi et al. (2003) and elucidated by Vaske et al. (2010). PCI scores range from 0 (no conflict) to 1 (maximum conflict) and indicate dispersion around an item's mean (Manfredi et al. 2003). For our purposes, a higher PCI score indicates a higher level of social conflict within-group (i.e., county residents) over a

particular conservation action. Finally, we used ArcGIS (version 10.1) to depict at the county level (a) the percent of people classified as a Mutualist (i.e., holding only a mutualist wildlife value orientation; Teel & Manfredro 2010), and (b) PCI scores on the conservation measure “allow wolves to recolonize the state on their own.” In this way, we used PCI scores as a statistic to compare counties on the degree of potential social conflict over specific conservation actions. We also used correlation analyses (Pearson’s  $r$ ) to support our visual depictions.

## **Results**

We mailed 14,799 surveys, of which 4,183 were completed and 1,664 were nondeliverable (32% response rate, overall). We received over 68 responses per county, allowing for county-level population estimates within  $\pm 10\%$  at the 90% confidence level. The follow-up phone survey ( $n = 2,024$ ) revealed statistically significant differences ( $p < 0.001$ ) between respondents and nonrespondents on all variables except two, *participation in outdoor activities* and *length of residence in current home*; however, effect sizes indicated only marginal variation ( $\eta \leq 0.150$ ; Cohen 1988) on all but three measures: sex and two of our wildlife value orientations measures. For example, the largest effect size ( $\eta = .358$ ; moderate effect) was on the variable “I value the sense of companionship I receive from animals”; non-respondents were more likely to agree with this statement than respondents. Since we only use these values measures in composite scales, we choose not to weight data on any individual attitudinal item. We did weight data by sex at the county level and population size for reporting at the state level (Dietsch et al. 2011) and note when unweighted data are used for specific analyses.

Consistent with previous research (e.g., Manfredro et al. 2009), reliability analysis results for wildlife value orientation scales indicated high internal consistency of item clusters (Table 1.1) (Nunnally & Bernstein 1994). Three of our four PCA resulted in two dimensions each,

which we further confirmed through reliability analyses. The fourth PCA conducted on our a priori grouping “acceptability of management actions” indicated that five dimensions provided a good fit of data; however, reliability results suggested that only four dimensions were suitable after reduction (Cronbach’s alpha > 0.6; Kline 2000): (1) lethal control of wildlife in situations that do not directly threaten humans, (2) lethal control of wildlife in situations that threaten pet or human safety, (3) compensation for losses due to wildlife , and (4) agency control of statewide recolonization by wolves (Table 1.2). Standardized factor loadings were all statistically significant at  $p < 0.001$  and above the minimum criterion of 0.40 used to denote practical significance (Table 1.2).

### ***Hypothesis Testing***

For  $H_1$ , our estimation of null models revealed significant variances ( $p < 0.05$ ) both within and between counties on wildlife value orientation measures (mutualism: within = 2.09 [SE = 0.05], between = 0.05 [SE = 0.02]; domination: within = 1.70 [SE = 0.04], between = 0.08 [SE = 0.0]). A greater amount of variation existed within groups (counties) than between groups on these measures, a typical finding in contextual analyses. Calculation of the ICC revealed that 4.4 and 2.2 percent of the variance in domination and mutualism scoring, respectively, existed between counties. Although the ICC values suggest a high degree of heterogeneity within counties on our values measures, the design effect ( $1 + [\text{average cluster size} - 1] * \text{ICC}$ ) is greater than 2 for both tests, supporting the need for multilevel modeling (Muthén & Satorra 1995). Coefficients in the column labeled “Contextual Effects” in Table 1.3 represent the county-level effects of modernization variables on value orientation scores while controlling for their impact as individual-level sociodemographics. Interpreted as unstandardized regression coefficients, the numbers indicate the change in an individual’s value orientation score that is

associated with a one-unit increase in the independent variable. For example, a one-unit increase in a county's mean education level is associated with a 1.20 decrease in a person's domination score, controlling for the effect of his or her own education level. The coefficient (1.20) could also be interpreted as the difference in domination scoring between two individuals who have the same education but who reside in counties differing by one unit in average education level. Results show significant county-level contextual effects in the hypothesized direction, meaning that there is something about the county in which an individual resides (defined by modernization variables) that relates to his or her value orientation above and beyond any effect due to individual sociodemographics.

We derive the total between-counties effect for the relationship between value orientations and modernization by adding the coefficients for individual-level and contextual effects. For example, the total between-counties effect of education on domination is  $-1.36$  ( $-0.16 + -1.20$ ), indicating the difference in mean scores on domination between two counties that differ by one unit in mean education. We also calculated the proportion of variance explained by covariates at both levels of the model (Snijders & Bosker 1999). At the individual level, the sociodemographic indicators had a modest impact, explaining between 9 and 13 percent of variation in value orientation scoring. At the aggregate level, these variables accounted for between 21 and 59 percent of the variance in mean value orientation scoring across counties (Table 1.3). These findings further support  $H_1$ : the composition of wildlife value orientations within counties is related to modernization forces as indicated by aggregate-level income, education and urbanization, and  $H_2$ : when using these variables, we can better explain the impact of modernization on values at the county level than individual level (i.e., a significant amount of variation in individual-level value orientations remains unexplained).

In support of  $H_3$ , we found that a mutualism value orientation at the individual level was positively correlated with measures indicating support for wildlife conservation (Figure 1.2). For example, mutualism was positively associated with recovering wild salmon populations, increasing predator populations, and agency provision of public services other than hunting and fishing (e.g., restore wildlife habitat, recover threatened and endangered species). These same measures were negatively correlated with domination. In contrast, the domination value orientation was positively correlated with lethal control of wildlife in threatening and non-threatening situations, control over statewide wolf recovery, and agency provision of services that meet humans needs (e.g., releasing hatchery-raised salmon to enhance fishing opportunities). In contrast, mutualism was negatively correlated with these measures. Increasing deer and elk populations and compensating landowners for wildlife-related losses were positively correlated with both orientations, but indicated minimal practical significance ( $r < 0.1$ ; Cohen 1988).

Our spatial depictions of wildlife value orientations indicated that counties in northwestern Washington had a higher prevalence of mutualism compared to remaining portions of the state (Figure 1.3a). For example, two counties (San Juan and Jefferson) in this region had more than 50% of residents who were classified as Mutualists. In contrast, the lowest county-level percentages of Mutualists were found primarily in the eastern portion of the state. Despite this relatively low proportion of Mutualists in eastern Washington, one eastern county (Franklin) had 36% of its residents classified as Mutualist. Only 8 of Washington's 39 counties had higher percentages of Mutualists, indicating a relatively large proportion of Mutualists in Franklin County relative to other counties. This finding suggests that the distribution of wildlife value orientations is not simply a result of a geographic divide between different portions of the state.

Our spatial depiction of the potential for conflict index (PCI) over wolves recolonizing the state on their own (Figure 1.3b) showed a pattern that was similar to the values distribution, but reversed; we found higher PCI values in the eastern portion of the state and Lewis County south of Olympia, Washington, and lower PCI values primarily in northwestern counties. We confirmed this finding with correlation analysis, resulting in a Pearson's  $r$  of  $-0.74$  between county-level mutualism and potential for social conflict over the return of wolves. A similar correlation analysis between mutualism and the potential for conflict over agency assistance of wolf recovery also showed a negative relationship (Pearson's  $r = -0.57$ ). This correspondence can be observed in a separate display of the county-level correlations between mutualism and potential for social conflict over wolf recovery (Figure 1.4); higher correlations suggest a stronger relationship between values and potential for conflict index (PCI) scores (e.g., Pearson's  $r = -0.591$ ), whereas lower correlations indicated a weaker relationship between these measures. In combination, these findings are consistent with  $H_4$ , indicating that a greater prevalence of mutualism within counties means less potential for social conflict over conservation measures that directly benefit a species of concern (wolves). The patterns of response also provide evidence of cross-level and cross-scale dynamics between social change that drives value shift and potential for social conflict over the landscape-level ecological change of wolf recovery.

### **Summary and Discussion**

The conservation challenges of today are increasingly recognized as functions of reciprocal relationships between people and the world in which we live (Liu et al. 2007; Oishi & Graham 2010). As such, we outlined and employed a framework to investigate how social processes affect change in socioecological contexts, and how this change is associated with public support for or resistance to conservation actions. Successful conservation actions are often



accompanied by public support in the form of behaviors (e.g., compliance with laws and regulations, financial donations), underscoring the importance of identifying the mechanisms through which such support arises. Furthermore, implemented conservation actions will have associated direct and indirect effects, creating feedback loops within a system that can enhance or derail initial public support. We need to effectively define the dynamics of the conservation challenges we face within the systems those challenges originate so that we can better understand and respond to their complexity with appropriate solutions (Guerrero et al. 2013).

In this paper, we consider the potential for cross-level and cross-scale dynamics in association with spatial and cognitive scales (Cash et al. 2006). Our work supports the notion that forces of modernization are changing the day-to-day lives of people (Inglehart & Welzel 2005), with lasting impacts on social-ecological systems. Our findings are consistent with previous research describing how modernization is leading to a shift in social values at levels of nation (Inglehart 1997; Schwartz & Sagie 2000) and state (Manfredo et al. 2009), and that the value shift brought about by modernization is subsequently leading to different interests and desired experiences. As an illustration of these dynamics, we found that counties exhibiting advanced socioeconomic development were associated with greater prevalence of mutualist values irrespective of individual-level sociodemographics. Essentially, how a person thinks about and responds to conservation issues relates to his or her social-ecological context. Our work describes the existence of an important relationship between location (spatial scale) and human thought (cognitive scale), and pinpoints a need for additional research that can fully explicate the role of context in shaping values (i.e., to what degree does place reinforce values over time?).

We also show evidence of key cross-level and cross-scale dynamics between values and support for conservation actions. First, we demonstrate within the cognitive scale how values

reliably correspond to attitudes: individuals with a mutualist value orientation had a higher propensity to positively rate management actions that benefit wildlife (e.g., salmon recovery, protection of habitat/open space) and negatively rate actions that harm or restrict wildlife (e.g., lethal control). Second, our case study of wolf recovery in Washington demonstrates how values can be used to explain attitudes along a cognitive hierarchy: mutualists were supportive of wolf recovery, while individuals with a domination orientation desired strong management restrictions on wolves. However, the relationship between values and attitudes was inconsistent across the landscape, suggesting that cross-level and cross-scale dynamics exist between cognition and place-specific conservation actions. More precisely, we found the expected *direction* of correlations between values and attitudes toward wolf recovery remained consistent, but the *strength* of relationships varied across counties: values related more strongly to specific attitudes in some places than other places. Our findings corroborate that social science information such as values can relay important information regarding support for conservation actions (Mascia et al. 2003), but further research under this framework is necessary to explicate additional cross-level and cross-scale dynamics.

