MORALS, VALUES, AND ENVIRONMENTALLY SIGNIFICANT BEHAVIOR

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ABSTRACT

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This dissertation uses a multiple-paper format to explore the relationships among environmentally significant behaviors (ESBs) at the individual and household levels, value orientations, and moral intuitions. Forty years of scholarship provides a nuanced understanding of the drivers, processes, and consequences of a range of ESBs; yet, there remain emergent and underexplored behaviors and predictors. In Chapter Two, I report the results of a between-subjects experiment investigating how values, moral intuitions, and varying psychological distances in messages about biodiversity loss influence subjects' choice of donating to a local, national, or international arm of a biodiversity conservation charity. In Chapter Three, I report on a between-subjects experiment examining how water conservation behavioral intentions and donation to an environmental charity are influenced by psychological distance (i.e., spatial and temporal distance from a drought), values, and morals. Chapter Three also introduces a new water conservation behavior instrument. In these two chapters, I use ordinary least squares, logistic, and zero-inflated negative binomial regression techniques. I directly observe monetary donations as a relatively novel outcome measure reflecting advances in online experimentation methods and capturing an important fundraising mechanism for environmental causes. I also introduce psychological distance as a novel potential predictor of environmentally significant behaviors.

Research streams of this decades-long duration can benefit from occasional reviews and systematization to improve their coherence and lead to a more organized accumulation of knowledge. To this end, in Chapter Four, I report an analysis of a sample of the environmentally

significant behavior/pro-environmental behavior literature. My review identifies the differences in and consequences of the performance of individual versus scaled outcome measures as well as a variety of psychosocial predictors, and the employment of our most-used theoretical approaches.

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CHAPTER 1: INTRODUCTION

Environmentally significant behaviors at the individual and household levels are two important factors in sustaining the availability and quality of critical nature-derived resources such as energy (e.g., Poortinga, Steg, and Vlek 2004), water (e.g., Dolnicar, Hurlimann, and Grün 2012), and ecosystems (e.g., Harshaw, Sheppard, and Lewis 2007). Scholars suggest that individual and household behaviors could yield savings approaching 48% of current residential energy use in the EU (Fonseca *et al.* 2009) or 31% of U.S. CO_2 emissions (Dietz *et al.* 2009). We have over forty years of research that give us a nuanced understanding of the drivers, processes, and consequences of environmentally significant behavior. Nevertheless, with greater understanding have come further questions. In this dissertation, I address several of these.

Different phrases have been interchangeably used to refer to a suite of related concepts. *Environmental concern* originated in the 1970s and represents the oldest and broadest umbrella concept. It is still used today. *Environmental concern* encompasses values, attitudes, beliefs, knowledge, worldviews, identities, policy preferences, self-reported behaviors and behavioral intentions. This is a convenient shorthand; however, it is imprecise. Clearly not all of these concepts require concern. Nor are they homogenous. Each of these drivers and outcomes has different predictors and behaves differently in various contexts. Consequently, they do not fit together well in any real analytical sense. More recently, Dietz (2003) has suggested the phrase *environmental decision-making* as shorthand for the concepts held under *environmental concern*, plus the cognitive and affective processes that leads to decisions and actions relevant to the environment.

Scholars have also examined behaviors, specifically. We see use of *environmental behavior* and then *pro-environmental behavior* to more precisely identify actions that affect, or have the intention to affect, the environment. The latter term recognizes that *environmental behavior* could have negative consequences and so delineates those actions that are intended to be "friendly" to the environment. In 2000, Stern introduced a definition of *environmentally significant behavior* that pays specific attention to the impacts of the behavior on natural resource quality or quantity.

In this dissertation, I use the phrase *environmentally significant behavior* when framing or discussing my work as a whole. It is the term that most closely fits my intended research. When I refer to the larger body of literature I follow Dietz using *environmental decision-making* as shorthand. However, the majority of scholars in this area still use *pro-environmental behavior* as their preferred term, so when directly discussing their work (i.e., in Chapter 4), I will use their chosen terminology.

Environmentally Significant Behavior/Pro-Environmental Behavior

Individual- and household-level environmentally significant behaviors (ESBs) have been of interest to scholars since the early years of environmental sociology (e.g., DeFronzo and Warkov 1979; Klausner 1977). Scholars studied behaviors such as those deemed harmful to recreational environments (e.g., littering and vandalism); the relationships between lifestyles and water or energy allocation; participation in and opposition to the Environmental Movement; and efforts to avoid pollution or other technological hazards (i.e., environmental racism-related behaviors). Now scholars also consider resource conservation behaviors, consumption practices, recycling, transportation choices, and technology acceptance (Attari *et al.* 2010; Dietz 2014;

Guagnano, Stern, and Dietz 1995; Steg and Vlek 1997; Stern *et al.* 2010). These changes have emerged as environmental consciousness has spread more widely among the public and as environmental sociology has progressed in its sophistication. Of particular interest, we have developed better methods to quantify resource use and to estimate the potential impacts of various environmentally significant behaviors (e.g., Dietz *et al.* 2009; York, Rosa, and Dietz 2003).

Predicting ESBs has proven to be a highly complex endeavor. There are contextual factors such as the geophysical environment or an area's energy-delivery system to consider. Social-psychological and demographic factors such as attitudes, beliefs, values, moralities, social identities, ideologies, and knowledge are both directly and indirectly influential, and individual cognitive factors such as preferred information processing strategies and heuristics work to facilitate or constrain the various ESBs (Dietz, Fitzgerald, and Shwom 2005; Gifford and Nilsson 2014; Stern 2014). Hundreds of studies of ESBs have focused upon the performance of these demographic and social-psychological predictors (Bamberg and Möser 2007). Demographics have typically explained only a small amount (between 5% and 15%) of the variation in ESBs with age, sex, educational attainment, and political ideology being the most consistent predictors (Barr 2007; Dietz, Kalof, and Stern 2002; Dietz *et al.* 1998; Gifford and Nilsson 2014). Among social-psychological influences, Gifford (2011) has identified at least 30 different psychological predictors alone. Factors such as worldview (e.g., the New Ecological Paradigm), value preferences (e.g., Schwartz's continuum, post-materialism, or cultural theory), perceptions of risk, attitudes toward the environment generally or an ESB specifically, and knowledge about environmental issues are all predictors of ESBs. Social-psychological predictors demonstrate

better predictive abilities with somewhere between 20% and 35% of variation typically explained.

Scholars test these predictors mostly atheoretically, but also use a few meso-level theories. The best supported of these are the Norm Activation Model (Schwartz 1977), Values-Beliefs-Norms theory (Stern *et al.* 1999), the Theory of Planned Behavior (Ajzen 1991), and combinations of these three (e.g., Kaiser, Hübner, and Bogner 2005).

Despite the breadth of this work on ESBs, we still have many questions regarding the best predictors of specific individual behaviors. Our field could also benefit from more systematic examination of promising predictors that have received insufficient or no attention lately. Here, I build from existing studies to examine one concept that has received extensive though unsystematic examination (values) and one concept that has received almost no attention in recent work (morals) in the context of a directly observed ESB: monetary donation to an environmental cause.

Values

Examination of the role of values in environmental decision-making shows that values influence behaviors more indirectly than do intentions, attitudes, and some beliefs (Dietz, Fitzgerald and Shwom 2005). For instance, in a large, cross-national study using the Theory of Planned Behavior extended with Schwartz values (Schwartz 1994) and post-materialist values (Inglehart and Flanagan 1987), Oreg and Katz-Gerro (2006) find that both positively influence attitudes toward recycling, frequency of driving a car, and environmental citizenship, as well as personal norms regarding the performance of these behaviors, but values are not seen to have any direct effects on these behaviors. Instead, values guide attention to and accessibility of these

knowledges, beliefs, and attitudes (Best and Mayerl 2013; Steg *et al.* 2014). This action is highlighted in Values-Beliefs-Norms theory-based studies (e.g., Stern *et al.* 1999), where values are established as specific precursors to knowledge about potential consequences and beliefs about responsibility. We also see that values combine with other social psychological factors (e.g., norms or beliefs about personal control) and situational contexts (e.g., availability of recycling bins or household-level energy use data) to lead to behavioral intentions (Steg *et al.* 2014; Dietz, Fitzgerald, and Shwom 2005).

Within environmental sociology, the Rokeach/Schwartz approach to conceptualizing and measuring values receives the most empirical support. The cultural theory/grid-group approach (Douglas and Wildavsky 1983) has been criticized for being a reflection of political ideology (CITES), while the post-materialism approach does not adequately explain variation in the Global South (CITES). Building on the work of Rokeach (1979), Schwartz (1994:21) has developed a continuum of behavior-motivating value orientations that he defines as "desirable trans-situational goals, varying in importance, that serve as guiding principles in the life of a person or other social entity." Schwartz and his colleagues have identified 12 cross-cultural values, though the subtypes are usually collapsed to 10 in research: Power, Achievement, Hedonism, Stimulation, Self-Direction, Universalism (Social), Universalism (Environmental), Benevolence, Tradition, Conformity, Security (Personal), and Security (Social).

The literature indicates that a few specific values are related to environmental decision-making (Stern and Dietz 1994; Stern, Dietz, Kalof and Guagnano 1995; Steg and deGroot 2012). Stern and Dietz (1998) created a reduced-item values scale based on these Schwartz values that relate to environmental decision-making. They re-labeled the resulting factors for ease of use. The Universalism (Environmental) items are called "Biospherism," the Universalism (Social)

and Benevolence items are called "Social Altruism," and the Hedonism and Power items are called "Egoism" (Dietz, Fitzgerald, and Shwom 2005). More recent research suggests that Hedonism and Egoism should be treated separately, however, as they have different theoretical implications (Steg and deGroot 2012). Biospherism is concern for the ecosystem as a whole and generally shows positive and significant influence on ESB-related attitudes and norms. Altruism, concern for fellow humans as a group, shows a positive and significant effect on environmentally significant behaviors that focus on social well-being. Egoism is concern for self, possibly extended to immediate family. It demonstrates a significant negative influence on environmentally significant behavior. Finally, Hedonism is concern for feeling better now. It is an emotion-focused drive that also shows impact on environmentally significant behavior, though the direction of influence varies based on the behavior in question and how good it makes the respondent feel (Steg, Perlaviciute, van der Werff, and Lurvink 2014).

Research on environmental values in the past decade has largely been conducted outside of the United States, predominantly in Western Europe and the British Commonwealth. Examination of a large sample of these studies indicates that values in roughly 50% of these recent empirical studies are Schwartz-derived, though this percentage appears to be closer to 30% in the United States. The NEP scale (Dunlap *et al.* 2000) is also popular, with roughly 20% of studies using it as a measure of values rather than as the "primitive beliefs" Dunlap and colleagues characterize their work as being. In the U.S., the prevalence of NEP use is closer to 50%. The other half of U.S. studies use either more obscure conceptualizations or the authors create their own measures. Recent values work in the United States seems to focus on the role of values in explaining choices between sustainable practices at the household, farm, and community levels, and explaining climate change belief and policy acceptability, while

international studies are explaining conservation and sustainability practices, and cross-cultural studies tend toward validation of models developed in the U.S. or Western Europe.

My dissertation brings both Schwartz-derived values—the most empirically supported and globally prominent conceptualization—and the NEP scale to bear on water conservation and donation to an environmental cause, where they have as yet received minimal attention.

Morality

Morality "guides human action beyond the immediate gratification of desires and the momentary demands of the situation" (Haidt 2008:68), "consists of a reasonably coherent set of notions of what is right and what is wrong" (Luckmann 2003:276), and has affective as well as cognitive significance (Stets 2010). Thus, like values, morals provide trans-situational guidance. But, unlike values, they work through emotional judgment about right and wrong and are based on socially agreed narratives about our roles, place, and purpose in the world (Smith 2003). Understanding moral systems, their origins, how they transform over time, how they are reproduced in social institutions, and how they are acted upon may be important for deeper understanding of social action and organization (Hitlin and Vaisey 2010). Durkheim, Weber, and Marx dedicated much energy to explorations of morality (Durkheim and Coser 1997; Gerth 2007; Shilling and Mellor 1998). Though there was a lull in the study of morality after Parsons' structural-functional explanations fell into disfavor (Abend 2008), cultural sociology took up the task of explaining moral systems, conceiving them as culturally derived "toolkits" (Swidler 1986) rather than socially imposed behavioral imperatives. A major weakness of this approach, however, is the (sometimes implicit) assumption that human behavior is, at heart, explained by

rational choice theory (Smith 2003). We know this is only part of the explanation (Stets 2005) and that, as mentioned, emotion also plays a major role (Lamont 2009).