We concentrated on individuals within a geographical designation of county, because this level is a geopolitical boundary that has meaning within the social systems we construct while remaining relevant to the level at which conservation challenges often occur. Our case study analysis of social conflict over wolf recovery is an example of this unique point of intersection across scales. Despite strong support for wolf recovery at the state-level (Dietsch et al. 2011), we found that support varied across the state consistent with the local social-ecological context (exemplified by county level analysis). Our results showed that modernization theory can help explain the potential for social conflict over wolf recovery in different areas of Washington state

(*between*-county variation); advanced socioeconomic development leads to new value priorities, which leads to greater consensus (a lack of social conflict) over conservation actions that benefit wildlife. However, our model left a large portion of *within*-county variation unexplained, suggesting that much more than place alone leads to value formation within individuals. Additional factors that can explain the full social-ecological context of values formation should be explored. As one example, individuals are more likely to hold a specific value orientation consistent with the values of the culture from his or her ancestry (Manfredo et al., *draft manuscript*). As another example, the connectivity of individuals within a place through social networks (also branded as social identity) may influence value strength (Turner 1991; Hogg 2006; Spears 2011; Guerrero et al. 2013). In summary, we know less about how values originate than we know about what happens when those values are expressly defined. Many fascinating opportunities for exploring values formation exist, and this research direction is important considering its relevancy to the development of solutions that rely on conservation-related attitudes and behaviors.

Finally, we acknowledge the difficulty of modelling feedback loops in complex systems; choices have to be made in defining which variables are to be examined and which are to be excluded (Ostrom 2007). For example, we explored the relationship between values and attitudes, at the expense of looking at the influence of social norms (Schultz 2010). We also realize that several of the relationships we considered are only approximations of the often non-linear ebb and flow of life. Important research questions remain to be addressed, including how do we model this ebb and flow in attitude change over time given cross-scale dynamics? Considering the wolf case study as one example, can we continue to expect support for wolves only in areas where wolves don't exist? How can we explain support for wolf recovery in places

where a domination value orientation is prevalent, and could those locations provide guidance for increasing support for wolves (and other species of conservation importance) in other locations? If these fundamental values truly are stable in one's adulthood, then conservation communication efforts should craft messaging consistent with the established values found within a place. Although several avenues of research are still left open, including a consideration of value shift in different cultural contexts, our work contributes to the emerging understanding that we need to model social-ecological systems as the complex relationships they are. Knowledge of these cross-scale and cross-level dynamics will enhance our profession's ability to address conservation challenges now and into the future.

Table 1.1. Reliability analysis results for wildlife value orientations from a 2009 survey of Washington residents.<sup>a</sup>

<i>Wildlife value orientation, basic belief dimension, and basic belief item<sup>b</sup></i>	<i>Cronbach's alpha</i>
Domination	0.79
Appropriate use beliefs	0.66
Humans should manage fish and wildlife populations so that humans benefit.	
The needs of humans should take priority over fish and wildlife protection.	
Fish and wildlife are on earth primarily for people to use.	
Hunting beliefs	0.80
We should strive for a world where there is an abundance of fish and wildlife for hunting and fishing.	
Hunting is cruel and inhumane to the animals. <sup>c</sup>	
Hunting does not respect the lives of animals. <sup>c</sup>	
People who want to hunt should be provided the opportunity to do so.	
Mutualism	0.87
Social affiliation beliefs	0.83
We should strive for a world where humans and fish and wildlife can live side by side without fear.	
I view all living things as part of one big family.	
Animals should have rights similar to the rights of humans.	
Wildlife are like my family and I want to protect them.	
Caring beliefs	0.75
I care about animals as much as I do other people.	
I feel a strong emotional bond with animals.	
I value the sense of companionship I receive from animals.	

<sup>a</sup>Consistent with previous findings related to testing of wildlife value orientations (e.g., Teel & Manfredi 2010), analyses used unweighted data.

<sup>b</sup>Item response scales range: 1 (strongly disagree) to 7 (strongly agree).

<sup>c</sup>Item was reverse coded prior to analysis.

Table 1.2. Principal components and reliability analysis results from a 2009 survey of Washington residents.

<i>A priori grouping, dimension, and belief items</i>	<i>Factor Loadings</i>	<i>Cronbach's alpha</i>
Acceptability of management actions <sup>a</sup>		
Lethal control/removal of wild animals in non-threatening situations		.89
Coyote if it is seen near your home	.84	
Coyote if it is a nuisance near your home	.80	
Black bear if it is seen near your home	.85	
Black bear if it is a nuisance near your home	.80	
Problem deer or elk	.60	
Lethal control of predators that threaten human or pet safety		.92
Coyote if it has a disease that may be spread to humans	.83	
Coyote if it attacks a pet near your home	.66	
Coyote if it attacks a person near your home	.88	
Black bear if it has a disease that may be spread to humans	.83	
Black bear if it attacks a pet near your home	.68	
Black bear if it attacks a person near your home	.87	
Control statewide wolf recolonization		.79
Move wolves from one area in state where recovery goals were reached to another area to establish new wolf populations <sup>b</sup>	.64	
Allow wolves to recolonize and establish new populations within the state on their own <sup>b</sup>	.63	
Limit wolves that have caused declines in deer and elk populations in certain areas	.70	
Capture and lethally remove a wolf if it causes livestock loss	.68	
Allow recreational hunt of wolves once recovery goals are met	.73	
Compensation for wildlife-related damages/losses		.87
Use agency funds to compensate landowners for damage (\$10,000 or more) caused by deer or elk	.77	
Contribute agency funds to cost-sharing program supporting fence construction around property damaged by deer or elk	.75	
Compensate landowners for livestock loss caused by a wolf	.81	
Use hunting and fishing license dollars to compensate for wolf-related losses	.80	
Use state revenue dollars to compensate for wolf-related losses	.81	

Table 1.2, *continued*. Principal components and reliability analysis results from a 2009 survey of Washington residents.

<i>A priori grouping, dimension, and belief items</i>	<i>Factor Loadings</i>	<i>Cronbach's alpha</i>
Wildlife acceptance capacities <sup>c</sup>		
Increase deer and elk populations		.82 <sup>d</sup>
Increase deer populations over the next 5 years	.91	
Increase elk populations over the next 5 years	.92	
Increase predator populations		.77
Increase coyote populations over the next 5 years	.80	
Increase black bear populations over the next 5 years	.80	
Increase mountain lion populations over the next 5 years	.87	
Beliefs about salmon recovery <sup>e</sup>		
Focus more effort on releasing hatchery-raised salmon to enhance fishing <sup>f</sup>		NA
Importance of salmon recovery efforts		.80
Salmon are important to the local economy	.90	
Salmon are important to the quality of life	.92	
Continue agency efforts to recover wild salmon	.71	
Importance of agency services <sup>g</sup>		
Importance of providing hunting and fishing opportunities <sup>f</sup>		NA
Importance of providing services other than hunting and fishing opportunities		.81
Care for injured or orphaned wildlife	.66	
Respond to complaints about wildlife in urban areas	.45	
Provide incentives to private landowners who restore wildlife habitat (e.g., tax breaks, reimbursement for expenses)	.66	
Protect and recover threatened and endangered species	.76	
Provide outdoor educational programs to connect youth/families to nature	.72	
Provide wildlife viewing opportunities (e.g., provide information, build viewing platforms/boardwalks)	.72	
Provide programs that help local governments plan for open space protection and wildlife populations in urban areas	.81	

<sup>a</sup>Item response scales range: 1 (highly unacceptable) to 7 (highly acceptable).

<sup>b</sup>Item was reverse coded.

<sup>c</sup>Item response scales range: 0 (eliminate this species) to 5 (increase greatly).

<sup>d</sup>Value presented is a Spearman-Brown (split half) coefficient, appropriate for 2-item scales, rather than a Cronbach's alpha.

<sup>e</sup>Item response scales range: 1 (strongly disagree) to 7 (strongly agree).

<sup>f</sup>PCA results indicated this item loaded separately from other items with the same response scale, so this specific factor consists of only one item.

<sup>g</sup>Item response scales range: 1 (not at all important) to 5 (extremely important).

Table 1.3. Results of multilevel modeling procedures testing individual and county-level effects of modernization, as defined by increasing levels of education, income and urbanization, on wildlife value orientation scoring by county from a 2009 survey of Washington residents.<sup>a</sup>

<i>Test</i>	<i>Individual-Level Effect<sup>b</sup></i>		<i>Contextual Effect<sup>c</sup></i>		<i>PVE<sup>d</sup></i>
	<i>Estimate</i>	<i>SE</i>	<i>Estimate</i>	<i>SE</i>	
<i>Covariate</i>					
Modernization → Domination					
1 - Education	-0.16	0.02*	-1.20	0.24*	0.13/0.59
2 - Income	0.05	0.01*	-0.63	0.17*	0.12/0.55
3 - Urbanization <sup>e</sup>	---	---	---	---	---/0.34
Sex	-0.85	0.04*			
Modernization → Mutualism					
1 - Education	0.04	0.02	0.62	0.26*	0.09/0.23
2 - Income	-0.09	0.01*	0.36	0.18*	0.09/0.27
3 - Urbanization <sup>e</sup>	---	---	---	---	---/0.21
Sex	0.75	0.05*			

<sup>a</sup> Variance explained for urbanization was calculated using population density estimates at the county level obtained from U.S. Census (2010). Individual level data were not obtained during survey procedures.

<sup>b</sup> Individual-level effect of the covariate (modernization variable) on wildlife value orientation scoring. Estimates represent unstandardized regression coefficients; SE = standard error.

<sup>c</sup> County-level effect of the covariate, while controlling for its individual-level impact on wildlife value orientation scoring. Analyses run on each covariate, also controlled for the individual-level effect of sex (0 = male, 1 = female).

<sup>d</sup> PVE = proportion of variance explained. First number = PVE at the individual level; second number = PVE at the county level.

<sup>e</sup> Data for urbanization was obtained at the county-level only (U.S. Census, 2010); therefore, estimates at the individual-level were not calculated.

\* $p < 0.05$ .



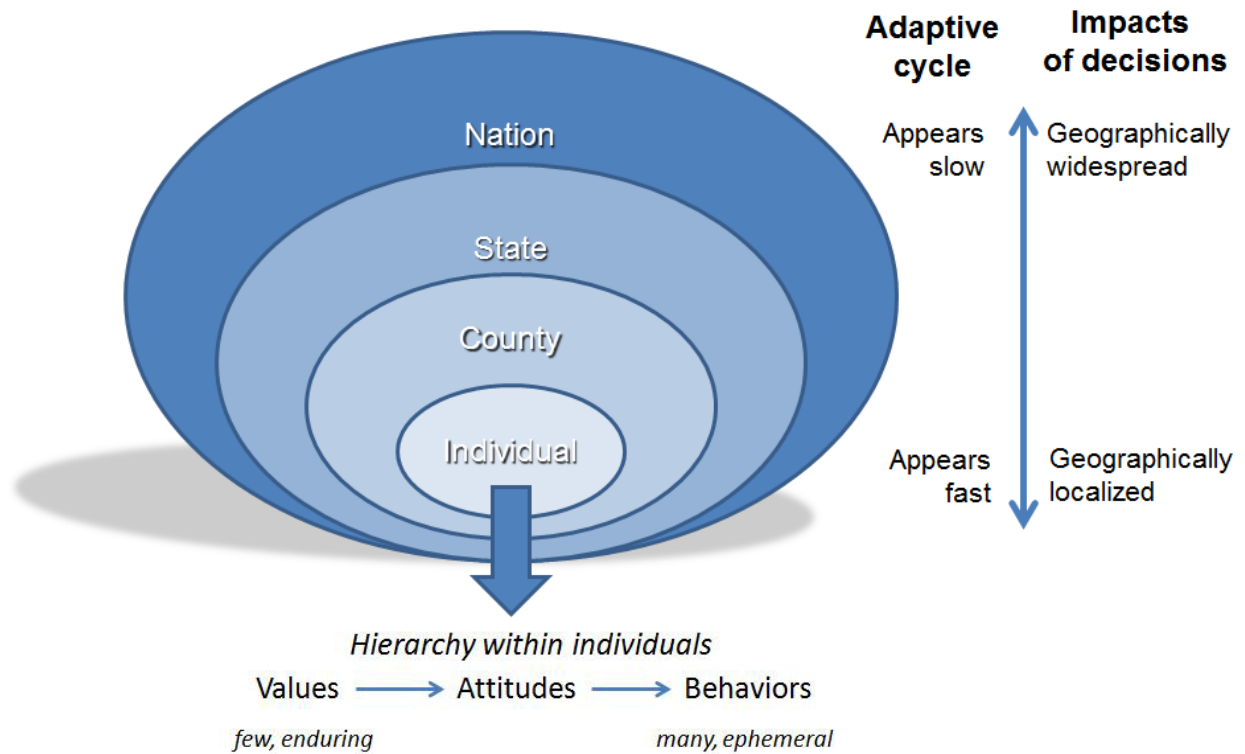


Figure 1.1. Contextualizing the individual in nested multilevel hierarchies that have varying properties (e.g., adaptive cycle, impacts of decisions). *Note: Relationships denoted here are general expected patterns rather than a statement of linearity. For example, a plethora of attitudes and behaviors could be depicted as nested within broader values.*