Recent scholarship indicates that morals impact worldviews, beliefs, attitudes, and behavioral intentions (Firat and Hitlin 2012; Graham, Haidt, and Nosek 2009; De Groot and Steg 2009; Hofmann *et al.* 2014; Lamont 2009). Given that morals are related to values (Hitlin 2007) and other aspects of decision-making like heuristics and information processing (Schwartz and Bilsky 1990; Haidt 2008; Wikstrom 2010), morals may be useful in an examination of ESBs. Studies focused on environmental topics suggest that the majority of people in affluent industrial countries view ESBs as being in the moral domain (Fransson and Garling 1999). They also suggest that, because of the visceral, emotional nature of moral beliefs, they may be able to transform behavioral goals like reduced car-driving from difficult "shoulds" to a more "feels good" frame as individuals behave according to a moral imperative (Abrahamse *et al.* 2009; Lindenberg and Steg 2007; Steg *et al.* 2014). In this dissertation, I introduce moral intuitions as a potential predictor of ESBs as an initial exploration of a potentially valuable research thread.

Psychological Distance

Construal Level Theory, also termed *psychological distance*, is not a focus of this dissertation but it is a theoretical frame that I use for my messaging experiments in Chapters Two and Three. This theory suggests that our attitudes, judgments, and subsequent choices of objects, people, groups, and issues varies by the social, temporal, spatial, or hypothetical distance we construe between our self and my mental representation of the object of attention (Trope and Liberman 2010). Oversimplified, the more abstract an object of attention is for us the less we identify with it and thus are less likely to spend our time, energy, or resources upon it. As related

to environmental decision-making, psychological distance may be a useful theoretical frame to illuminate attitudinal or behavioral differences in response to global environmental issues, between groups, or where planning for future consequences is important.

To date, the environmental decision-making literature has not used Construal Level theory. There have been several studies of climate change concern that point to the usefulness of this frame for global issues (e.g., Uzzell 2000) and non-environmentally focused researchers have just begun to examine the impact of Construal Level theory on consumer behaviors (Liberman, Trope, and Waslak 2007). This dissertation provides the first introductions of psychological distance to the issues of combatting biodiversity loss and enhancing water conservation.

This Research

In this research, I address the roles of values and morals on two types of ESBs (water conservation behavior, and monetary donations to a water conservation organization and to a biodiversity conservation organization) as well as the foundational issue of measuring pro-environmental behaviors (PEBs). My research questions are:

1. How do psychological distance, values, and morals interact to influence charitable donation behavior? (Chapters 2 and 3)
2. How do psychological distance and values influence self-reported home water conservation behaviors and behavioral intentions? (Chapter 3)
3. How have PEBs been conceptualized and operationalized, and what ramifications do these have for our theoretical and empirical understanding of PEB? (Chapter 4)

Chapter Two considers Research Question One. I conducted an experiment using the Amazon Mechanical Turk (AMT) capability for recruitment and Qualtrics for survey design and delivery. Experiments using AMT are faster and more cost-effective to conduct (Litman, Robinson, and Rosenzweig 2015). AMT samples tend to be more female, more educated, lower income, and more liberal/Democrat than a representative U.S. sample (Paolacci and Chandler 2014) but AMT samples compare favorably to other pay-for-sample services like GfK (Berinsky *et al.* 2012) and are superior to university-student convenience samples in diversity and representativeness. Experiments also allow me to access actual behavior instead of self-reports or intentions.

In Chapter Two, I address two key issues facing conservation organization fundraising: more accurately identifying and engaging likely donors and selecting projects where their personnel and resources may be most efficacious. I add to the very limited literature on personal characteristics of donors to conservation charities by comparing subjects who choose to give to local versus national versus international/global programs. I use Construal Level Theory (i.e., psychological distance) to partially explain donation choice, focus on relatively durable and trans-situational donor characteristics (motivating values and moral intuitions), and employ actual donation as the outcome variable. I do this with a 2x2 factorial design experiment that manipulates social and temporal distance. The results of zero-inflated negative binomial regression and multinomial logistic regression analyses indicate that temporal distance influences spatial target of donation, while motivating values and moral intuitions weakly influence subjects' choice to donate, amount donated, and spatial target of donation.

Chapter Three addresses Research Questions One and Two. As in Chapter Two, I use the AMT capability and Qualtrics. This experiment explores the effect of a psychological distance

message about the California drought on water conservation behavior and donation to a water conservation charity. The study considers two complementary approaches to addressing water scarcity issues: promoting individual water conservation behaviors and supporting organizations that work on water conservation issues at a broader social and political scale. I introduce a refined behavioral measurement instrument that incorporates the concept of behavioral plasticity as I examine the experimental effects of temporal and spatial psychological distance and known environmental decision-making predictors on subjects' self-reported home water conservation behaviors, behavioral intentions, and donation to a water conservation program. I use the Values-Beliefs-Norms model to guide model building with ordinary least squares and logistic regressions for model analysis. Results support the validity of my instrument, confirm the VBN model as relevant to home water conservation behaviors, and document that the effects of psychological distance become statistically insignificant with the introduction of psychosocial factors into the models. Secondary analyses suggest, however, that there may be value in further investigation with this psychological distance concept.

In Chapter Four, I undertake a systematic review and analysis of the of the PEB literature for implications for the study of PEBs and environmental decision-making. Over the last five decades, scholars across academic disciplines have studied individual pro-environmental behaviors as important components of such things as mitigating pollution, resource conservation, and anthropogenic climate change. Yet there is inconsistency in how pro-environmental behavior is measured and limited understanding of the consequences of those measurement choices. In a review of a sample of the pro-environmental behavior literature, I examine how we have been measuring pro-environmental behaviors and the implications of those measurement. I conclude with recommendations for future measurement of pro-environmental behaviors.

By addressing these research questions, my dissertation makes at least five key contributions. First, my examinations of values and morals simultaneously will give wider sociology some of the first empirical evidence of how these concepts may operate together. This will be true on two levels: the specific manner in which the operationalizations I have chosen (Schwartz values and Moral Foundations) work together, as well as the theoretical relationships between values theory and moral foundations theory.

Following from this more general input on the relationships between values and morals, a second contribution of my dissertation is the introduction of both Schwartz values and morals into the discussion of donation to environmental causes. These will potentially provide important, more stable predictors of these behaviors than currently exist in the literature.

Third, my dissertation introduces the concept of behavioral plasticity to the water conservation literature. Behavioral plasticity is how perceived difficulty to act constrains the behavioral responses across individuals, behaviors, and contexts. Understanding this dimension of ESBs allows interventions such as policy, education, and incentive programs to be more precisely targeted to those who have not yet performed the ESBs of interest. Fourth, my examination of the individual- and household-level PEB literature will help scholars target identified gaps, more clearly specify the contributions of their work, and tie their work into a more coherent whole. This will enable others to explicitly build upon their work and leverage relevant aspects for related research. In addition, my analysis of the implications of my theoretical approaches to date, will clarify some perhaps unseen assumptions about ESBs and potentially open new avenues of theoretical exploration. My dissertation's fifth and final contribution is to provide the first evidence of how psychological distance interacts with Schwartz values and morals, both in the specific contexts I have chosen and more generally.

Globalization has extended the range of possible ESBs to include those that impact national, regional, and international issues across a broader span of time (e.g., the immediate crisis of a drought to the looming devastation of species extinctions). These expanded options may uncover limits to how "trans-situational" values and morals may be.

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CHAPTER 2: EXPLAINING MONETARY SUPPORT FOR CHARITABLE CONSERVATION PROGRAMS

Introduction

The current scale and pace of biodiversity loss and ecosystem change is unprecedented (MEA 2005; UNEP 2014), prompting public warnings about "the sixth extinction" (Kolbert 2014) and driving campaigns to name our current geological epoch as "The Anthropocene" (Waters *et al.* 2016). Sustained efforts to conserve species and ecosystems have never been so consequential, increasing pressure on conservation organizations to expand existing projects and embark on ambitious new ones. Americans gave approximately $10.5 billion to environmental and animal welfare organizations[1] in 2014 (The Giving Institute 2015) for conservation missions and programs spanning from local to international or global in focus (Aldashev and Verdier 2010). Maintaining, if not increasing, this level of financial support will be crucial for the effectiveness and expansion of conservation efforts in the near future.

Conservation organizations can partially manage this financial uncertainty by more accurately identifying and engaging likely donors (Land Trust Alliance 2016) and by selecting those local, national, and/or international/global projects where their personnel and resources may be most efficacious. This study examines some likely predictors of donation both to a conservation organization and between its programs. I do this within an experiment investigating how framing the problem of biodiversity loss influences such donation.

[1] Public donation data does not include a specific category for "biodiversity conservation." Rather, such donations fall within categories for environmental and animal welfare organizations, which are typically conflated in donation reports (Bennett, 2003).

While the literature on predictors of philanthropic donation remains sparse and mixed (Bekkers and Wiepking 2011; Bennett 2003) I draw insights from the robust interdisciplinary literature on environmental decision-making. Briefly, many studies document the strong influence of values on environmental decision-making, often indirectly through related beliefs, attitudes, and intentions (Dietz, Fitzgerald, and Shwom 2005). The Rokeach/Schwartz approach to conceptualizing and measuring personal values—based upon the work of Milton Rokeach (1979) and Shalom Schwartz (Schwartz and Bilsky 1990)—receives the most empirical support, documenting how the influence of values is trans-situational and typically persists across the life course. Many studies find that biospherism, altruism, and hedonism are positively related to pro-environmental decisions, and egoism is negatively related to the same (Stern and Dietz 1994; Stern, Dietz, Kalof and Guagnano 1995; Steg and deGroot 2012). I expect similar relationships in this study.

Recent research suggests that another set of trans-situational characteristics also may be relevant for understanding environmental decision-making. An emerging body of work finds that moral intuitions influence a range of attitudes, worldviews, beliefs, and behavioral intentions (De Groot and Steg 2009; Firat and Hitlin 2012; Graham, Haidt, and Nosek 2009; Hofmann, Wisneski, Brandt, and Skitka 2014; Lamont 2009). Moral Foundations Theory, which identifies five general moral intuitions (harm, fairness, in-group loyalty, authority, and purity) is the leading approach for conceptualizing and measuring moral intuitions (Graham, Haidt and Nosek 2009). While the majority of residents in affluent industrial countries place environmental decision-making in the moral domain (Fransson and Garling 1999) no empirical studies examine which specific moral intuitions are related to environmental decision-making. As such, I include trans-situational moral intuitions in my analyses largely for exploratory purposes.

Perhaps as important as examining how potential donors' characteristics influence donation behavior is investigating how the framing of biodiversity loss influences the same. Environmental scientists and conservation advocates may emphasize the effects of local biodiversity loss to nearby communities or the effects of global biodiversity loss, perhaps to remote communities in developing countries. They also may highlight current problems or focus on ones in the near or distant future. Yet, we do not fully understand how such variation in emphases may affect donation behavior, or how individuals' values or morals may moderate the influence of such framing on donation behavior.

I draw insights from Construal Level Theory (Liberman and Trope 2008; Trope and Liberman 2010) which argues that "psychological distance"—conceptualized as the spatial, social, and/or temporal distance between individuals and targets of interest—is consequential for many attitudes, beliefs, and behaviors. While a few scholars have applied Construal Level Theory to examine concern and behavioral intentions about climate change (a problem that clearly spans spatial, social, and temporal scales) (Spence and Pidgeon 2010; Spence et al. 2012; Uzzell 2000), the theory receives limited attention in the broader environmental decision-making literature. In line with Construal Level Theory, I expect that low psychological distance (emphasizing the current effects of biodiversity loss to people like the potential donors) will be positively related to donation to local conservation programs, while high psychological distance (emphasizing the future effects of biodiversity loss to people unlike the potential donors) will be positively related to donation to international conservation programs.