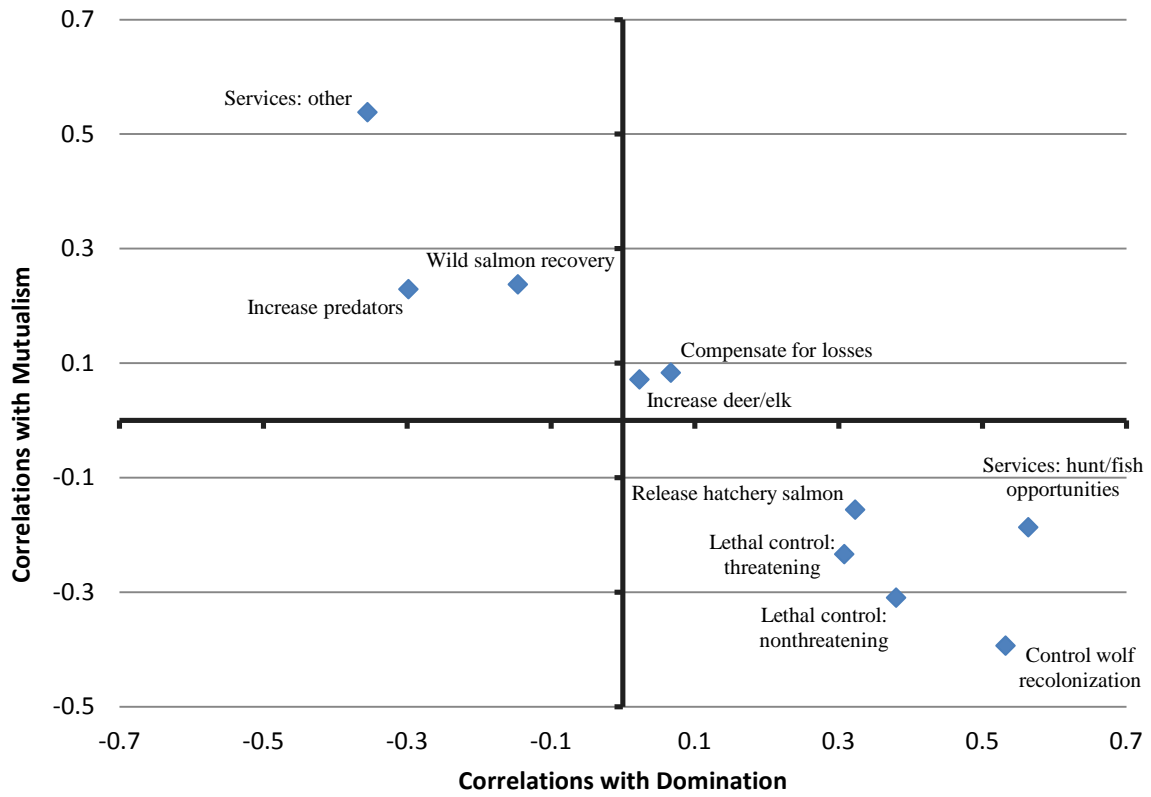
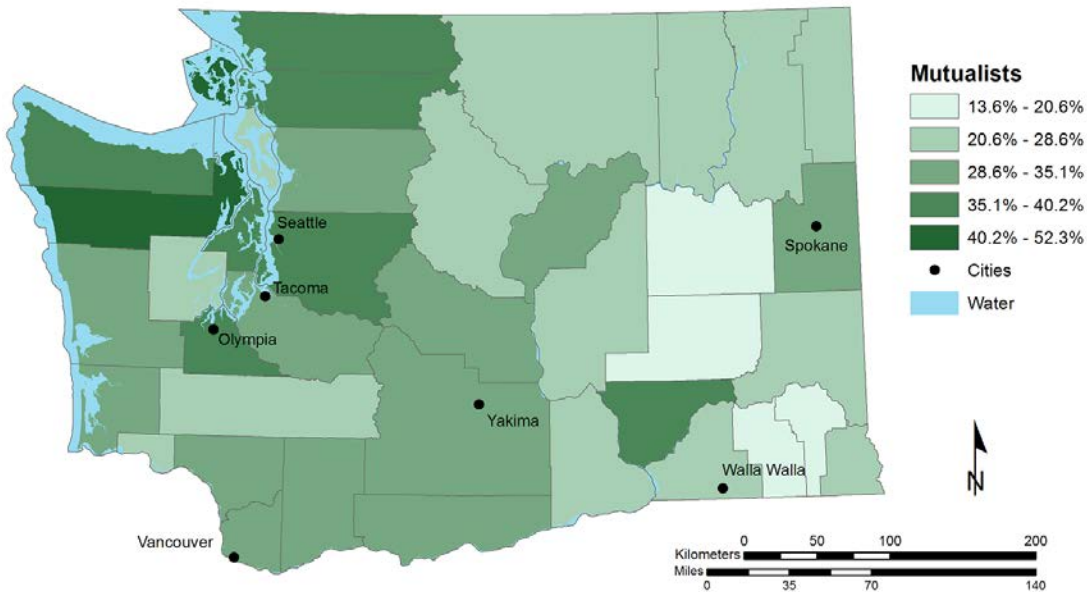


Figure 1.2. Pearson's correlation results wildlife value orientations and various attitudinal dimensions from a 2009 survey of Washington residents.

(a)



(b)

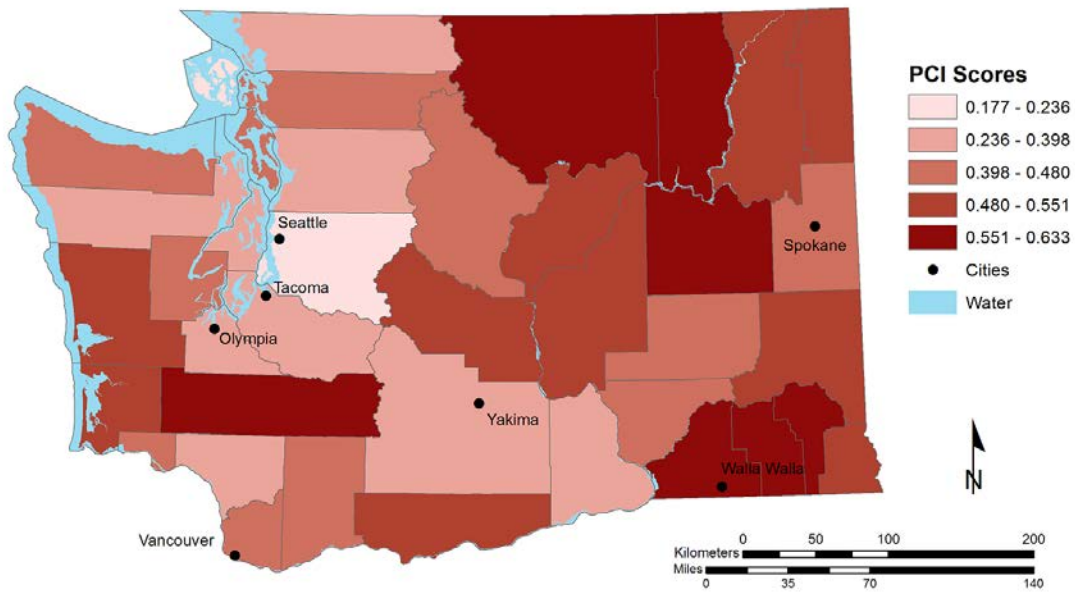


Figure 1.3. Percent of residents in Washington's 39 counties who (a) are classified as Mutualist, and (b) agree that Washington Department of Fish and Wildlife should control recolonization of the state by wolves.

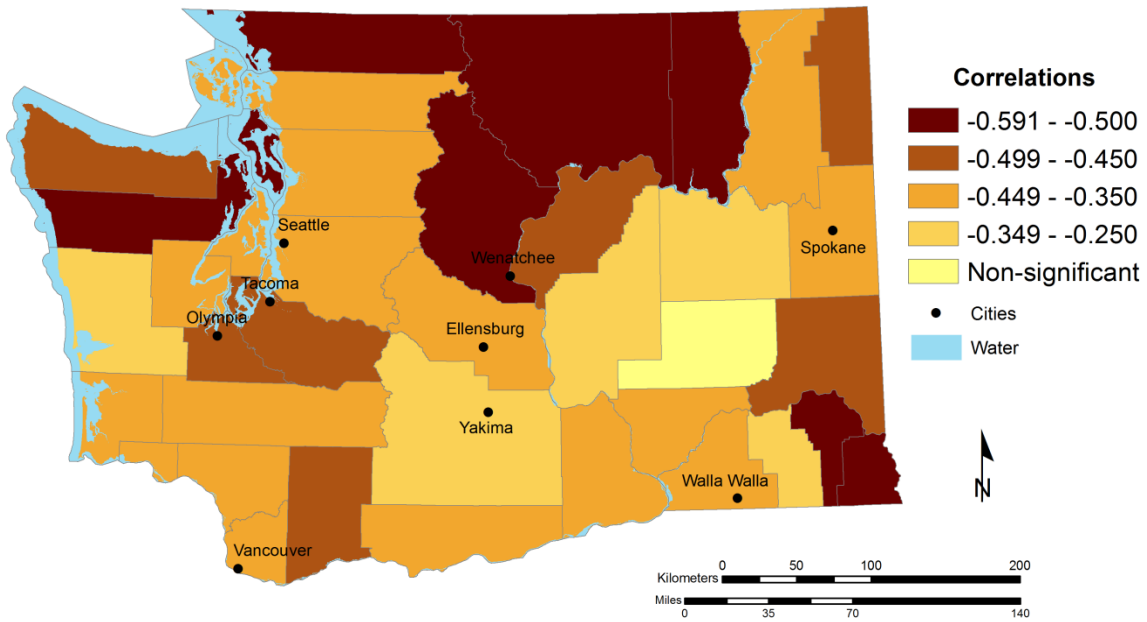


Figure 1.4. Correlations between mutualism and potential for social conflict over wolf (*Canis lupis*) recovery in 39 counties of Washington (U.S.). Darker colors suggest a stronger relationship between values and potential for conflict index (PCI) scores (e.g., Pearson's  $r = -0.591$ ), whereas lighter colors indicate a weaker relationship. The patterns of response provide evidence of cross-level and cross-scale dynamics between social change that drives value shift and potential for social conflict over the landscape-level ecological change of wolf recovery.