Methods

Participants

I conducted a 2x2 full factorial experiment with a control condition within an online Qualtrics questionnaire to participants recruited via Amazon Mechanical Turk (AMT). (See Appendix B for the full questionnaire). The two experimental conditions were low versus high social distance (people in industrial societies versus people in pre-industrial societies) and low versus high temporal distance (now versus in future decades). AMT is an online labor market in which "requestors" advertise tasks that "workers" then complete for pay. Samples derived from AMT are more diverse than are the typical convenience samples of university students used in social-psychological experiments (Weinberg et al 2014) and they compare favorably to samples derived from professional survey organizations such as Knowledge Networks/GfK (Berinsky et al. 2012).

I recruited 491 American adults over the age of 18 to participate in my experiment. I paid subjects $1.00 for completing the experiment, which took approximately 11 minutes and 40 seconds on average. The actual samples analyzed range from the 487 subjects who selected a donation amount to the 479 subjects who identified their preferred donation target. While my convenience sample is more demographically, socially, and geographically diverse than are the traditional experiment recruitment pools of university undergraduates, it is more male, younger, white, and highly educated than would be a representative sample of the U.S. general public (U.S. Census Bureau 2016). (See Table 3 in Appendix A.)

The experiment

My experiment had four experimental conditions and a control condition described below. After giving consent to participate in this study, subjects answered a series of questions designed to measure their value orientations, moral intuitions, and general environmental beliefs. Subjects then were randomly assigned to one of five conditions. All subjects read a brief news story about the effects of biodiversity loss that was created specifically for this experiment. (See Appendix C for all five fabricated news stories). Subjects in the control condition received a news story about the social and economic costs of biodiversity loss in general. Subjects in the low social distance/low temporal distance condition received a similar news story modified to emphasize the effects of biodiversity loss to people in industrial societies now, and those in the high social distance/low temporal distance condition received a news story on the effects of biodiversity loss to people in pre-industrial societies now. Subjects in the low social distance/high temporal distance condition received a news story on the effects of biodiversity loss to people in industrial societies in future decades, and those in the high social distance/high temporal distance condition received a news story on the effects of biodiversity loss to people in pre-industrial societies in future decades. After reading their assigned news story, subjects answered two comprehension check questions and a manipulation check question.

Subjects then completed a small number of questions that measure selected demographic and social characteristics. On a subsequent page, subjects were notified that for completing the questionnaire they had earned a bonus of $1.00, equivalent to their participation pay. I gave them the option to donate between $0.00 and $1.00 of their bonus to The Nature Conservancy.[2] Subjects first identified whether they did not want to donate their bonus. If they did want to

[2] I chose The Nature Conservancy because it is relatively apolitical, one of the largest conservation advocacy organizations, and its programs range from local to regional/national to international/global in scope.

donate their bonus they were prompted to choose between a local, national, or international conservation program. Subjects choosing to donate then indicated how much of their bonus they wanted to donate by inputting a numeral between 1 and 100. On the final page, I thanked subjects for their participation and debriefed them about my research objectives.

Variables

Appendix B contains all of the questionnaire items that I used to create all of the variables employed in my analyses. Appendix A contains Table 4, which displays the name, description, coding, mean, and standard deviations of all of the variables employed in my analyses. I created my outcome variables from my final two questionnaire items. *Donation amount* ranges from 0 to 100. Subjects' preferred target of their donation is measured with an ordinal variable, *donation target*, where "no donation"=0, "local"=1, "national"=2, and "international"=3.

I measured value orientations using a revision of Schwartz's main instrument (Schwartz 1994) with additional hedonism items as suggested by Steg, Perlaviciute, Van der Werff, and Lurvink (2012). Subjects indicated the importance (from "not at all"=1 to "extremely important"=7) of several brief value statements as a guiding principle in their lives. Calculating the average of responses to similar items, I created five values scales using alpha scaling: *altruism/biospherism* (Cronbach's $\alpha = 0.83$), *hedonism* ($\alpha=0.77$), *self-interest* ($\alpha=0.53$), *traditionalism* ($\alpha=0.67$), and *openness to change* ($\alpha=0.46$).

I measured moral intuitions using the Moral Foundations Questionnaire (Graham, Haidt, and Nosek 2009), which consists of two questions assessing the kinds of moral intuitions people use when making decisions about right and wrong. Subjects indicated the relevance (from "not

at all relevant"=1 to "extremely relevant"=6) of several brief moral considerations when deciding whether something is right or wrong, and they expressed their judgment (from "strongly disagree"=1 to "strongly agree"=6) about several statements. Calculating the average of responses to similar items, I created five moral intuition scales using alpha scaling: *prevention of harm* (α=0.76), *fairness* (α=0.71), *in-group loyalty* (α=0.77), *respect for authority* (α=0.79), and *purity* (α=0.86).

I accounted for general environmental beliefs with a short (5-item) version of the New Ecological Paradigm scale (Dunlap, Van Liere, Mertig, and Jones 2000), which averages the responses ("strongly disagree"=1 to "strongly agree"=7) to similar items about the human-environment relationship: *new ecological paradigm* (α=0.84). I also employed five demographic and social variables as statistical controls in my analyses. Two are dummy variables: *female* for gender ("male"=0; "female"=1) and *white* for race ("non-white"=0; "white"=1). *Age* is measured with five categories: "18-29"=1 to "60 and over"=5. *Education* is measured by the highest degree earned: "less than high school diploma or equivalent"=1 to "doctoral degree"=7. *Income* is measured as approximate yearly household income: "less than $25,000"=1 to "$100,000 or more"=5.

Analytic techniques

My analyses explained three key outcomes: (a) whether or not subjects donate to the conservation organization; (b) how much donors actually donate; and (c) donors' preferred spatial target of their donation (local, national, or international). My count variable *donation amount* contains approximately 60% zeroes. Not only is this variable zero-inflated and consequently non-normal, but the ratio of its variance (1002.88) to its mean (18.74) indicates

overdispersion. For these reasons, to explain my first two outcomes I employed zero-inflated negative binomial (ZINB) regression, which is most appropriate for this data structure (Long 1997). ZINB regression yields two different models—a logit model predicting that subjects make no donation and a model predicting donation amount among the subgroup of donors—under the theoretical assumption that these two processes can be modeled independently. To explain my third outcome about the spatial target of donation, I used multinomial logistic regression. Zero-inflation violates the proportional odds assumption of ordered logistic regression, as indicated by diagnostic test results displayed in Appendix C. Multinomial logistic regressions treat the *donation target* variable as categorical rather than ordinal.[3]

Finally, to explore whether or not subjects' values or morals may moderate the influence of my experimental messages on donation behavior, I created interaction terms between my experimental dummy variables and my values and morals variables (e.g., social distance X respect for authority). Since these analyses are exploratory, I briefly summarize them in a footnote below.[4] I performed all analyses with Stata 14.1.

Results

I included two comprehension checks in my survey to assess subjects' attentiveness. The first item requested a brief summary of their assigned message. In that open-ended question, approximately 99% of subjects accurately described their assigned message. The second item

[3] Results of an ordered logistic regression model (Displayed in Table 5 in Appendix A) are essentially the same as reported in my multinomial logistic model.

[4] Exploration of the interactions between my experimental effects and values and morals measures indicate that *hedonism* values and *respect for authority* moral intuitions negatively moderate temporal distance messaging effects on donation behavior.

asked subjects to identify a fact in the message, and approximately 88% of subjects did so correctly. These results suggest that my messaging was clear.

Table 1 displays the results of the two ZINB regression models, with the first column containing the logistic regression coefficients explaining the likelihood of being in the "no donation" category and the second column containing the ZINB regression coefficients explaining the donation amount of donors. Briefly, neither experimental dummy variable influences either making a donation or not or the donation amount. Consistent with many studies of environmental decision-making, *altruism/biospherism* values decrease the likelihood of being in the "no donation" category (i.e., increase the likelihood of making a donation):and traditional values increase the likelihood of not making a donation. Only one predictor (*in-group loyalty* moral intuition) helps to explain the donation amount. Having a moral intuition for your own group's well-being decreases donation amounts among those who did donate. None of the demographic and social controls influence donation behavior.

Table 1: Unstandardized coefficients (and robust standard errors) from zero-inflated negative binomial regression predicting choice to donate and donation amount

	Logit Model Predicting No Donation	ZINB Model Predicting Donation Amount
Experimental Effects		
High temporal distance	-0.34 (0.21)	0.16 (0.09)
High social distance	-0.02 (0.21)	-0.06 (0.10)
Values, Morals, and Environmental Beliefs		
Altruism/Biospherism value	-0.54 (0.14)***	0.04 (0.08)
Hedonism value	0.12 (0.13)	0.02 (0.07)
Self-Interest value	-0.11 (0.10)	-0.07 (0.05)
Traditional value	0.36 (0.13)**	-0.01 (0.07)
Openness to Change value	0.01 (0.14)	-0.06 (0.07)
Harm moral intuition	-0.01 (0.17)	0.13 (0.09)
Fairness moral intuition	0.10 (0.19)	-0.04 (0.08)
In-Group Loyalty moral intuition	-0.19 (0.17)	-0.27 (0.08)**
Authority moral intuition	0.04 (0.18)	0.16 (0.09)
Purity moral intuition	0.02 (0.14)	0.01 (0.06)
New Ecological Paradigm	-0.19 (0.10)	0.04 (0.05)
Demographic and Social Characteristics		
Female	0.08 (0.21)	-0.04 (0.11)
White	0.09 (0.24)	0.05 (0.12)
Age	-0.13 (0.09)	0.04 (0.04)
Educational attainment	-0.05 (0.09)	-0.04 (0.05)
Income	0.04 (0.11)	0.09 (0.05)
Constant	2.82 (0.97)**	3.52 (0.59)***
Sample size	311	176

Wald Chi-Square = 46.56, p<0.001
*p<.05, **p<.01, ***p<.001

Table 2 displays the results of the multinomial logistic regression model explaining the likelihood of subjects donating to local, national, or international conservation programs versus not donating. As expected by Construal Level Theory, exposure to news stories emphasizing *high temporal distance* in the effects of biodiversity loss increases the likelihood of donating to international conservation activities versus not donating. Consistent with the existing literature, *altruism/biospherism* values increase the likelihood of earmarking a donation to local

conservation programs versus not making a donation at all, and *traditional values* decreases the likelihood of the same. Having a moral intuition for *respecting authority*—which taps preferences for duty, conforming to rules, and obeying orders—decreases the likelihood of donating to international conservation activities versus not donating at all. No demographic or social variable influences the choice of donation target.

Table 2: Unstandardized coefficients (and standard errors) from multinomial logistic regression model predicting donation target (n=479; Pseudo R2=0.08)

	Local	**National**	**International**
Experimental Effects			
High temporal distance	0.22 (0.29)	-0.26 (0.34)	0.75 (0.30)*
High social distance	0.01 (0.29)	-0.07 (0.35)	0.29 (0.31)
Values, Morals, and Environmental Beliefs			
Altruism/Biospherism value	0.87 (0.22)***	0.42 (0.25)	0.37 (0.22)
Hedonism value	-0.17 (0.19)	-0.21 (0.22)	-0.03 (0.19)
Self-Interest value	0.15 (0.15)	0.21 (0.18)	0.12 (0.14)
Traditional value	-0.52 (0.19)**	-0.21 (0.24)	-0.16 (0.19)
Openness to Change value	-0.25 (0.19)	-0.08 (0.22)	0.16 (0.21)
Harm moral intuition	0.14 (0.26)	0.07 (0.30)	0.12 (0.27)
Fairness moral intuition	-0.32 (0.26)	-0.21 (0.31)	0.10 (0.27)
In-Group Loyalty moral intuition	0.30 (0.26)	0.06 (0.30)	0.09 (0.25)
Authority moral intuition	0.18 (0.26)	0.18 (0.31)	-0.61 (0.27)*
Purity moral intuition	-0.18 (0.21)	-0.01 (0.24)	0.08 (0.21)
New Ecological Paradigm	0.08 (0.15)	0.30 (0.17)	0.16 (0.16)
Demographic and Social Characteristics			
Female	-0.14 (0.29)	0.21 (0.35)	-0.30 (0.32)
White	0.37 (0.36)	-0.10 (0.40)	-0.36 (0.34)
Age	0.04 (0.14)	0.16 (0.16)	0.14 (0.14)
Educational attainment	0.19 (0.14)	-0.05 (0.16)	0.09 (0.14)
Income	0.10 (0.14)	0.01 (0.17)	-0.11 (0.16)
Constant	-3.80 (1.43)**	-4.50 (1.71)**	-4.16 (1.56)**

*p<0.05, **p<0.01, ***p<0.001

Discussion

This study offers the following scholarly contributions, each of which point to promising avenues for future research. First, I applied Construal Level Theory, which is optimally suited for explaining the effects of distance gradients, to the understudied issue domain of support for biodiversity conservation. While some conservation efforts are more clearly local (e.g., protecting a specific stream or small forest or re-introducing a species to an isolated island), many others span wider areas and cross political boundaries (e.g., reducing the effects of air and water pollution on a region-wide habitat or fighting the global trafficking of endangered species) (Visconti et al. 2016). My results suggest that conservation organizations' decisions to vary their priorities across the spatial scale (from local to national/regional to international/global) may not substantially affect who chooses to donate to them or how much is donated. While a message emphasizing a high temporal distance in the effects of biodiversity loss did increase the likelihood of donating to an internationally focused program, no other experimental messages directly influenced any other donation behavior analyzed.