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## II. THE EMERGENCE AND IMMERGENCE OF VALUES IN CONTEMPORARY SOCIETY

### **Introduction**

Theorists and researchers propose that conditions of society influence the formation of human values during youth, values stay relatively stable throughout one's lifetime, and values influence attitudes and behaviors over many different contexts (Rokeach, 1973; Rohan 2000; Gelfand et al. 2011; Schwartz 2012). Such approaches, however, may not fully capture the dynamics of human cognition as a unique ecosocial system (Lemke 2000). Both complex and adaptive, cognition is subject to the upward and downward pressure of emergence and immergence processes (Conte et al. 2007). Such processes are often referred to as “feedback loops” in the systems literature, where micro and macro level properties affect one another in meaningful ways (Gunderson & Holling 2002). Cognition also appears to operate differently depending on the level or scale under investigation, further supporting the notion that a systems view of values is needed. By conceptualizing values as part of a multilevel, multiscale world, we can better understand the complex adaptive capacity of human cognition and implications of values for social-ecological systems worldwide (Kitayama 2002; Manfredi et al. 2014).

Our work casts a prominent theory of value shift under a systems lens. We suggest that emergence and immergence processes relate to the proposal by Inglehart and his colleagues that modernization has created a shift in human thinking from values rooted in materialism (life goals focused on baseline needs, such as food, shelter, and job security) to postmaterialist thought focused on self-actualization and transcendence (Inglehart 1990; 1997; Abramson & Inglehart

1995; Inglehart & Welzel 2005). According to Inglehart's thesis<sup>1</sup>, the day-to-day existence of people living in post-industrialized nations following World War II was (arguably) better than the lives of previous generations. Youth were raised under conditions of improved national security, greater wealth, and increased education and employment opportunities. Additionally, more and more people were choosing to live and work in urbanized areas. These new circumstances that resulted from modernization significantly impacted daily behaviors (e.g., greater reliance on technology, decreased knowledge of natural systems), and the constant re-enactment of behaviors over time led to the emergence of a new set of cultural values (Kitayama et al. 2006). Conte and her colleagues (2007) describe this upward pressure of emergence as a process by which micro-level units are capable of generating macro-level effects outside of micro-level dynamics. Simply put, people do not consciously attempt to create any particular effect (e.g., value shift) when acting out their daily lives.

Our conceptualization acknowledges values as phenomena that emerge from individuals who are in turn shaped by pervasive social-ecological conditions (e.g., warfare, mass migrations, disease spread). Therefore, a systems view would suggest that processes of both emergence and immergence affect values. Immergence is defined as a downward process by which macro-level mechanisms affect units at the micro level. Specifically, immergence occurs when an emergent process changes a system in such a way that new rules or mechanisms arise and are subsequently reproduced (Conte et al. 2007). Considering immergence, we argue that postmaterialist values which emerged in the decades after World War II should be reproducible in at least two discernable ways. First, macro-level indicators of modernization, such as national wealth, should

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<sup>1</sup> We note that some authors have criticized Inglehart's explanation of value shift (for a review of criticisms and counter-criticisms, see Abramson 2011). Our contribution is to depict value shift as a dynamic process that allows for the emergence of postmaterialist values in many nations during the decades following World War II and other sets of values to emerge under different cultural contexts or future conditions.

be related to micro-level expressions of postmaterialist values. This pathway of emergence is supported by Inglehart's body of work (e.g., Inglehart & Abramson 1994; Inglehart 1997), which suggests that individuals express new value priorities upon experiencing macro-level effects of modernization. Second, values that have emerged should be evident across a multitude of contexts. More precisely, the macro-level effects of postmaterialist values within a society would predict a wide range of individual-level attitudes and behaviors. Inglehart supports this pathway by demonstrating how postmaterialist values are associated with greater support for civil rights, the environment, and other non-patriarchal foci (e.g., Inglehart 1995; Inglehart & Welzel 2005).

Despite the significant body of research describing the emergence process in relation to modernization and values cross-culturally, we know less about how modernization forces operate within a particular nation. A systems view of values would suggest that macro-level processes have properties of their own that do not always operate in the same manner at other levels. In light of this view, we raise the question of whether or not modernization processes only operate at the national level. Can we detect evidence of the downward pressure of modernization on a nation's citizenry that leads to individual-level expressions of postmaterialist values everywhere or does the emergence process operate differently in certain parts of a nation? For example, Talhelm and colleagues (2014) showed that significant cognitive differences occurred within distinct regions of China: people who were more interdependent and holistic-thinking came from regions that historically cultivated rice rather than wheat. The authors did not find a modernization explanation for this particular cognitive difference, raising the question of whether or not modernization processes can only be detected as operating across nations rather than within one. In response to this inquiry, we seek to identify the effects of modernization on values using a meaningful geopolitical boundary (e.g., state) one step removed from nation. A

response to this inquiry can provide information on the process by which modernization influences social values within a particular system.

We also seek to investigate the degree to which processes of immergence are detectable within the realm of environmental thought, an area of increasing concern given the number of challenges (e.g., climate change, biodiversity loss, habitat destruction) facing many social-ecological systems worldwide. A systems view suggests that we could detect evidence of the reproducibility of values that are deeply embedded into a culture. Can we, therefore, identify the immergence of postmaterialist values across a wide range of environmental attitudes and behaviors? Inglehart (1995) indicates that postmaterialism would lead to increased concern for the environment, membership in environmental groups, and financial sacrifices aimed at alleviating environmental problems. Researchers have demonstrated that linkages exist between postmaterialism and general environmental thought (e.g., Gelissen 2007; Franzen & Meyer 2010; Jorgenson & Givens 2013), but to our knowledge, few if any studies have simulatenously examined the relationship between postmaterialist values and a multitude of specific environmental topics.

Our work improves upon prior research by exploring the breadth of value immergence in the domain of environmental concern. We specifically examine the questions we have raised in the context of a long-term program of research documenting macro-level impacts of modernization on values toward wildlife in the United States (U.S.) (Manfredo et al. 2009). Similar to Inglehart's proposal regarding a rise in postmaterialism due to modernization, this research suggests that the same processes are contributing to a wildlife value orientation that often prioritizes species protection over the needs and interests of humans. This mutualism orientation has been shown to have a predictable influence on attitudes and behaviors that have

major implications for wildlife conservation and management (Teel & Manfredi 2010). We note that both sets of values focus on prioritizing entities other than self, and we have documented a positive relationship between mutualism and postmaterialist values (Manfredi et al. 2009). With this paper, we seek to provide further support to the notion of postmaterialist value immergence through a variety of means, as well as inform management responses to the many environmental challenges facing social-ecological systems worldwide.

### **Hypotheses**

To explore questions about the two pathways of values immergence outlined above, we used data on values, attitudes, and sociodemographics that were collected as part of the previously-mentioned research program from residents ( $n = 12,673$ ) of 19 western states in the U.S. (Manfredi et al. 2009; Teel & Manfredi 2010). Our hypotheses are described below:

- *H<sub>1</sub>: Postmaterialist values are positively associated with state-level indicators of modernization (i.e., increased income, education, and urbanization). This hypothesis relies on the supposition that processes associated with modernization operate similarly at different macro levels (e.g., nation and state).*
- *H<sub>2</sub>: Postmaterialist values are positively associated with general support for environmental protection. We base this hypothesis on prior research indicating that postmaterialism is related to broad measures of environmental concern (e.g., Inglehart 1995).*
- *H<sub>3</sub>: Postmaterialist values are positively associated with a range of attitudes toward specific actions that support environmental protection, and negatively associated with actions that benefit humans at the expense of entities other than self. This hypothesis tests our assertion that postmaterialist values are reproducible across myriad environmental*

scenarios at the micro level. As illustrations of this hypothesis, we expect individuals with postmaterialist values to be less likely to support traditional management approaches that result in death of or harm to wildlife, and more likely to support actions that prioritize protection of wildlife species over human needs and interests.

- *H<sub>4</sub>: Relationships tested in Hypothesis 3 will yield patterns consistent with the relationship between mutualism and the same attitudinal measures.* Mutualism reliably predicts specific attitudes and behaviors in a wildlife-management context (e.g., Teel & Manfredi 2010), so we test this hypothesis in the interest of providing additional support for our assertion of values emergence.

## **Methods**

### ***Data Collection***

Data for the western U.S. study were collected via a mail survey administered to a sample of residents in each of 19 states during 2004. Samples were purchased from Survey Sampling International (Shelton, Connecticut), employing a probability sampling scheme stratified by state and age to ensure adequate representation of population subgroups as compared to state census information. We used standard procedures for survey administration consisting of two full mailings of the survey and cover letter in addition to a reminder postcard (Dillman, 2007). We targeted for approximately equal representation of males and females using a request contained in the cover letter of our first mailing. We aimed for 400 completed surveys per state, allowing for population estimates within  $\pm 5\%$  at the 95% confidence level (Scheaffer et al. 1996). We received 12,673 completed surveys (over 400 per state), and obtained a 21% response rate overall.

To test for nonresponse bias, we phoned a sample of nonrespondents in each state following data collection ( $n = 7,388$ ). The phone survey contained several questions from the mail survey, including items to assess wildlife value orientations and sociodemographics. Follow-up comparisons revealed significant differences between respondents and nonrespondents on age and participation in wildlife-related recreation but only marginal variation (partial  $\eta^2 < 0.01$ , the level at which the effect size is defined as small [Cohen 1988]) on value orientations. Given these findings and our interest in understanding the relationships among variables of interest, we used unweighted data in all of our analyses except those for  $H_2$ : results for this hypothesis describe the percentage of people within a state that expressed postmaterialist values and support for environmental beliefs, necessitating the use of weighted data to correspond with previous publications representing state-level beliefs (e.g., Teel & Manfredi 2010).

### ***Measurement***

We measured sociodemographic indicators of income, education and urbanization by asking respondents to specify the following through selection from fixed-response options: annual household income before taxes, highest level of education achieved and size of current community. We also measured sex with fixed-response categories (male/female).

Postmaterialist values were assessed using an adaptation of Inglehart's (1997) approach, in which respondents ranked a series of goals for their country in order of importance. Goals were arranged in three choice sets, with each set containing two materialist and two postmaterialist statements (12 items total). Respondents ranked goals within each set on a scale from 1 (most important) to 4 (least important). We assigned postmaterialist values scores to individuals by summing the number of items receiving either a 1 or 2 (indicating high

importance) in each choice set. Scores ranged from 0 (no items selected) to 6 (all items selected), with higher numbers denoting stronger postmaterialist values. We classified a person as “post-materialist” if he or she selected 4 or more of the 6 items representing postmaterialist life goals.

We measured overall support for environmental protection using three items that were adapted from Inglehart’s (1995) original measures: (1) the natural environment should be protected for its own sake rather than simply to meet our needs; (2) protecting the natural environment should be this country’s top priority; and (3) we should strive for a society that emphasizes environmental protection over economic growth. These items were measured on a scale ranging from 1 (strongly disagree) to 7 (strongly agree), and a composite scale of all 3 items representing support for environmental protection indicated high internal consistency (Cronbach’s alpha = 0.75).

We assessed attitudes toward various issues relating to environmental management in the western U.S. using a set of 623 items that were included in state-specific versions of the survey instrument. These issues were determined a priori by personnel of state wildlife management agencies in consultation with the research team. We measured items on the following scales:

- 294 items assessed on a bi-directional agreement scale ranging from 1 (strongly disagree) to 7 (strongly agree)
- 143 items assessed on a bi-directional acceptability scale ranging from 1 (highly unacceptable) to 7 (highly acceptable)
- 162 items assessed on a uni-directional importance scale ranging from 1 (not at all important) to 5 (extremely important); 2 of these items ranged from 0 (not important) to 3 (very important)



- 24 items assessed on a bi-directional preference scale ranging from 1 (strongly prefer choice A) to 6 (strongly prefer choice B); no neutral point existed on these items.

To measure the mutualism value orientation, we used multiple survey items representing basic beliefs about wildlife and wildlife management. Item development followed domain sampling procedures of scale construction (Nunnally & Bernstein 1994), with a focus on ensuring adequate representation of specified “belief dimensions.” These dimensions are sets of basic beliefs that we previously verified and refined through open-ended interviews. A mutualism orientation was indicated by belief dimensions of caring and social affiliation. Respondents rated their level of agreement with belief items on a scale ranging from 1 (strongly disagree) to 7 (strongly agree). We computed value orientation scores through a two-step process. First, we gave respondents a score for each belief dimension (caring and social affiliation), computed as the mean of all items within that dimension. Next, we assigned a mutualism value orientation score by computing the mean of the two belief dimension scores. We have previously published results of these analyses indicating that our hypothesized groupings of items into belief dimensions and the mutualism orientation provided a good fit for the data collected (Manfredo et al. 2009; Teel & Manfredo 2010).

### ***Analyses***

To test our first hypothesis ( $H_1$ ), we conducted a multilevel, or random effects, model (conducted in SPSS, Version 22) to determine state- and individual-level effects of sociodemographic indicators on postmaterialist values. To begin, we specified a null model to assess the variance within and between states, and to calculate the intraclass correlation (ICC) for our macro-level dependent measure. Next, we assessed relationships of interest using contextual effects analysis (Raudenbush & Bryk 2002). The effect of covariates measured at the individual

level was decomposed into within-state (individual-level) and contextual effects. A contextual effect assesses the impact of a state's average level of a covariate (e.g., education) on an individual's score for an outcome variable (e.g., postmaterialist values) net the effect of the individual's own score for the covariate. We tested random intercepts and slopes, and retained random slopes in all of the models since they proved to be statistically different from zero ( $p < 0.05$ ). As part of these analyses, we controlled for the effect of sex at the individual level given prior research showing sex differences in environmentally-related attitudes and value orientations (e.g., Stern et al. 1993; Zinn & Pierce 2002; Dietz et al. 2005; Xiao & McCright 2013). As part of the urbanization model, we also controlled for whether or not residents indicated that they resided in a suburb of a larger city or metropolitan area.

For testing of our second hypothesis ( $H_2$ ), we used correlation (Pearson's  $r$ ) analysis to explore the individual-level relationship between postmaterialist values and our global measure of support for environmental protection. We conducted a follow-up regression analysis, controlling for individual-level income, education and urbanization, and a second regression analysis additionally controlling for whether a respondent was male or female to assess additional variance explained by these sociodemographics above and beyond values. We also converted our support for environmental protection scale to a categorical variable indicating whether residents were unsupportive, neutral, or supportive of environmental protection. We then graphically depicted the percent of people in a state who were supportive of environmental protection with the percent of residents classified as "postmaterialist", and used correlation (Pearson's  $r$ ) analysis at the state-level to determine the strength of that relationship.

We tested our third hypothesis ( $H_3$ ) through a series of steps. Since residents of each state were asked a unique set of questions pertaining to environmental topics of interest to that state's

wildlife management agency, we first conducted a series of factor analyses within states to elucidate potential themes for grouping items. Themes resulting from these analyses were then compared across states and consolidated when similar groupings emerged. Some items (e.g., “the state agency has no business being involved in the Endangered Species Act”) were reverse-coded for purposes of maintaining a consistent direction among the majority of items within a group. We noted correlations that were statistically significant at the  $p < 0.05$  level, as well as relationships exhibiting a moderate or stronger effect size ( $r \geq 0.30$ ; Cohen 1988).

For testing of the fourth hypothesis ( $H_4$ ), we ran two additional sets of correlations in addition to the correlations assessed in our third hypothesis (postmaterialist values and specific attitudes). The second set of correlations (Pearson’s  $r$ ) assessed the relationships between the mutualism orientation and those same attitudes. Finally, we used Pearson’s  $r$  correlation analyses to determine the direction and strength of relationships between our two values measures (postmaterialism and mutualism) on these 623 items.

## **Results**

For our first hypothesis ( $H_1$ ), the estimation of our null model revealed significant variance ( $p < 0.05$ ) both within and between states on postmaterialist values scoring (within = 2.42 [SE = 0.03], between = 0.04 [SE = 0.01]). As is typical in contextual analyses, we found a greater amount of variation within groups (states) than between groups; calculation of the ICC revealed that 1.6 percent of the variance in values existed between states. Although the ICC values suggest a high degree of heterogeneity within states on our values measures, the design effect ( $1 + [\text{average cluster size} - 1] * \text{ICC}$ ) is greater than 2, supporting the need for multilevel modeling (Muthén & Satorra 1995). Coefficients in the column labeled “Contextual Effects” of Table 2.1 represent the state-level effects of modernization variables on postmaterialist values

while controlling for their impact as individual-level sociodemographics (as well as the individual-level effect of sex). Interpreted as unstandardized regression coefficients, the numbers indicate the change in an individual's values score produced by a one-unit increase in the independent variable. For example, a one-unit increase in a state's mean level of education is associated with a 0.99 increase in a person's postmaterialist values score, while controlling for the effect of his or her own level of education. The coefficient (0.99) could also be interpreted as the difference in postmaterialist values scoring between two individuals who have the same education but who reside in states differing by one unit in mean level of education. Results did *not* show significant state-level contextual effects in the hypothesized direction for any of the modernization variables, meaning that state-level modernization does not appear to have obvious effects on values above and beyond any effects due to individuals' own sociodemographics. The total between-states effect of education on values is 1.17 (0.18 + 0.99), indicating the difference in mean scores on postmaterialist values between two states that differ by one unit in their average level of education. We also calculated the proportion of variance explained by covariates at both levels of the model. At the individual level, the sociodemographic indicators had a negligible impact (accounted for 0–2% of the variation) on values scores. At the aggregate level, these variables also do not appear to have much of any effect on mean values scores (accounted for 0–1% of the variation) across states (Table 2.1). These findings do not support  $H_1$ , suggesting that modernization forces of income, education and urbanization are only marginally related to postmaterialist values.

For our second hypothesis ( $H_2$ ), we found that postmaterialist values were significantly and positively correlated (Pearson's  $r = 0.44$ ) with support for environmental protection at the individual level. Specifically, the stronger one's postmaterialist values, the more likely he or she

is to support environmental protection. This finding suggests a moderate to strong effect size for the association between variables (Cohen 1988). Data on these two measures were collected simultaneously and cannot be used to prove causality; however, squaring our correlation result indicates that 19% of the variance in support for environmental protection would be explained by postmaterialist values as a predictor, assuming that values influence attitudes (Homer & Kahle 1988). Our follow-up regression analysis, controlling for individual-level income, education and urbanization, indicated that 20% of the variance in support for environmental protection could be explained by this model. Controlling for sex explained an additional 1% of variance in support for environmental protection, with females being more likely to indicate support than males ( $B = 0.284$ ,  $SE = 0.026$ ,  $p < 0.001$ ). These results suggest that individual sociodemographic characteristics do not contribute much to support for environmental protection above and beyond what is already explained by values. At the state level, we also found a positive relationship between the percentage of people with postmaterialist values and the percentage of people indicating support for environmental protection (Pearson's  $r = 0.34$ ; Figure 1). In combination, these results support  $H_2$ : postmaterialist values are positively associated with broad environmental concern.

Findings also provided support for our third hypothesis ( $H_3$ ), indicating that postmaterialist values are indeed related to attitudes toward a wide range of environmental topics. We determined a total of 30 themes represented by six general categories during our analyses, including (1) land management priorities; (2) wildlife management priorities; (3) prioritization of human vs. wildlife needs; (4) funding priorities; (5) agency performance indicators; and (6) outdoor activities. Specifically, results showed that 456 of the 623 correlations between attitudinal items and postmaterialist values were statistically significant ( $p$

< 0.05), with 65% or more of correlations in each of the six categories being statistically significant (Table 2.2). Ten percent of these statistically-significant correlations were at or above the 0.30 level, indicating a moderate to strong effect size between variables of interest (Cohen 1988). Results of these correlational analyses revealed specific patterns of thought that have implications for environmental management (Table 2.3).

Considering the general theme “land management priorities”, we found that postmaterialist values were positively correlated with 100% of the items related to protecting and restoring habitats and lands. Individuals with postmaterialist values were also more likely to support state agencies securing greater access to lands and waters for cultural purposes, in urban areas, or for wildlife viewing opportunities, but less likely to support obtaining access for hunting and fishing opportunities. Postmaterialist values were positively associated with regulating human activities through licenses (e.g., establishing recreation permits for hiking, camping, diving), restrictions (e.g., catch limits on fishing), or other forms of enforcement (e.g., apprehending those who break laws). Similarly, postmaterialist values were positively correlated with 100% of the items relating to placing restrictions on off-road or all-terrain vehicles (ORV/ATV). For the general theme “wildlife management priorities”, we found that people with postmaterialist values were more likely to support endangered species protection, prioritize native species over nonnative or invasive species, and desire that agencies maintain diverse wildlife populations. Individuals with postmaterialist values were also more likely to find current management practices inadequate and traditional forms of management (e.g., lethal control) unacceptable.

We additionally found that postmaterialist values were strongly associated with the general theme “prioritization of humans vs. wildlife needs”. Results showed that postmaterialist

values were positively correlated with items prioritizing the needs of wildlife (e.g., the agency should be a strong advocate for wildlife, even if it means opposing development) and negatively correlated with items prioritizing human needs (e.g., place more importance on economic development and jobs than on protecting habitats). Postmaterialist values were also negatively correlated with items indicating that water should be prioritized for human uses such as household electricity, agriculture, and industry. Generally, individuals with postmaterialist values were less likely to perceive wildlife diseases as posing a threat to humans; however, this category had the least amount of consensus across items, with 62.5% of items being negatively correlated with values and 37.5% being positively correlated.

For the general theme “funding priorities”, individuals with postmaterialist values were more likely to think that all citizens (rather than just fishing and hunting license-holders) should pay to support wildlife management, and that reallocation of existing funds (i.e., through taxes or special programs) was necessary. Postmaterialist values were positively correlated with items suggesting the creation of new funding sources (e.g., new or increased federal and state taxes, conservation licenses plates, adding fees to water bills) and negatively correlated with making payments from wildlife management dollars to private landowners who sustain wildlife-related damages on their properties. Postmaterialist values were also positively correlated with a belief that recreation provides financial benefits to local economies. Correlations between values and three items related to changing the hunting and fishing license fee structure were insignificant.