Second, I add to my scholarly understanding of how relatively durable, trans-situational characteristics (i.e., values and moral intuitions) influence environmental decision-making. Research in the philanthropy literature finds that most donors select donation targets on the basis of how well the mission and projects of the latter match their personal values (Aldashev and Verdier 2010). Indeed, philanthropic management services recommend that conservation organizations carefully attend to the values of current and potential donors (Network for Good 2015). My results confirm two robust findings of many other studies in the wider environmental decision-making literature. Briefly, humanistic and biospheric altruism is positively related to

financial support for a conservation organization, while traditional values are negatively related to the same.

Since few studies have examined the influence of moral intuitions on environmental decision-making, I offer caution when interpreting the performance of the moral intuitions variables. Nevertheless, my results do appear consistent with key findings in the wider environmental decision-making literature (e.g., McCright, Xiao, and Dunlap 2014). That is, moral intuitions revealing preferences for traditionalism and conservatism (in-group loyalty and respect for authority) are negatively related to financial support for a conservation organization. Future research should continue to examine the influence of durable, trans-situational characteristics, such as personal values and moral intuitions, on support for biodiversity conservation.

Third, rather than examine behavioral intentions, I employed a relatively novel method to measure actual donation behavior. As such, I offer one of the first empirical studies of financial support for biodiversity conservation. While the amount available to donate was small, it nevertheless was equivalent to the money subjects received for their participation. They likely perceived this not as trivial but as at least somewhat consequential. Thus, this method seems appropriate for studying actual environmental decision-making, and I urge other scholars to utilize this method to further investigate actual (and not just intentional) financial support for biodiversity conservation.

APPENDICES

APPENDIX A

Supplementary Tables

Table 3: Selected socio-demographic sample characteristics

		Percentage
Gender	Female	44.9
Race	White	75.1
Age	Aged 18-29	40.9
	Aged 30-39	33.0
	Aged 40-49	13.9
	Aged 50-59	7.9
	Aged 60 or older	4.3
	Mean	**Standard Deviation**
Educational Attainment"less than high school diploma or equivalent"=1 to "doctoral degree"=7	3.42	1.14
Household Income"less than $25K"=1 to "$100K and more"=5 2.11	1.05	

Table 4: Variable names, coding, means, and standard deviations

Variable	Coding	Mean	Standard Deviation
Donation Amount	positive integer between 0 and 100	18.74	31.67
Values			
Altruism/Biospherism	"not at all important"=1 to "of supreme importance"=7		
6 items		5.40	1.11
Hedonism	same as Altruism		
3 items		5.53	1.04
Self-Interest	same as Altruism		
3 items		4.38	1.27
Tradition	same as Altruism		
3 items		5.61	1.06
Openness to Change	same as Altruism		
3 items		5.33	0.96
Moral Intuitions			
Prevention of Harm	"not at all relevant"=1 to "extremely relevant"=6, and "strongly disagree"=1 to "strongly agree"=6		
6 items		4.73	0.86
Fairness	same as Prevention of Harm		
6 items		4.64	0.80
In-group Loyalty	same as Prevention of Harm		
6 items		3.59	0.99
Authority	same as Prevention of Harm		
6 items		3.85	1.00
Purity	same as Prevention of Harm		
6 items		3.47	1.24
General Environmental Beliefs			
New Ecological Paradigm	"strongly disagree"=1 to "strongly agree"=7		
5-items with 2 reversed		5.28	1.31

Table 5: Odds ratios (and standard errors) from ordered logistic regression model predicting donation target (n=479; Pseudo R2=0.05)

	Odds Ratios (Standard Errors)
Experimental Effects	
Temporal distance (biodiversity loss in 10yrs)	1.60 (0.31)*
Social distance (biodiversity loss affects others)	1.10 (0.22)
Values, Morals, and Environmental Beliefs	
Altruism/Biospherism value	1.58 (0.22)**
Hedonism value	0.90 (0.11)
Self-Interest value	1.13 (0.11)
Traditional value	0.81 (0.10)
Openness to Change value	1.00 (0.13)
Harm moral intuition	1.08 (0.19)
Fairness moral intuition	0.93 (0.16)
In-Group Loyalty moral intuition	1.11 (0.19)
Authority moral intuition	0.80 (0.14)
Purity moral intuition	0.99 (0.14)
New Ecological Paradigm	1.16 (0.12)
Demographic and Social Characteristics	
Female	0.91 (0.19)
White	0.90 (0.21)
Age	1.13 (0.11)
Educational attainment	1.07 (0.10)
Income	1.00 (0.10)
Cut 1	2.82 (1.00)
Cut 2	3.58 (1.00)
Cut 3	4.25 (1.00)

APPENDIX B

Survey

Q2 Values: Please indicate how important each of the following is AS A GUIDING PRINCIPLE IN YOUR LIFE. Use the following scale where 1 represents "Not At All Important" and 7 represents "Of Supreme Importance".

	Not At All Important 1	2	3	4	5	6	Of Supreme Importance 7
a varied life	❍	❍	❍	❍	❍	❍	❍
family security	❍	❍	❍	❍	❍	❍	❍
a world at peace	❍	❍	❍	❍	❍	❍	❍
enjoying life	❍	❍	❍	❍	❍	❍	❍
protecting the environment	❍	❍	❍	❍	❍	❍	❍
respecting authority	❍	❍	❍	❍	❍	❍	❍
being curious	❍	❍	❍	❍	❍	❍	❍
Equality	❍	❍	❍	❍	❍	❍	❍
self-discipline	❍	❍	❍	❍	❍	❍	❍

Q3 Values: Please indicate how important each of the following is AS A GUIDING PRINCIPLE IN YOUR LIFE. Use the following scale where 1 represents “Not At All Important” and 7 represents “Of Supreme Importance”.

	Not At All Important 1	2	3	4	5	6	Of Supreme Importance 7
gratification	❍	❍	❍	❍	❍	❍	❍
unity with nature	❍	❍	❍	❍	❍	❍	❍
being influential	❍	❍	❍	❍	❍	❍	❍
an exciting life	❍	❍	❍	❍	❍	❍	❍
honoring parents and elders	❍	❍	❍	❍	❍	❍	❍
social justice	❍	❍	❍	❍	❍	❍	❍
pleasure	❍	❍	❍	❍	❍	❍	❍
respecting the earth	❍	❍	❍	❍	❍	❍	❍
wealth	❍	❍	❍	❍	❍	❍	❍

Q4 Moral Perspectives: Please read the following sentences and indicate your disagreement or agreement.

	Strongly Disagree	Moderately Disagree	Somewhat Disagree	Somewhat Agree	Moderately Agree	Strongly Agree
Compassion for those who are suffering is the most crucial virtue	❍	❍	❍	❍	❍	❍
When the government makes laws, the number one principle should be ensuring that everyone is treated fairly	❍	❍	❍	❍	❍	❍
I am proud of my country's history	❍	❍	❍	❍	❍	❍
Respect for authority is something all children need to learn	❍	❍	❍	❍	❍	❍
People should not do things that are disgusting, even if no one is harmed	❍	❍	❍	❍	❍	❍
It is better to do good than to do bad	❍	❍	❍	❍	❍	❍
One of the worst things a person could do is hurt a defenseless animal	❍	❍	❍	❍	❍	❍
Justice is the most important requirement for a society	❍	❍	❍	❍	❍	❍

Q5 Moral Perspectives: Please read the following sentences and indicate your disagreement or agreement.

	Strongly Disagree	Moderately Disagree	Somewhat Disagree	Somewhat Agree	Moderately Agree	Strongly Agree
People should be loyal to their family members, even when they have done something wrong	❍	❍	❍	❍	❍	❍
Men and women each have different roles to play in society	❍	❍	❍	❍	❍	❍
I would call some acts wrong on the grounds that they are unnatural	❍	❍	❍	❍	❍	❍
It can never be right to kill a human being	❍	❍	❍	❍	❍	❍
I think it's morally wrong that rich children inherit a lot of money while poor children inherit nothing	❍	❍	❍	❍	❍	❍
It is more important to be a team player than to express oneself	❍	❍	❍	❍	❍	❍
If I were a soldier and disagreed with my commanding officer's orders, I would obey anyway because that is my duty	❍	❍	❍	❍	❍	❍
Chastity is an important and valuable virtue	❍	❍	❍	❍	❍	❍

Q6 Moral Perspectives: When you decide whether something is right or wrong, to what extent are the following considerations relevant to your thinking? Whether or not . . .

	Not At All Relevant	Not Very Relevant	Slightly Relevant	Somewhat Relevant	Very Relevant	Extremely Relevant
someone suffered emotionally	❍	❍	❍	❍	❍	❍
some people were treated differently than others	❍	❍	❍	❍	❍	❍
someone's action showed love for his or her country	❍	❍	❍	❍	❍	❍
someone showed a lack of respect for authority	❍	❍	❍	❍	❍	❍
someone violated standards of purity and decency	❍	❍	❍	❍	❍	❍
someone was good at math	❍	❍	❍	❍	❍	❍
someone cared for someone weak or vulnerable	❍	❍	❍	❍	❍	❍
someone acted unfairly	❍	❍	❍	❍	❍	❍

Q7 Moral Perspectives When you decide whether something is right or wrong, to what extent are the following considerations relevant to your thinking? Whether or not . . .

	Not At All Relevant	Not Very Relevant	Slightly Relevant	Somewhat Relevant	Very Relevant	Extremely Relevant
someone did something to betray his or her group	❍	❍	❍	❍	❍	❍
someone conformed to the traditions of society	❍	❍	❍	❍	❍	❍
someone did something disgusting	❍	❍	❍	❍	❍	❍
someone was cruel	❍	❍	❍	❍	❍	❍
someone was denied his or her rights	❍	❍	❍	❍	❍	❍
someone showed a lack of loyalty	❍	❍	❍	❍	❍	❍
an action caused chaos or disorder	❍	❍	❍	❍	❍	❍
someone acted in a way that God would approve of	❍	❍	❍	❍	❍	❍

Q8 Views about Nature: Please read the following sentences and indicate your disagreement or agreement.

	Strongly Disagree	Moderately Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Moderately Agree	Strongly Agree
The so-called "ecological crisis" facing humankind has been greatly exaggerated	❍	❍	❍	❍	❍	❍	❍
If things continue on their present course, I will soon experience a major ecological catastrophe	❍	❍	❍	❍	❍	❍	❍
Humans are severely abusing the environment	❍	❍	❍	❍	❍	❍	❍
The balance of nature is strong enough to cope with the impacts of modern industrial nations	❍	❍	❍	❍	❍	❍	❍
The earth is like a spaceship with very limited room and resources	❍	❍	❍	❍	❍	❍	❍

Q9 It is important to us that you CAREFULLY and COMPLETELY read the following news story. Please FULLY CONSIDER the message IN ITS ENTIRETY. I want to know how well you understand the news story, so I will ask you some important questions about it afterwards.

Q15 Please clearly describe the MAIN POINT of the news story's message. The more complete your answer, the easier it will be for us to know how well you understood it.

Q16 The CURRENT rate of biodiversity loss is _____ than the rate of biodiversity loss in previous eras.

- ❍ much lower
- ❍ slightly lower
- ❍ about the same
- ❍ slightly higher
- ❍ much higher

Q17 Please read the following sentences and choose the ONE that you think is the most accurate.

- ❍ Biodiversity loss is a problem that does affect people like me.
- ❍ Biodiversity loss is already a serious problem right now.
- ❍ Biodiversity loss is a problem that mainly affects people very different from me.
- ❍ Biodiversity loss will mostly be a serious problem in the future.

Q18 What is your sex?
- ❍ Male
- ❍ Female

Q19 How old are you as of today?
- ❍ 18-29
- ❍ 30-39
- ❍ 40-49
- ❍ 50-59
- ❍ 60 or older

Q20 Are you Hispanic, Latino, or Chicano?
- ❍ No
- ❍ Yes

Q21 What race/ethnicity do you identify with MOST?
- ❍ Arab-American or Middle Eastern
- ❍ Asian or Asian-American
- ❍ Black or African-American
- ❍ Indian/South Asian or Indian-American
- ❍ Native American/American Indian or Alaska Native
- ❍ Native Hawaiian or other Pacific Islander
- ❍ White
- ❍ Other (please specify) _____

Q22 What is the highest degree you have earned?
- ❍ 12th grade or less
- ❍ high school diploma or GED
- ❍ associate's degree
- ❍ bachelor's degree
- ❍ master's degree
- ❍ professional degree (e.g., law or medicine)
- ❍ doctorate degree

Q23 What is your approximate yearly income?
- ❍ $0-$24,999
- ❍ $25,000-$49,000
- ❍ $50,000-$74,999
- ❍ $75,000-$99,999
- ❍ $100,000 and up

Q24 In what ZIP code is your home located? (enter your 5-digit ZIP code; for example, 00544 or 94305)

Q25 Please enter your Mechanical Turk Worker ID Number. Be sure to check it for accuracy as this will be needed to pay you!

Q26 One Final Question For completing this survey, you have earned a bonus of $1.00! This bonus is IN ADDITION TO the $1.00 you have already earned. You have the option to donate some of your bonus to The Nature Conservancy, a biodiversity conservation organization founded in 1951. I will deduct the amount you select from your bonus and donate it to The Nature Conservancy. Your donation will be used to support efforts in conserving nature and preventing further loss of biodiversity. You have the option to specify whether you want your donation to support local, national, OR international biodiversity conservation efforts. (I will use the ZIP code you provided to identify the nearest local office of The Nature Conservancy.) Considering the article about biodiversity loss you read earlier, would you like to donate some of your bonus to The Nature Conservancy?

- ❍ I prefer NOT to donate
- ❍ I prefer to donate to LOCAL efforts
- ❍ I prefer to donate to NATIONAL efforts
- ❍ I prefer to donate to INTERNATIONAL efforts

Q27 How much of your bonus would you like to donate to The Nature Conservancy? Please enter an amount between 0 and 100 cents.

APPENDIX C

Experimental Messages, Donation Distribution Graph, and Brandt Test Results

Figure 1: News story for control condition

Scientists Warn about Social and Economic Impacts of Biodiversity Loss

Wednesday, June 7, 2016 Posted: 11:28 AM EST

Washington—Scientists released a report today detailing the social and economic impacts of biodiversity loss.

A scientific study out today from the Millennium Ecosystem Assessment reports that extinction rates since the Industrial Revolution are 100 to 1000 times higher than those in previous eras. Estimates are that 12% of bird species, 23% of mammals, 32% of amphibians, and 25% of coniferous plants are endangered.

The authors point out that this degree of biodiversity loss creates heightened risks for humanity. We lose valuable amounts of raw materials and energy and the ecosystem's capacity to take in the pollution and waste we generate. Also, we lose key cultural services we get from biodiversity, such as ecotourism, sacred places, and a sense of local character and beauty.

Using new accounting techniques, the authors estimate that biodiversity loss costs humanity about 15% of our global economy's value. Yet, the authors also estimate that biodiversity has an economic value between 10 and 100 times greater than the costs associated with conservation.

Figure 2: News story for low social distance/low temporal distance condition

Scientists Warn about Social and Economic Impacts of Biodiversity Loss to Industrial Societies Now

Wednesday, June 7, 2016 Posted: 11:28 AM EST

Washington—Scientists released a report today detailing the social and economic impacts of biodiversity loss.

A scientific study out today from the Millennium Ecosystem Assessment reports that extinction rates since the Industrial Revolution are 100 to 1000 times higher than those in previous eras. Estimates are that 12% of bird species, 23% of mammals, 32% of amphibians, and 25% of coniferous plants in areas inhabited by industrial societies are currently endangered.

The authors point out that this degree of biodiversity loss currently has heightened risks for industrial societies. We are losing valuable amounts of raw materials and energy and the ecosystem's capacity to take in the pollution and waste we are generating. Also, we are losing key cultural services we get from biodiversity, such as ecotourism, sacred places, and a sense of local character and beauty.

Using new accounting techniques, the authors estimate that current biodiversity loss is costing industrial societies about 15% of our economy's value. Yet, the authors also estimate that biodiversity has an economic value between 10 and 100 times greater than the costs associated with conservation.

Figure 3: News story for high social distance/low temporal distance

Scientists Warn about Social and Economic Impacts of Biodiversity Loss to Pre-Industrial Societies Now

Wednesday, June 7, 2016 Posted: 11:28 AM EST

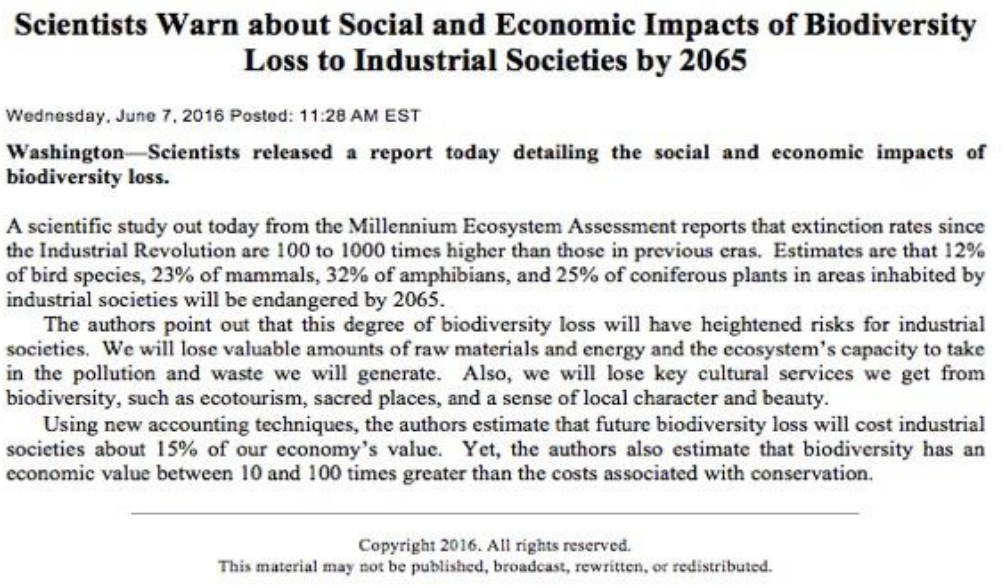
Washington—Scientists released a report today detailing the social and economic impacts of biodiversity loss.

A scientific study out today from the Millennium Ecosystem Assessment reports that extinction rates since the Industrial Revolution are 100 to 1000 times higher than those in previous eras. Estimates are that 12% of bird species, 23% of mammals, 32% of amphibians, and 25% of coniferous plants in areas inhabited by pre-industrial societies are currently endangered.

The authors point out that this degree of biodiversity loss currently has heightened risks for pre-industrial societies. They are losing valuable amounts of raw materials and energy and the ecosystem's capacity to take in the pollution and waste they are generating. Also, they are losing key cultural services they get from biodiversity, such as ecotourism, sacred places, and a sense of local character and beauty.

Using new accounting techniques, the authors estimate that current biodiversity loss is costing pre-industrial societies about 15% of their economy's value. Yet, the authors also estimate that biodiversity has an economic value between 10 and 100 times greater than the costs associated with conservation.

Figure 4: News story for low social distance/high temporal distance condition



Scientists Warn about Social and Economic Impacts of Biodiversity Loss to Industrial Societies by 2065

Wednesday, June 7, 2016 Posted: 11:28 AM EST

Washington—Scientists released a report today detailing the social and economic impacts of biodiversity loss.

A scientific study out today from the Millennium Ecosystem Assessment reports that extinction rates since the Industrial Revolution are 100 to 1000 times higher than those in previous eras. Estimates are that 12% of bird species, 23% of mammals, 32% of amphibians, and 25% of coniferous plants in areas inhabited by industrial societies will be endangered by 2065.

The authors point out that this degree of biodiversity loss will have heightened risks for industrial societies. We will lose valuable amounts of raw materials and energy and the ecosystem's capacity to take in the pollution and waste we will generate. Also, we will lose key cultural services we get from biodiversity, such as ecotourism, sacred places, and a sense of local character and beauty.

Using new accounting techniques, the authors estimate that future biodiversity loss will cost industrial societies about 15% of our economy's value. Yet, the authors also estimate that biodiversity has an economic value between 10 and 100 times greater than the costs associated with conservation.

Figure 5: News story for high social distance/high temporal distance condition

Scientists Warn about Social and Economic Impacts of Biodiversity Loss to Pre-Industrial Societies by 2065

Wednesday, June 7, 2016 Posted: 11:28 AM EST

Washington—Scientists released a report today detailing the social and economic impacts of biodiversity loss.

A scientific study out today from the Millennium Ecosystem Assessment reports that extinction rates since the Industrial Revolution are 100 to 1000 times higher than those in previous eras. Estimates are that 12% of bird species, 23% of mammals, 32% of amphibians, and 25% of coniferous plants in areas inhabited by pre-industrial societies will be endangered by 2065.

The authors point out that this degree of biodiversity loss will have heightened risks for pre-industrial societies. They will lose valuable amounts of raw materials and energy and the ecosystem's capacity to take in the pollution and waste they will generate. Also, they will lose key cultural services they get from biodiversity, such as ecotourism, sacred places, and a sense of local character and beauty.

Using new accounting techniques, the authors estimate that future biodiversity loss will cost pre-industrial societies about 15% of their economy's value. Yet, the authors also estimate that biodiversity has an economic value between 10 and 100 times greater than the costs associated with conservation.

Figure 6: Distribution of the donation amount variable

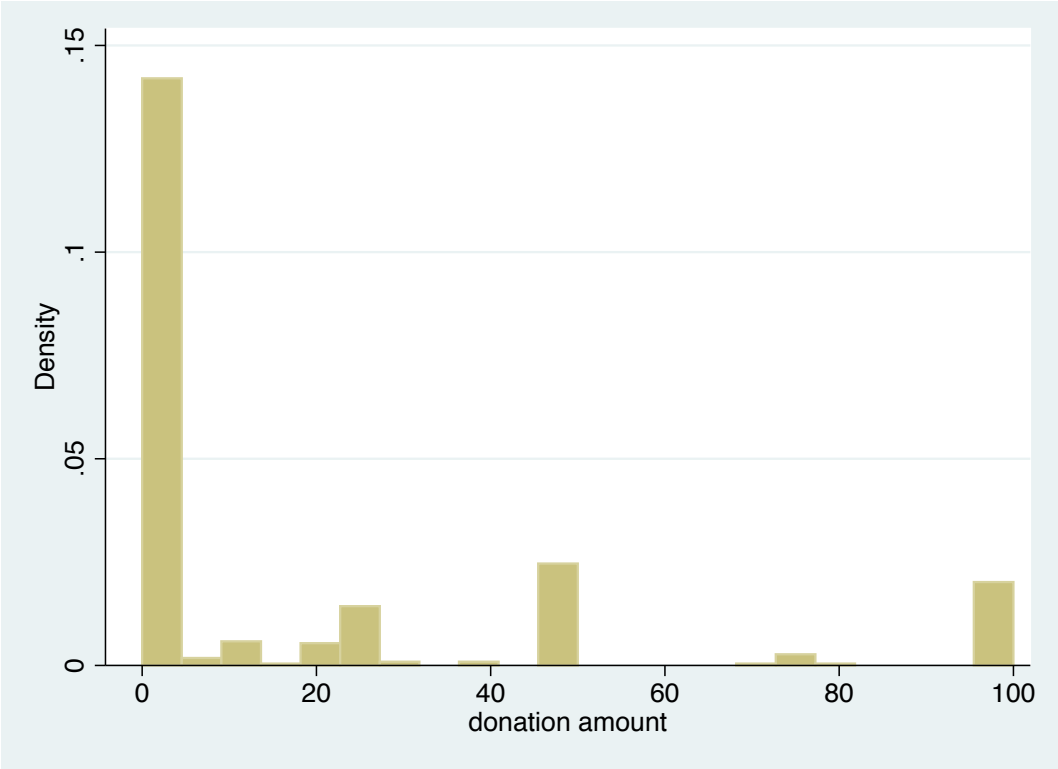


Table 6: Brant Test of parallel regression assumption

Variable	chi2	p>chi2	df
All	42.71	0.205	36
Social far	0.71	0.702	2
Time far	1.00	0.607	2
Altruism/Biospherism	9.55	0.008	2
Hedonism	0.68	0.712	2
Wealth/Power	0.25	0.883	2
Traditional	4.38	0.112	2
Openness to Change	3.09	0.213	2
New Ecological Paradigm	0.85	0.654	2
Prevention of Harm	0.24	0.888	2
Fairness	1.87	0.392	2
In-Group Loyalty	1.10	0.578	2
Respect for Authority	5.89	0.053	2
Purity	1.37	0.505	2
Sex	1.31	0.519	2
Age	0.36	0.835	2
Ed	1.93	0.381	2
Income	1.03	0.597	2
White	2.44	0.295	2

A significant test statistic provides evidence that the parallel regression assumption has been violated.