For the general theme “agency performance indicators”, we found that postmaterialist values were negatively correlated with trust in the managing agency to do its job correctly<sup>2</sup>. We

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<sup>2</sup> Exception: postmaterialist values were positively correlated with four items related to the state wildlife management agency being trusted to do its job correctly. These items were evaluated by residents of Washington, suggesting that the relationship between residents of this state and the managing agency may differ from that of neighboring states on this topic.

also found that individuals with postmaterialist values were less likely to believe that the agency provided enough information on general wildlife issues or health and safety issues<sup>3</sup> (e.g., chronic wasting disease in deer [*Odocoileus* spp.]). In contrast, those with postmaterialist values were more likely to support agency promotion of educational activities (e.g., wildlife education in the classroom, construction of educational facilities, hunter safety classes) and collaborating with other entities, including nonprofit groups and private landowners, to achieve environmental objectives. Finally, in relation to the general theme “outdoor activities”, we found postmaterialist values to be positively correlated with wildlife-viewing activities, and hiking, camping or other general outdoor activities such as tourism. In contrast, postmaterialist values were negatively correlated with activities perceived to harm wildlife, such as hunting, trapping and fishing. Postmaterialist values were also negatively correlated with outdoor activities that are mechanized (e.g., motor-boating, farming, mountain biking, snowmobiling) or otherwise assisted (e.g., horseback riding, skiing). In total, our results lend support for  $H_3$ : postmaterialist values are positively correlated with a wide range of attitudes and activities that are perceived to protect (or not cause harm to) the environment and negatively associated with actions that benefit humans at the expense of entities other than self (e.g., fish, wildlife, habitat).

For our final hypothesis ( $H_4$ ), we found attitudinal items that strongly correlated with postmaterialist values were also strongly correlated with a mutualism wildlife value orientation (Figures 2a-f). Of the 30-item groups, three (make payments to landowners for damages, change hunting and fishing license fees, and recreation provides financial benefits to the economy) did not have enough items to assess the strength and direction of relationship between item responses

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<sup>3</sup> Exception: postmaterialist values were positively correlated with five items related to providing enough information on health and safety issues. These items were evaluated by residents of North Dakota, suggesting that the relationship between residents of this state and the managing agency may differ from that of neighboring states on this topic.



and our two values dimensions. Both value dimensions were weakly correlated with one another on three item groupings (restrict ORV/ATV use on lands, wildlife diseases pose a threat to humans, and the agency provides enough information on health and safety issues), suggesting that people holding the two value sets may feel differently about these particular issues or that attitudes are not very strongly held by individuals with either value set. The remaining 24 of 30 correlations (Pearson's  $r$  values) ranged from 0.41 to almost 0.90, suggesting very strong relationships between both values measures on the items assessed. Overall, these findings support  $H_4$ : the two value sets appear to be related to one another and help to provide evidence of values emergence.

### **Summary and Discussion**

In this article, we conceptualize human values as phenomena subject to processes of emergence and emergence (Conte et al. 2007). We illustrate these processes using a predominant theoretical perspective of value shift proposed by Inglehart and his colleagues (Inglehart 1990; 1997; Abramson & Inglehart 1995; Inglehart & Welzel 2005), who describe the “modernization” of many post-industrialized nations following World War II that brought on a shift in individual-level thinking from materialist values rooted in fulfilling basic life goals of food, shelter, and security to postmaterialist values focused on self-actualization and transcendence. This pathway of value shift is consistent with the notion of emergence, where macro-level effects are replicated across micro-level units. These “units”, or individuals, then contribute to value shift through the process of emergence (micro to macro) that arises out of the combined, ongoing, and daily practices of human behavior (Kitayama et al. 2006). We propose that considering values in this way subscribes to a more holistic view of cognition as an ecosocial system with complex, adaptive dynamics (Lemke 2000).

In light of Inglehart's proposal, we elaborate on two possible pathways for the immergence of values that have become embedded into society. Although a large body of research already exists related to this first pathway of immergence (modernization's impact on postmaterialist values), Davis (2000) acknowledges a need for greater exploration on this topic within nations. We support the supposition that a more thorough investigation of modernization's effects on values in the context of a particular society can tell us more about whether or not macro-level processes operate similarly at other levels. For example, Talhelm and colleagues (2014) determined that regional variation in cognition within China existed, but that the variation was independent of modernization. We also detected no evidence of modernization operating specifically on postmaterialist values at the state level within the U.S. Combined, these results may suggest that modernization does not operate strongly at more refined levels other than nation. Reasons for why we were unable to detect the influence of modernization variables on values remain unclear. It's possible that value shift as described by Inglehart has already occurred within the U.S., and postmaterialist values are now rooted within that society rather than still forming.

Alternatively, our lack of evidence regarding the effect of modernization on values may suggest that processes other than modernization are driving contemporary value shift (at least within the U.S.). For example, Inglehart (1997) suggests that improved conditions within post-industrialized nations following WWI gave rise to postmaterialist values. However, the trajectory of societal values during the next several decades may be influenced by other factors. As an illustration, the U.S. is currently undergoing immense growth in minority populations through immigration and reproduction, which introduces and reinforces different sets of customs, beliefs, and behaviors. Long-term data that capture the context in which individuals are raised, including

one's ethnic background, as well as the context in which people live during their lifetime would help to elucidate factors tied to the ongoing emergence and immergence of new social values. A systems view of values can improve understanding of this important interplay between various levels of cognition across different scales (e.g., spatial, temporal).

Our next step was to explore a second pathway of values immergence. Specifically, values that are embedded into a society (macro-level phenomenon) should be apparent across a wide range of micro-level attitudes and behaviors. In the case of postmaterialist values, for example, Inglehart and Welzel (2005) show that postmaterialist values are evident in many contexts, including consumer preferences, voting and civic action, and other examples of human expression. We specifically explore this pathway of immergence in the realm of environmental concern given the increasing emphasis on understanding the relationship between values and support for environmental protection. Our results maintain the prevailing hypothesis that postmaterialist values are strongly associated with broad environmental concern (Inglehart 1995; Gelissen 2007; Franzen & Meyer 2010). We also found postmaterialist values to be related to specific concerns about the environment across a large majority of the 623 correlations we examined. Categories of items included land management priorities, wildlife management priorities, prioritization of human vs. wildlife needs, agency performance indicators, funding priorities, and outdoor activities that impact fish and wildlife, demonstrating that postmaterialist values immergence is evident in many environmental contexts.

In addition to exploring these two pathways of immergence, we also sought to investigate the relationship between postmaterialist values and environmental attitudes in relation to a known program of study investigating wildlife value orientations. This interest stems from the documented connection between wildlife-related thought and behaviors and a mutualism

orientation that often prioritizes the perceived needs of wildlife over human needs (Manfredo et al. 2009; Teel & Manfredo 2010). For example, individuals with a mutualist orientation often find lethal control of wildlife as an unacceptable management action. We show a strong relationship between postmaterialist environmental concerns and the concerns of individuals with a mutualism wildlife value orientation toward the same environmental concerns. Our results support the idea that broad views about the world and humans' roles within that world have become infused in the culture of western America, and that those views have reliable implications for humans' relationships with the natural world.

In conclusion, we suggest that knowledge of the emergence and immergence of values can enhance environmental management in several ways. First, Inglehart suggests that a rise in postmaterialist values will lead to increased interest in participatory processes and open governance structures that allow for self-expression (Inglehart 1990, 1997; Abramson & Inglehart 1995). We found some evidence of this in an environmental context, where people with postmaterialist values indicated an interest in wildlife management agencies working collaboratively with the public, private landowners and nongovernmental organizations. In the arena of wildlife management, such demand may be contrary to processes that often received input only from specific user groups, such as hunters and anglers (Organ & Fritzell 2000), who do not always reflect society at large (Gill 1996). The dynamic relationships between agencies and their publics will be critical to investigate in the years to come, particularly as to whether or not collective action between agencies and their publics fosters more sustainable outcomes to environmental problems (Dietz et al. 2003; Ostrom & Ahn 2009; Ostrom & Cox 2010 ).

Another way in which a systems view of values could be used to enhance environmental management is related to understanding the ways in which audiences seek to engage with the

natural world. Our work supports the notion that values have undergone some process of shifting, and pervasive environmental thought exists among those with postmaterialist values. Therefore, we might expect growing social conflict over management approaches that seem to favor human needs at the expense of nonhuman entities (e.g., habitat loss for residential development). We also demonstrated that postmaterialist values are positively associated with an interest in activities that are perceived as less threatening or harmful to wildlife (e.g., environmental education, hiking, camping). Knowledge of values, therefore, allows for a better understanding of target audiences and emerging preferences that can be used to inform the development of programs that evolve with society over time.

Finally, we note that knowledge of how values operate can enhance communication, education, interpretation, and outreach efforts of agencies engaged in environmental management. For example, residents living in locations dominated by materialist values may be motivated to comply with messages from traditional, hierarchical governing authorities that advocate environmental restoration efforts will bolster national pride and economic security (materialist desires). In contrast, residents living in locations dominated by more postmaterialist values may find inclusive efforts that foster individual say and co-management options as successful avenues for the future (Olsson et al. 2004). More than one approach will be necessary (Ostrom et al. 2007), and determining how to work within these value priorities may be the most effective approach to developing solutions, as opposed to initiatives focused on attempts to change values (Crompton 2010; Clayton et al. 2013). A deeper understanding of the feedback loops (i.e., emergence and immergence) between different levels of cognition can only improve our ability to solve the grave environmental challenges we face.

Table 2.1. Results of multilevel modeling testing for individual and state-level effects of covariates on postmaterialist values from a survey of residents in the western U.S. ( $n = 12,673$ ).

<i>Model tested</i>	Individual-Level Effect <sup>1</sup>		Contextual Effect <sup>2</sup>		PVE <sup>3</sup>
	Estimate	SE	Estimate	SE	
<i>Education</i> → <i>Postmaterialism</i>					
Education	0.18	0.02*	0.99	0.52	0.02/0.01
Sex	0.25	0.03*			
<i>Income</i> → <i>Postmaterialism</i>					
Income	-0.04	0.01*	0.55	0.30	0.01/0.00
Sex	0.27	0.03*			
<i>Urbanization</i> → <i>Postmaterialism</i>					
Urbanization	0.03	0.01*	0.08	0.12	0.00/0.00
Suburb	-0.16	0.03*			
Sex	0.26	0.03*			

<sup>1</sup> Individual-level effect of the covariates on the dependent variable. Estimates represent unstandardized regression coefficients; SE = standard error.

<sup>2</sup> State-level effect of the covariate, while controlling for its individual-level impact on the dependent variable. Analyses, run separately for each covariate, also controlled for the individual-level effect of sex (0 = male, 1 = female).

<sup>3</sup> PVE = proportion of variance explained. First number = PVE at the individual level; second number = PVE at the state level.

\*  $P < 0.05$ .

Table 2.2. Correlations between post-materialist values and groupings of 623 attitudinal items from a survey of residents in 19 states of the western U.S.