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CHAPTER 3: WATER CONSERVATION IN THE HOME AND WALLET

Introduction

In 2014 and 2015, locations as dispersed and diverse as Detroit, Israel, and Kyrgyzstan experienced water scarcity-related conflict. The devastating consequences of these disputes included dehydration and water-borne illness, agricultural failures, reduced industrial capacity, decreases in the abundance of wildlife and ecosystem services, and property devaluation (Water Project 2017). In addition to these immediate health, economic, and environmental problems (Moe and Rheingans 2006; Postel 2000) water scarcity disputes create policy debates for those places currently experiencing or anticipating such conflict. These debates center around infrastructure improvements, water restrictions, equitable use, and access rights with other jurisdictions (e.g., Rijsberman 2006).

The wide range of water uses and users yields an equally broad range of approaches to addressing water scarcity. Most methods focus on one user community such as agriculture, industry, or households. Recommended interventions are typically efficiency or curtailment focused. Efforts are split between incentivization and the creation of constraints to achieve the chosen intervention within a particular user group. Two common and complementary approaches are to promote home water conservation and to support organizations that work on water conservation issues at broader social and political levels (Datta et al. 2015). This paper provides insights on both of these approaches while making several other contributions.

First, I introduce a revised measurement instrument that improves how we measure water conservation behaviors by incorporating the concept of *behavioral plasticity* (Dietz, Gardner, Gilligan, Stern, and Vandenbergh 2009). This will enable a more detailed inspection of where

and to whom home water conservation behaviors programs might best be targeted. Second, I use the Values-Beliefs-Norms theoretical framework to consider the effects of psychosocial environmental concern predictors (e.g., value orientations, personal norms, and environmental worldview) on self-reported home water conservation behaviors and water conservation behavioral intentions. Finally, I report the results of an experiment investigating the effects of psychological distance (e.g., temporal and spatial distance from a water scarcity situation) on donations to a California drought-focused water conservation charity. These results give more detail to our understanding of who donates to environmental causes and why.

Previous Scholarship

Home water conservation behavior

The environmental decision-making literature suggests that home water conservation behavior has two dimensions, indoor and outdoor, and that it consists of six primary types of behavior: showering, clothes-washing, running faucets, bathing, irrigation, and use/installation of water-saving devices (e.g., low-flow showerheads and toilets, drought-tolerant plantings/grass) (Dolnicar, Hurlimann, and Grün 2012; Jorgensen, Graymore, and O'Toole 2009). All six types are included in the refined water conservation behavior instrument which follows. To investigate these behaviors, I select from psychosocial, contextual, and demographic variables that demonstrate significant effects in previous research.

Psychosocial predictors of increased home water conservation include stronger pro-environmental attitudes and beliefs (generally measured with the New Ecological Paradigm scale [R. Dunlap 2008]) (Mayer, DeOreo, and AWWA Research Foundation 1999; Willis et al. 2013) holding personal norms about water conservation, and the awareness of consequences of water

scarcity (Corral-Verdugo, Bechtel, and Fraijo-Sing 2003; Lute, Attari, and Sherman 2015). Relevant contextual factors that predict individual water conservation in the home include drought conditions and attendant water restrictions (Trumbo and O'Keefe 2005; Willis, Stewart, Giurco, Talebpour, and Mousavinejad 2013). Demographic variables of relevance include older age, higher education, middle income, and female gender all predicting increased water conservation behavior. For this research, I include all of these variables.

Donation to environmental efforts

Where the environmental decision-making literature gives us insights into the predictors of direct water conservation by an individual, we go to the charitable donation literature to better understand monetary support for water conservation causes. This latter literature suggests that women are more likely to make donations in general, while men, when they do donate, make larger contributions; greater educational attainment is positively associated with larger donation amounts; and younger individuals are more likely to donate to environmental/animal causes than are older people; (Bekkers 2010; Bekkers and Wiepking 2011; Gittell and Tebaldi 2006; Sargeant 2014; Sargeant, Ford, and West 2006; Wiepking and Bekkers 2012).

Though the Giving Institute (2015) indicates that individual Americans gave $10.5 billion for environmental and animal welfare causes in 2014, characterizations of individual donors to these causes is limited and mixed. One large, cross-sector study finds that social and demographic characteristics that predict donations in general do not help predict donations to environmental/animal organizations specifically (Wiepking 2010) but other studies indicate that younger, wealthier, more educated individuals are more likely than older, poorer, and less educated donors to give to environmental causes and organizations (Bennett 2003). In a very

recent study, Clements *et al.* (2015) found that reporting higher levels of personal values such as biospheric altruism and pro-environmental beliefs as measured by the New Ecological Paradigm increased the likelihood of an individual donating to an environmental effort.

Role of psychological distance

Finally, my contribution to understanding donations to conservation efforts is the inclusion of psychological distance, conceptualized here as the temporal, spatial, or social distance between donors and recipients. Studies that consider psychological distance (i.e. Construal Level Theory [Liberman and Trope 2008; Trope and Liberman 2010]) suggest that individuals are more willing to donate to an organization when they are psychologically distant from the population in need (Bekkers 2010; Ein-Gar and Levontin 2013). Related social distance research that does not explicitly use Construal Level Theory also suggests that altruistic and pro-social behavior varies inversely with the amount of social distance an individual perceives (e.g., Rachlin and Jones 2008). To date, psychological distance has received limited empirical attention in the environmental decision-making literature, with the few existing studies focused upon climate change (Spence and Pidgeon 2010; Spence et al. 2012; Uzzell 2000). However, as the average citizen's connection to the wider world has increased through traditional and social media, and with environmental programs increasingly raising funds in the United States for their international and global efforts, the psychological distance between potential donors and an environmental issues may emerge as an influential predictor of donation behaviors.

Methods

For this research, I use a cross-sectional, between-subjects, random assignment experiment. I controlled spatial distance by recruiting from only two states – Michigan and California - representing those not affected and affected by a drought, respectively. I manipulated temporal distance in my experimental message (drought effects now versus in ten years). The experiment was embedded in an online Qualtrics questionnaire for which subjects received payment.

Participants

I recruited 405 American subjects over the age of 18 years for a survey-based experiment investigating the influence of psychological distance on donations to a California water conservation program. The sample is comprised of a subsample from California (201 subjects) and another from Michigan (204 subjects). Though 405 were recruited, only 375 completed the water conservation behaviors and intentions portion with 367 completing the donation behavior. Consequently, sample sizes vary slightly in each model.

I recruited my subjects through the Amazon Mechanical Turk (AMT) service and delivered the survey using Qualtrics. AMT is an online labor market in which "requestors" advertise tasks which "workers" then complete for pay. In this case, I paid subjects $1.00 for completing the experiment. Practically speaking, experiments using AMT are faster and more cost-effective to conduct than traditional experiments. AMT samples tend to be more female, more educated, lower income, and more liberal/Democrat than a representative U.S. sample, but AMT samples compare favorably to other pay-for-sample services like GfK (Berinsky, Huber, and Lenz 2012). AMT samples are also more diverse and closer to national representation than

are the more typical university student convenience samples (Weinberg, Freese, and McElhattan 2014). While this convenience sample is more demographically and socially diverse than are the traditional experiment recruitment pools of university undergraduates, it is more male, younger, white, and highly educated than would be a representative sample of the U.S. general public (U.S. Census Bureau 2016). Table 7 shows selected socio-demographic characteristics of the full sample as well as differences in the means of the two subsamples. The Michigan subsample is more male, more white, and has a higher rate of home-ownership than the California subsample. The California subsample has more reporting of personal norms around water conservation as well as more awareness of the consequences of water conservation behaviors. I conducted my analyses using the full sample.

Table 7: Selected socio-demographic sample characteristics of total sample and comparison of means of for California and Michigan sub-samples (CA – MI)

Characteristics	**Total Sample**		**Subsamples Compared**	
	Percentage		*t-statistic*	*df*
Female	48.9		-2.65**	403
White	73.8		-5.47***	403
Age			-1.78	403
Aged 18-29	42.2			
Aged 30-39	33.6			
Aged 40-49	10.8			
Aged 50-59	9.6			
Aged 60 or older	3.7			
Homeowner	42.8		-4.02***	402
Aware of local water restrictions	20.2		16.34***	403
	Mean	*SD*		
Educational attainment				
"12th grade or less"=1 to "doctorate degree"=7	3.38	1.05	1.05	403
Household income				
"less than $25K"=1 to "$100K and more"=5	2.29	1.19	1.52	401
Altruism personal values				
"not at all important"=1 to "of supreme importance"=7	5.32	0.98	-0.08	403
Awareness of consequences				
"strongly disagree"=1 to "strongly agree"=7	4.19	1.59	11.07***	403
New Ecological Paradigm				
"strongly disagree"=1 to "strongly agree"=7) 5 items	5.25	1.28	0.08	403
Personal Norms				
"strongly disagree"=1 to "strongly agree"=7	5.02	1.21	5.84***	403

Procedures

Water conservation behaviors instrument

One of my intentions with this paper is to help improve how we measure water conservation behaviors through incorporating the concept of behavioral plasticity (Dietz et al., 2009) into a new instrument (Allen, Dietz and McCright 2015). Attending to *behavioral plasticity*—how the perceived difficulty to act constrains behavioral responses across individuals, behaviors, and contexts – allows us to collect more precise self-reported behavior and behavioral intention data, hopefully limiting the ever-present gap between these and

observed behavior data. This instrument uses modified response categories to identify the homes in which water conservation behaviors are already performed, or those that have not yet performed the behavior but may in the future. It aids in sorting out those homes where water conservation behaviors cannot be performed because of structural constraints. As Allen, Dietz, and McCright (2015) note, looking at behaviors that are already performed may help us understand the roles of structural and social psychological factors, traditionally the more stable influences in pro-environmental behavior.

Another goal is to provide a replicable set of home water conservation behavior items that reflects our best understanding of which actions have the most potential for pro-environmental impact. To this end, I took items primarily from Inskeep and Attari (2014). I group these behaviors after distinctions made in Inskeep and Attari (2014) and in Allen, Dietz, and McCright (2015) as "routine" and "once-and-done". Routine behaviors include those actions that a subject performs on a regular and frequent basis (e.g., bathing, running a faucet). Once-and-done behaviors include installation of water-saving devices (e.g., low-flow toilets and showerheads) or replacement of less-conserving appliances (e.g., dishwashers and clothes washers). Because of the small number of outdoor behaviors, I do not include the indoor/outdoor dimension in my analyses, but do use it for display purposes in the relevant table. In all, the items in this instrument include installation and replacement of water-related appliances and fixtures such as dishwashers, rain sensors, and faucets, taking shorter showers, not flushing after every toilet use, and use of the garbage disposer. Table 8 displays the full instrument and a description of my question stem and coding follows in the Measures section.