General Theme Item Grouping	# of Correlations (%)		<i>p</i> < 0.05
	Positive	Negative	
<b>Land management priorities</b>			<b>81 (75%)</b>
Protect/restore habitat and lands	31* (100%)	0 (0%)	
Secure access to lands and waters	15 (75%)	5 (25%)	
Regulate humans	19 (76%)	6 (24%)	
Restrict ORV/ATV use on lands	32* (100%)	0 (0%)	
<b>Wildlife management priorities</b>			<b>108 (74%)</b>
Endangered species protection	48* (100%)	0 (0%)	
Native species have priority	14 (93%)	1 (7%)	
Maintain diversity of fish and wildlife	25* (89%)	3 (11%)	
Current management is adequate	0 (0%)	11 (100%)	
Heavy-handed management (e.g., predator removal)	0 (0%)	42* (100%)	
<b>Prioritization of human vs. wildlife needs</b>			<b>76 (70%)</b>
Prioritize the needs of fish and wildlife	37* (95%)	2 (5%)	
Water for human uses (e.g., agriculture, electricity, industry)	0 (0%)	22 (100%)	
Prioritize the needs of humans over endangered species	0 (0%)	23* (100%)	
Wildlife diseases pose a threat to humans	9 (37.5%)	15 (62.5%)	
<b>Funding priorities</b>			<b>59 (80%)</b>
All citizens should pay for wildlife management	14 (82%)	3 (17%)	
Reallocate existing funds	14 (100%)	0 (0%)	
Create new funding sources	35* (97%)	1 (3%)	
Make payments to landowners for damages	0 (0%)	3 (100%)	
Change hunting and fishing license fee structure	2 (67%)	1 (33%)	
Recreation provides financial benefits to economy	1 (100%)	0 (0%)	

Table 2.2, *continued*. Correlations between post-materialist values and groupings of 623 attitudinal items from a survey of residents in 19 states of the western U.S.

General Theme Item Grouping	# of Correlations (%)		<i>p</i> < 0.05
	Positive	Negative	
<b>Agency performance indicators</b>			<b>72 (67%)</b>
Agency is trusted to do its job right	5 (15%)	29 (85%)	
Agency provides enough information on general wildlife issues	0 (0%)	10 (100%)	
Agency provides enough information on health and safety issues	5 (31%)	11 (69%)	
Agency should promote education	19* (95%)	1 (5%)	
Agency should work with others	27 (100%)	0 (0%)	
<b>Outdoor activities</b>			<b>60 (72%)</b>
Hunting	0 (0%)	21* (100%)	
Trapping	0 (0%)	4* (100%)	
Fishing	0 (0%)	22* (100%)	
Wildlife-viewing	17 (100%)	0 (0%)	
Hiking, camping, or general outdoor activities (e.g., tourism)	6 (67%)	3 (33%)	
Mechanized or otherwise assisted outdoor activities	0 (0%)	10 (100%)	

\* At least one of the correlations measured in this particular category exhibited a moderate or stronger relationship ( $\geq 0.30$ ), denoting practical significance (Cohen 1988).



Table 2.3. Correlations between two value sets (i.e., postmaterialism and mutualism) across 623 attitudinal items from a survey of residents in 19 states of the western U.S.

<b>General Theme</b>	
Item Grouping	Pearson's <i>r</i>
<b>Land management priorities</b>	
Protect/restore habitat and lands	0.549
Secure access to lands and waters	0.810
Regulate humans	0.623
Restrict ORV/ATV use on lands	0.162
<b>Wildlife management priorities</b>	
Endangered species protection	0.605
Native species have priority	0.831
Maintain diversity of fish and wildlife	0.725
Current management is adequate	0.407
Heavy-handed management (e.g., predator removal)	0.695
<b>Prioritization of human vs. wildlife needs</b>	
Prioritize the needs of fish and wildlife	0.720
Water for human uses (e.g., agriculture, electricity, industry)	0.552
Prioritize the needs of humans over endangered species	0.691
Wildlife diseases pose a threat to humans	0.125
<b>Funding priorities</b>	
All citizens should pay for wildlife management	0.716
Reallocate existing funds	0.475
Create new funding sources	0.701
Make payments to landowners for damages	***
Change hunting and fishing license fee structure	***
Recreation provides financial benefits to the local economy	***
<b>Agency performance indicators</b>	
Agency is trusted to do its job right	0.392
Agency provides enough information on general wildlife issues	0.563
Agency provides enough information on health and safety issues	-0.161
Agency should promote education	0.854
Agency should work with others	0.711
<b>Outdoor activities</b>	
Hunting	0.825
Trapping	0.886
Fishing	0.693
Wildlife-viewing	0.808
Hiking, camping, or general outdoor activities (e.g., tourism)	0.686
Mechanized or otherwise assisted outdoor activities	0.617

\*\*\* Category had 3 items or less, so we did not conduct a correlation analysis.

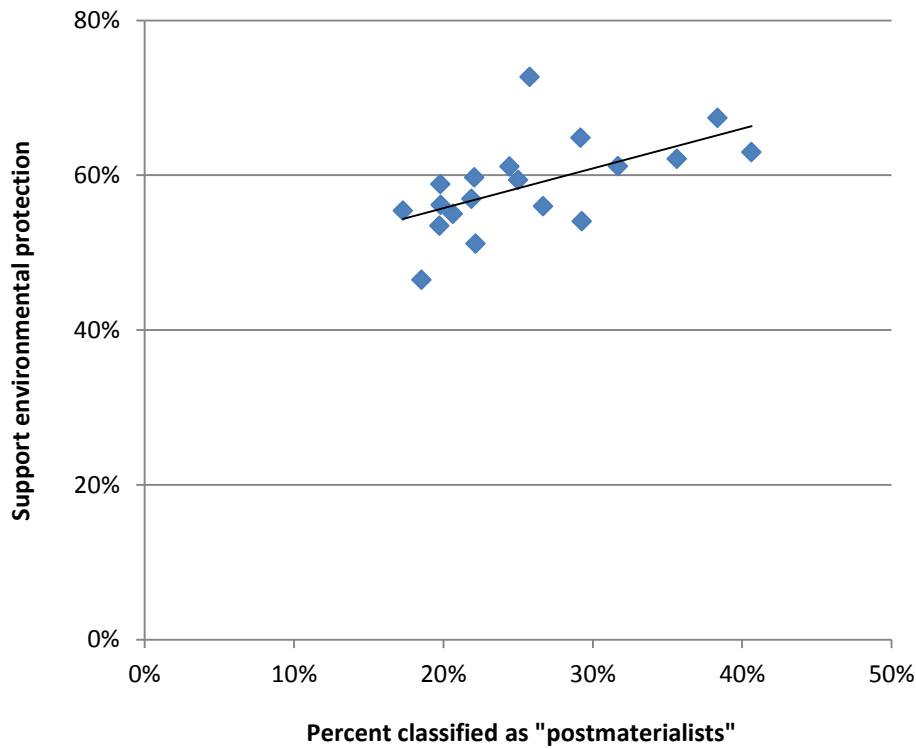
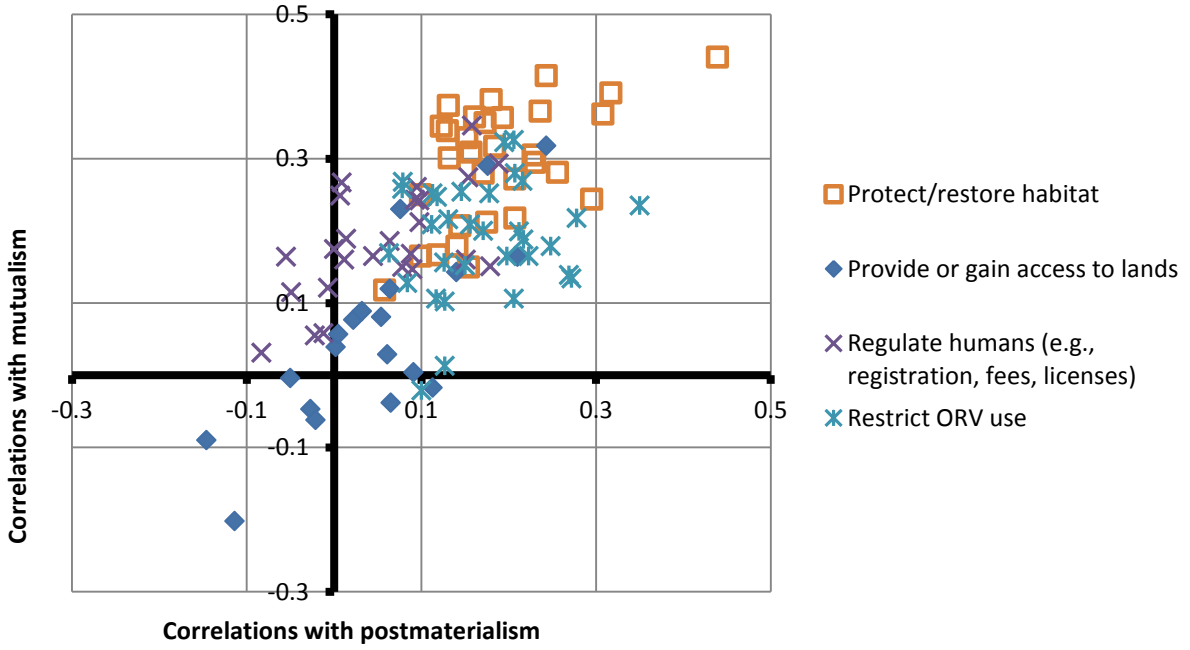
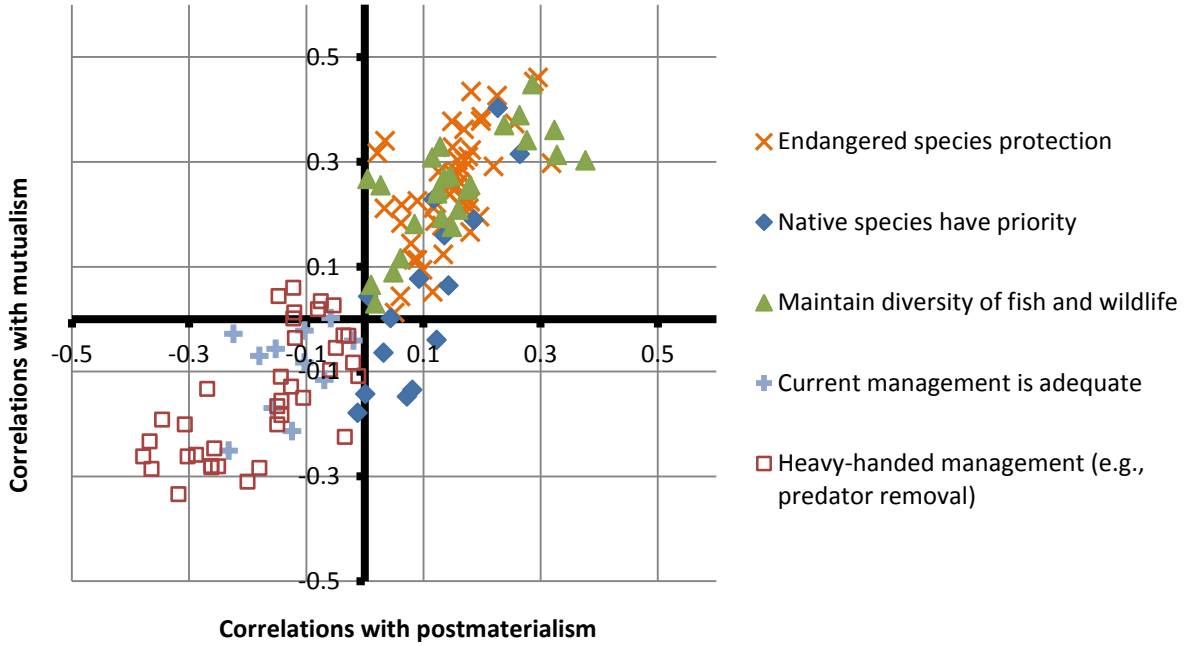


Figure 2.1. Relationship between the percent of residents classified as “postmaterialist” and the percent of residents who support environmental protection (each dot represents one of 19 states in the western U.S.). Correlation (Pearson’s  $r = 0.34$ ) indicates a “moderate” effect size for this relationship (Cohen, 1988). Note: without Hawai’i the Pearson’s  $r$  correlation of 0.50 between measures indicates a “strong” effect size.