Donation experiment

California, at the time of data collection, was experiencing an extended drought state of emergency that resulted in widespread residential water use restrictions (USGS 2017). Because of the multi-year nature of the drought and the resulting inconveniences of the water restrictions, Californians had no real expectation as to when drought effects might be alleviated. In my experiment, I took advantage of this uncertainty by presenting subjects with information labeled as current (2016 - low temporal distance) or as a forecast (2026 - high temporal distance). Subjects were randomly assigned to one of two conditions designed to test the messaging effects of a fabricated informational presentation slide illustrating the severity, change, and impacts of the California drought. The message slides are available in Appendix B.

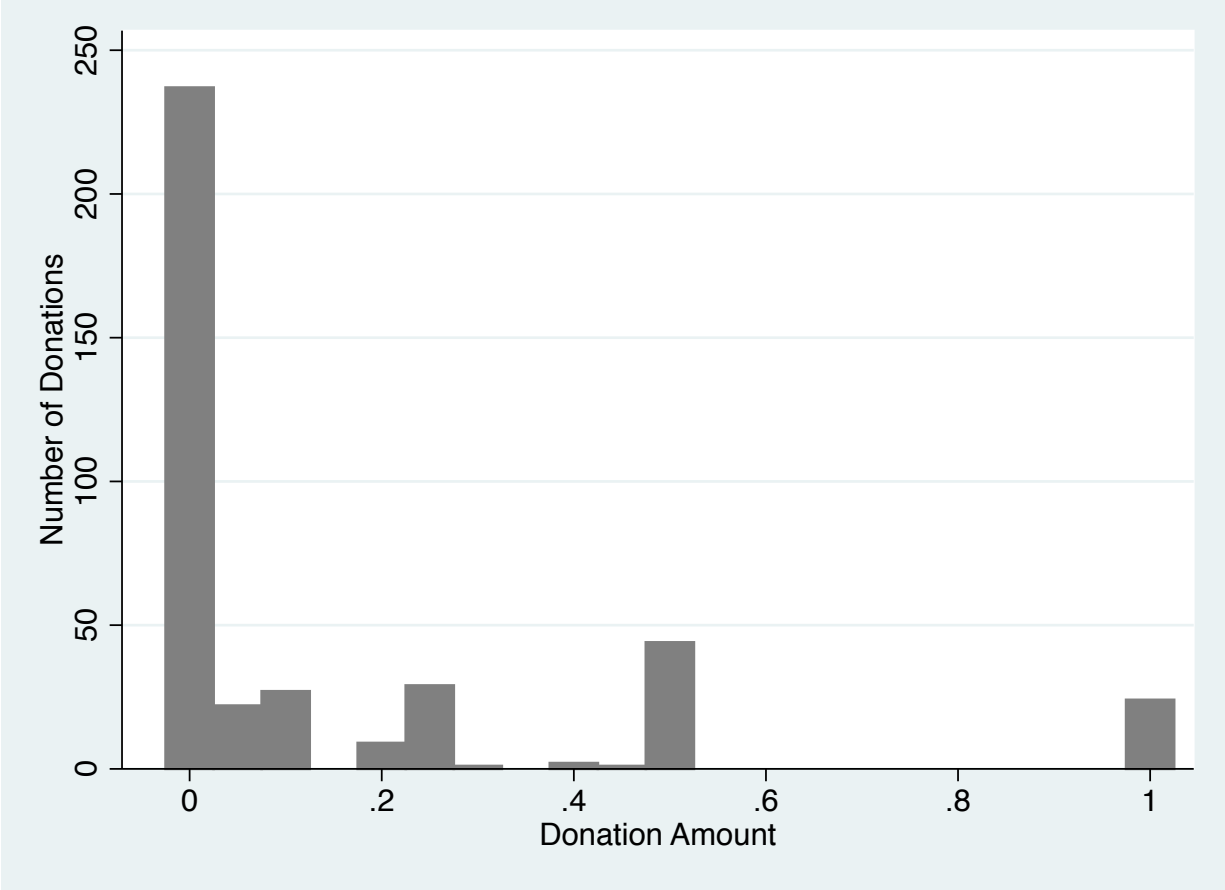
To consider the effects of spatial distance, I recruited two samples, one from California and the other from Michigan. In contrast to California, Michigan has had no issues with water availability in the recent past, rendering drought conditions more abstract than the very real daily considerations they are for Californians. In psychological distance terms, this geographic removal from a subject in Michigan provides a natural spatial distance correlate.

Before being presented with the stimulus, subjects answered a series of questions designed to measure their overall value orientations, their general environmental beliefs, and their personal norms about home water conservation and water scarcity. All subjects then answered two open-ended questions about the slide's message and implications. Subjects answered a series of questions regarding their own home water conservation behaviors, followed by standard socio-demographic questions.

After answering the final socio-demographic item, subjects were thanked for their participation and notified that they had earned a bonus of $1.00 (equivalent to their participation

pay). They were then given the option to donate some, all, or none of their bonus to the Pacific Institute, an independent nonprofit that works on freshwater issues and has a specific California drought program. Subjects indicated their desired donation amount by selecting an amount between $0.05 and $1.00 in 5 cent increments from a drop-down menu. Figure 1 indicates the distribution of donation amounts with 60% of subjects choosing not to donate and 11% of subjects choosing to donate exactly half their bonus (i.e. 50 cents). The total amount donated was $59.05.

Figure 7: Histogram of donation amounts



Measures

Water conservation behaviors instrument measures

Table 8 displays the items used in my water conservation behavior instrument, the percentage of respondents reporting they are already performing the behavior, the percentage reporting they cannot perform the behavior, and the mean score on the likelihood of performing the behavior in the future. I derived items from a review of the literature, but primarily from Inskeep and Attari's (2014) review of the most efficacious home water conservation behaviors. The question stem asked: "Taking into consideration the costs and inconvenience for each action, how unlikely or likely are you personally to perform each of the following behaviors?" and response options were comprised of a range of where "very unlikely" =1 and "very likely" =4, "I already do this" =5 and "I can't do this" =6. Calculation of the mean intention includes those who fully intend, i.e., are already performing, the behavior.

Before conducting my analysis, I created indices reflecting the intersections of the self-reported behavior/behavioral intentions and routine/once-and-done dimensions for a total of four indices – self-reported routine behaviors, self-reported once-and-done behaviors, routine behavioral intentions, and once-and-done behavioral intentions. For each subject, I derived their mean response to the group of items, accommodating subjects who did not respond to all items. I then conducted these analyses using standard OLS regression techniques.

Table 8: Water conservation behavior items and descriptive statistics (low likelihood=1 to very high likelihood=5)

Behavioral Item	Percentage Already Performing	Percentage Cannot Perform	Mean Likelihood of Performing (for Eligible Subjects)
Indoor Routine			
Take a shower instead of a bath	77.4	1.7	4.6
Only wash a full load of clothes (or adjust the water level to the load size) whenever I wash clothes	72.4	2.0	4.5
Reduce the time faucet is running while brushing teeth or washing hands	66.2	0.7	4.4
Take shorter showers	44.7	1.0	3.9
When taking a bath, fill tub only half full	30.2	11.1	3.5
Don't pre-rinse dishes before putting them in the dishwasher	21.2	15.8	3.1
Stop using water with the garbage disposer	14.4	18.6	2.8
Reduce how often I flush my toilets	35.2	3.5	3.3
Outdoor Routine			
Water outdoor plants in the morning	36.6	17.8	3.9
Don't water my lawn and/or garden or use collected rainwater to water them	28.9	20.0	3.6
Indoor Once-and-Done			
Inspect for and fix plumbing leaks	42.6	13.1	4.1
Replace my clothes washer with a water-efficient one	37.6	19.3	3.9
Replace my current showerheads with low-flow showerheads	35.8	13.1	3.7
Replace my dishwasher with a water-efficient one	30.4	30.9	3.8
Replace my current toilets with low-flow toilets	27.4	22.2	3.5
Install toilet tank water-saving inserts	18.8	17.3	3.2
Install faucets labeled as water-conserving	18.8	19.0	3.4
Replace my outdoor plants and grass with native or low-water- use plants	17.0	24.4	3.2
Outdoor Once-and-Done			
Install a drip irrigation system for my outdoor plants	10.2	28.0	2.9
Install an outdoor sensor that detects whether it has rained recently	2.7	21.0	2.3

Donation experiment measures

In addition to the water conservation behaviors instrument above and the temporal and spatial conditions inherent in my sample selection and experimental condition assignments, I measured psychosocial characteristics associated with the VBN model of pro-environmental behavior - value orientations, general environmental beliefs, personal norms around water conservation and scarcity, awareness of the consequences of water scarcity, and standard socio-demographics.

I used a revision of Schwartz's value orientation survey (Schwartz, 1994) with additional hedonism items as suggested by Steg, Perlaviciute, Van der Werff, and Lurvink (2012) to measure value orientations. The question stem asked subjects to "indicate how important each of the following is as a guiding principle in your life." Response options ranged from "not at all important" =1 to "extremely important" =7. There were three items for each value orientation, which I then summed into scales. Cronbach's alphas were as follows: *altruism* (α= 0.80), *hedonism* (α= 0.76), *egoism* (α= 0.47), *tradition* (α= 0.61), and *openness to change* (α= 0.54). I accounted for general environmental beliefs with a short (5-item) version of the New Ecological Paradigm scale (Dunlap, Van Liere, Mertig, and Jones, 2000) which averages the responses ("strongly disagree"=1 to "strongly agree"=7) to similar items about the human-environment relationship: *new ecological paradigm* (α=0.84).

Personal norms around saving water were measured using a 7-option scale where "strongly disagree" =1 and "strongly agree" =7. I asked subjects to read a series of statements and indicate their disagreement or agreement. I measured personal norms using three items: "I should conserve water", "I always save water even when it's a big effort" and "I feel guilty if I don't conserve water" again creating a summative scale (Cronbach's α=0.69).

Using the same 7-option response scale where "strongly disagree" =1 and "strongly agree" =7, I measured *awareness of the consequences* of water scarcity along four levels of psychological distance – consequences for the subject, consequences for the subject's family, consequences for the subject's community, and consequences to the more general environment. I used the item "Drought and water scarcity impact my choices and personal freedom" for awareness of consequences to the self and I measured awareness to family with the item "My family suffers when there is a drought". Awareness of consequences to community was measured as "The effects of water scarcity and drought on my community are worse than I realize", and I used the statement "Water scarcity has a large negative impact on the environment" for measuring awareness of consequences to the environment. These items were then combined into a summative index (Cronbach's $\alpha = 0.87$).

I also included items ascertaining subjects' home-ownership status, either owning, renting, living in a home someone rents for them, or living in a home someone else owns and to whom they do not pay rent (e.g., living with parents). For my analyses, I collapsed these categories into a dichotomous *own* variable (does not own =0, owns =1). I also employed five demographic and social variables as statistical controls in my analyses. Two are dummy variables: *female* for gender ("male"=0; "female"=1) and *white* for race ("non-white"=0; "white"=1). *Age* is measured with five categories: "18-29"=1 to "60 and over"=5. *Education* is measured by the highest degree earned: "less than high school diploma or equivalent"=1 to "doctoral degree"=7. *Income* is measured as approximate yearly household income: "less than $25,000"=1 to "$100,000 or more"=5.

Analytic methods

My analyses answer five questions:

(1) Does the proposed instrument perform as expected?

(2) What characterizes those who already perform home water-saving behaviors?

(3) What characterizes those who intend to perform home water-saving behaviors?

(4) What predicts who is likely to donate for water conservation? and

(5) What predicts how much a donor will donate for water conservation?

To answer these questions, I first examined the predictors of self-reported home water conservation behaviors and then predictors of water conservation behavioral intentions. I then examined predictors of subjects' donation decisions, using logistic regression to understand which variables contribute to the donation/no donation decision and, after separating out those subjects who chose to donate, I conducted OLS regression to predict donation amounts. Again, because of the small number of outdoor behaviors, I do not include the indoor/outdoor dimension in my analyses, but do use it for display purposes in the relevant table.

As a secondary analysis, I performed nested regressions on each of the four water conservation indices, donation choice, and donation amount in order to more closely examine the performance of psychological distance in these models. These are available in Appendix A. I used the VBN theoretical model to build each set of regressions. I conducted all analyses using Stata 14.2.

Results and Discussion

Performance of the water conservation instrument

This water conservation behaviors instrument differentiates current behavior from intentions and allows for the inability of some respondents to perform some behaviors. First, I discuss the performance of the instrument with descriptive statistics. Then I follow with an analysis of the predictors of current behavior and behavioral intentions (Tables 10 and 11). These yield results consistent with the general patterns of previous research and suggest that the instrument has predictive validity.