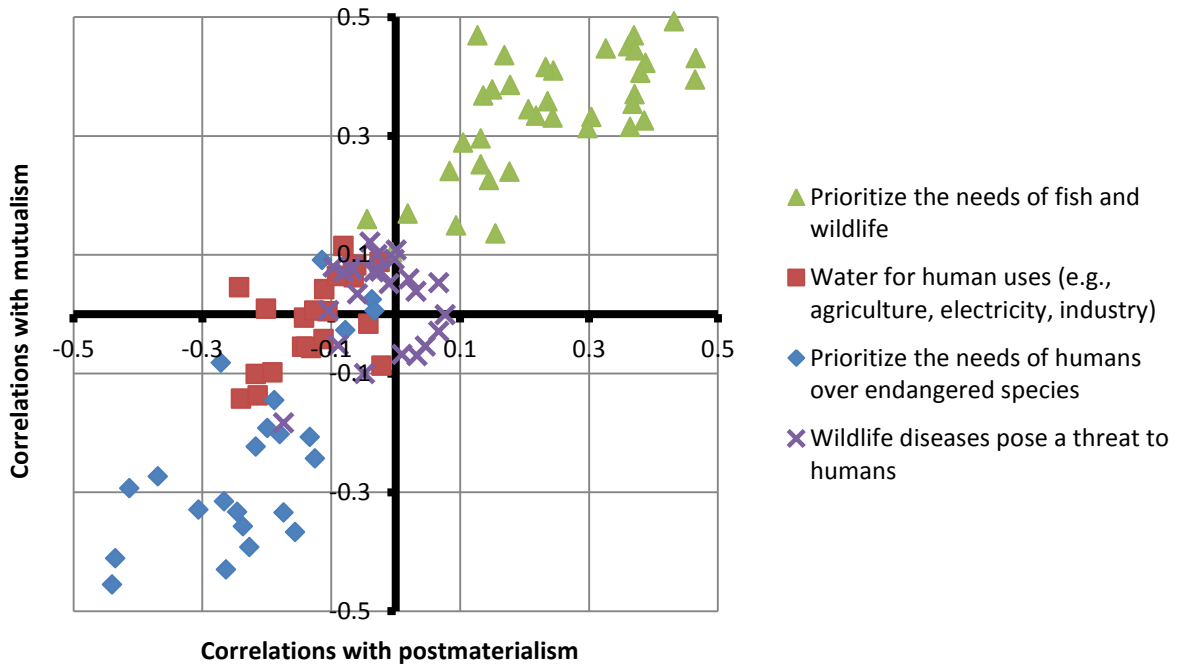
(a)



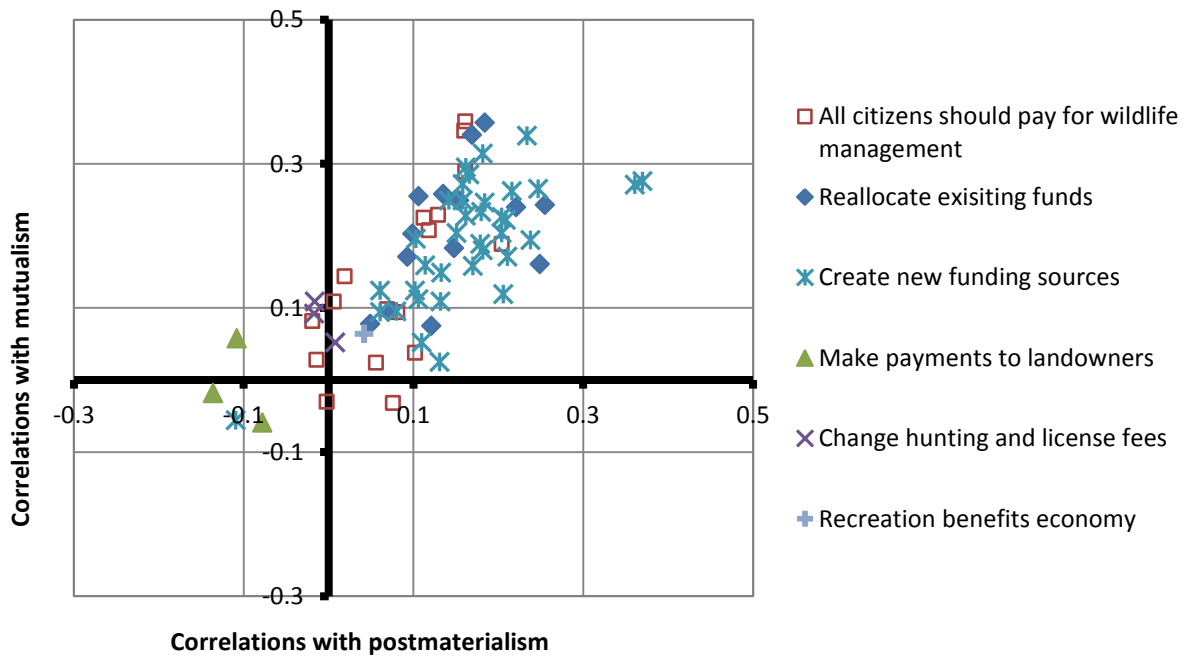
(b)



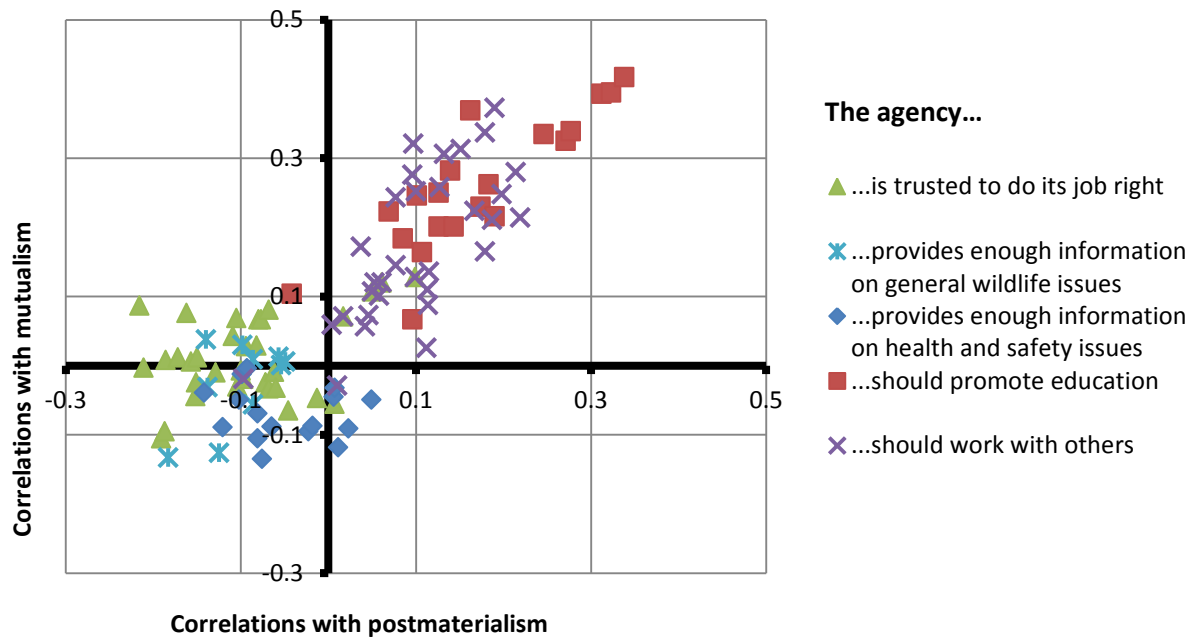
(c)



(d)



(e)



(f)

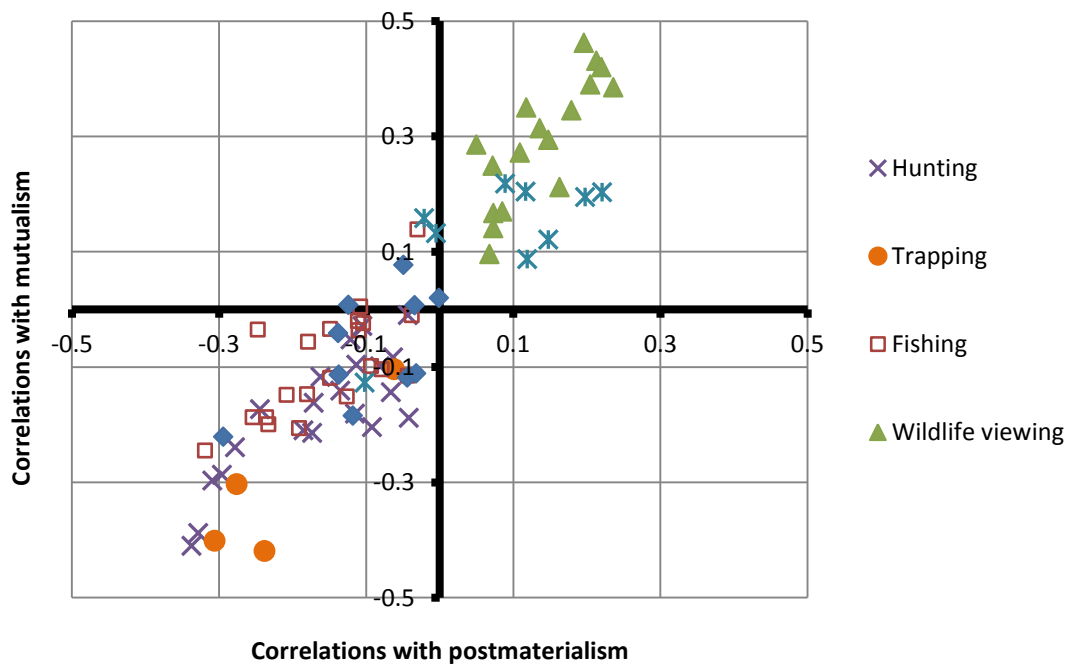


Figure 2.2. Correlations between two values measures (i.e., postmaterialism and mutualism) and 623 attitudinal items from a survey of residents in 19 states of the western U.S. Items were grouped into the following categories: (a) land management priorities, (b) wildlife management priorities, (c) prioritization of human vs. wildlife needs, (d) funding priorities, (e) agency performance indicators, and (f) outdoor activities.

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