Table 8 displays the descriptive statistics for the water conservation behaviors instrument. I see that in this sample, the most common water conservation behavior is taking a shower instead of a bath (77% of respondents), while the least common is installing an outdoor sensor that detects whether it has rained recently (3% of respondents). Replacing a dishwasher with a water-efficient one, installing a drip irrigation system for outdoor plants, and replacing outdoor plants and grass with native or low-water-use plants are the most constrained behaviors, with between 24% - 30% of respondents reporting they could not perform each of these behaviors. For those who could perform them but have not yet done so, the most likely future behaviors are taking a shower instead of a bath (mean=4.6) and only washing a full load of laundry or adjusting water levels to match load size (mean=4.5), while the least likely future behavior is installing an outdoor water sensor that detects whether it has rained recently (mean=2.3). Overall, outdoor behaviors are the most constrained behaviors in my sample. This may be a reflection of my sample's rate of homeownership and housing types (i.e. if they do own, owning apartments or townhomes).

I also examine the dimensionality of my water conservation items. A principal components analysis of the variables followed by a promax rotation yields four factors with eigenvalues greater than 1. Table 9 reports the factor loadings and eigenvalues from this analysis. The factor loadings suggest that the items could be sorted into four factors, which I describe as once-and-done behaviors (factor 1), outdoor routine behaviors (factor 2), indoor routine behaviors 1 (factor 3), and indoor routine behaviors 2 (factor 4). The indoor/outdoor dichotomy is not perfectly clean in this sample, though the pattern is nonetheless clear. Likewise, the split of routine indoor behaviors into two factors still indicates the routine nature of the behaviors, though the differences between the two sets of behaviors is not obvious. Two items loaded on both factor 1 and factor 2. "Install a drip irrigation system..." and "Install an outdoor sensor..." both relate to both capital improvements and outdoor actions. Two items failed to load on any factor, "When taking a bath, fill tub only half full" and "Inspect for and fix plumbing leaks". Overall, this pattern seems to match the kinds of time and financial constraints and difficulties involved in performing these routine versus once-and-done behaviors. It also suggests support for the indoor/outdoor division.

Table 9: Factor loadings and eigenvalues from principle component factor analysis of water conservation instrument items with pro-max rotation

Behavioral Item	**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**
Replace my current toilets with low-flow toilets	**0.8346**	0.0050	-0.0089	0.0613
Install toilet tank water-saving inserts	**0.7541**	0.0103	-0.0609	0.1135
Replace my clothes washer with a water-efficient one	**0.7542**	0.0191	0.2320	-0.1431
Replace my current showerheads with low-flow showerheads	**0.7585**	-0.1872	0.1016	0.1317
Install faucets labeled as water-conserving	**0.7672**	0.1704	-0.0683	-0.0466
Replace my dishwasher with a water-efficient one	**0.7643**	-0.0765	0.1771	0.0546
Replace my outdoor plants and grass with native or low-water- use plants	**0.5751**	0.3992	-0.0949	-0.0245
Install a drip irrigation system for my outdoor plants	**0.4395**	**0.5926**	-0.0884	-0.112
Install an outdoor sensor that detects whether it has rained recently	**0.5440**	**0.4184**	-0.2653	0.0091
Don't water my lawn and/or garden or use collected rainwater to water them	0.2303	**0.5139**	0.0513	0.1378
Water outdoor plants in the morning	-0.0329	**0.7353**	0.2056	-0.0081
Only wash a full load of clothes (or adjust the water level to the load size) whenever I wash clothes	0.1316	0.0577	**0.7037**	-0.0435
Take a shower instead of a bath	-0.0048	-0.0154	**0.7057**	-0.0413
Reduce the time faucet is running while brushing teeth or washing hands	-0.0459	0.0161	**0.7820**	-0.0245
Reduce how often I flush my toilets	-0.2393	0.3307	-0.0341	**0.6436**
Take shorter showers	-0.0092	0.0155	0.3947	**0.4103**
Stop using water with the garbage disposer	0.0897	-0.1218	0.0009	**0.7788**
Don't pre-rinse dishes before putting them in the dishwasher	0.1688	-0.0584	-0.0900	**0.7758**
When taking a bath, fill tub only half full	-0.1292	0.3469	0.3493	0.2594
Inspect for and fix plumbing leaks	0.2279	0.2937	0.3922	-0.0878
Eigenvalues	6.7463	2.5922	1.222	1.0679

Predicting self-reported water conservation behaviors

I further assess the construct validity of my water conservation behaviors instrument by demonstrating that well-known predictors of environmentally significant behavior influence my subjects' water conservation behaviors and behavioral intentions, even while controlling for subjects' demographic and social characteristics. The results in Table 10 are generally congruent

with the Values-Beliefs-Norms theoretical model, offering evidence that my instrument has construct validity. *Personal norms* have a statistically significant positive effect on both routine and once-and-done behavior scale scores. *Awareness of water restrictions* has a similarly positive effect on these scale scores. Noticing the difference in performance of *awareness of consequences*, a knowledge factor, and *awareness of water restrictions*, an external context and behavioral expectation, also leads us to view a subject's knowledge of water restrictions acts as a social norm in this sample. Thus, the statistical significance of these variables suggests that a more normative approach to incentivization of water conservation behaviors, rather than one based on increasing knowledge of impacts should be efficacious.

Additionally, the performance of the demographic and social variables aligns with the results of recent studies. Other than age, none of the remaining variables have consistent effects across the two categories of behaviors. This finding is similar to previous research documenting that race (McCright and Dunlap 2015; Clements et al. 2014a; Clements et al. 2014b) income, and education (O'Connor et al 1999; McCright and Dunlap 2015) either have no effect or mixed effects, especially when controlling for environmental beliefs. Nevertheless, my results also show face validity in the performance of race and income as statistically significant on once-and-done behaviors. I might expect older subjects and those with more income and homeownership experience to be more likely to make capital investments in appliances and facility upgrades in their homes.

Table 10: Unstandardized coefficients (and standard errors) from OLS regression of self-reported water conservation behaviors on a range of theoretical and socio-demographic predictors

	Self-Reported Routine Water Conservation Behaviors	Self-Reported Once-and-Done Water Conservation Behaviors
Values, Beliefs, and Norms		
Altruism	0.02 (0.02)	0.02 (0.02)
Awareness of Consequences	-0.02 (0.01)	0.00 (0.01)
New Ecological Paradigm	0.01 (0.01)	-0.00 (0.01)
Personal Norms	0.07 (0.01)***	0.04 (0.02)**
Awareness of Water Restrictions	0.08 (0.04)*	0.12 (0.040**
Socio-Demographic Characteristics		
Female	0.03 (0.03)	0.00 (0.03)
Age	0.02 (0.01)**	0.03 (0.01)**
White	0.05 (0.03)	0.13 (0.04)***
Educational attainment	-0.03 (0.01)*	-0.02 (0.01)
Income	0.02 (0.01)	0.04 (0.01)**
Home ownership	-0.02 (0.03)	-0.02 (0.03)
Michigan residence	0.03 (0.04)	0.01 (0.04)
Constant	-0.10 (0.10)	-0.34 (0.11)**
Adjusted R^2	0.16	0.19
N	375	375

*p<.05, **p<.01, ***p<.001

Predicting water conservation behavioral intentions

Table 11 reports the effects of key variables from OLS regression models predicting water conservation behavioral intentions. Similar to the self-reported behaviors findings, personal norms and awareness of water restrictions, along with altruistic value orientation, are typically the strongest predictors of behavioral intentions. Thus, the results in Table 11 provide additional evidence that my instrument has construct validity. *Personal norms* and *altruism* have a statistically significant positive effect on both behavioral intention categories, while *awareness of water restrictions* influences the more costly behavior category. I suggest that *altruism* appears as significant here where it did not in the previous models of self-reported behavior because of the more abstract nature of behavioral intentions. Previous VBN-based research

documents that value orientations have more influence before the introduction of specific attitudes, norms, and constraints (Dietz, et al. 2005). I also suggest that in these models, in addition to their action as a social norm, a*wareness of water restrictions* act as a marker for subjects' understanding of what actions would be appropriate responses to water restrictions. Subjects may not view their curtailment-focused routine behaviors as having an especially large impact on water conservation in the home when compared to efficiency measures such as appliance upgrades. In other words, though they are aware of the restrictions, subjects may not think that their routine behaviors have much impact.

As expected, the remaining demographic, social, and political variables have no consistent effects on behavioral intentions across the two models, but a few of the sparse effects warrant brief attention. For routine behavioral intentions, being older is the only significant socio-demographic predictor, while income effects once-and-done intentions as does being white. Again, these results are in line with previous literature, suggesting that the instrument performs as expected. Overall, these results suggest that home water conservation behavioral studies can be expected to conform to the traditional models and predictor patterns that work for other environmentally significant behaviors.

Table 11: Unstandardized coefficients (and standard errors) from OLS regression predicting intentions to perform water conservation behaviors on a range of theoretical and socio-demographic predictors

	Routine Water Conservation Behavioral Intentions	Once-and-Done Water Conservation Behavioral Intentions
Construal Level Theoretical Predictors		
Temporal distance (forecast message)	0.03 (0.07)	0.06 (0.09)
Spatial distance (Michigan residence)	-0.02 (0.10)	0.01 (0.13)
Values, Beliefs, and Norms		
Altruism	0.11 (0.04)**	0.20 (0.06)***
Awareness of Consequences	-0.03 (0.03)	0.06 (0.04)
New Ecological Paradigm	0.03 (0.03)	-0.02 (0.04)
Personal Norms	0.22 (0.04)***	0.14 (0.05)**
Awareness of Water Restrictions	0.13 (0.10)	0.35 (0.13)**
Socio-Demographic Characteristics		
Female	0.10 (0.07)	0.09 (0.09)
Age	0.04 (0.02)**	0.02 (0.02)
White	0.01 (0.08)	0.39 (0.11)**
Educational attainment	-0.07 (0.04)	-0.07 (0.05)
Income	0.04 (0.03)	0.15 (0.04)**
Home ownership	-0.01 (0.08)	0.10 (0.10)
Constant	1.97 (0.25)***	0.72 (0.33)*
Adjusted R^2	0.23	0.24
N	375	375

*p<.05, **p<.01, ***p<.001

Predicting donations to a water conservation program

Table 12 displays results from my logistic and OLS regressions on donation behaviors. The logistic model uses my entire sample to predict donation choice, while I predict donation amounts using only those subjects who chose to donate. My psychological distance conditions – controlled spatial distance and experimentally assigned temporal distance – did not show statistical significance in my final models. I discuss my secondary analyses to better understand

why this is so below, but essentially, we see the strong effects of psychosocial variables as is typically with environment-related studies.

In the logistic model of my subjects' choice to donate or not to donate, two predictors have statistically significant effects. *NEP* and *routine behavioral intentions* each increase my subjects' likelihood of donating for water conservation. As noted, *NEP* has been documented as a positive influence of pro-environmental donation behavior (Clements, et al. 2015). *Routine behavioral intentions* are the closest intentional match to donation behavior in this experiment. Donation as I have organized it here, is a low-cost, low-risk behavior with minimal external constraints. Routine behaviors are similarly low-cost and low-risk and generally low-constraint. Intentionality, rather than an actual behavior, further adds to the lack of perceived constraint. Thus, the congruence between this intention measure and the measured donation behavior makes sense. Regarding prediction of the donation amount, my model does not perform particularly well, though I do see two variables with statistically significant influence. Table 12 again shows *NEP* as significant and positive as is *income*; the latter intuitively correct as well as documented in previous literature (Wiepking 2010).

Predicting donations to an environmental cause is a relatively new undertaking. Donation may be a factor of environmentally relevant beliefs, measured here by the NEP; however, income influences the amount of donation but not the actual choice to donate. Given the relatively small amount of variance explained by this set of variables, further research is needed to identify more reliable predictors or models for monetary support of environmental causes.

Table 12: Logistic and OLS regressions (and standard errors) predicting donation to California drought program and amount of donation

	Logit Model Predicting Donation	OLS Model Predicting Donation Amount
Experimental Effects		
Temporal distance (forecast message)	-0.06 (.23)	0.07 (.05)
Spatial distance (location)	-0.66 (.34)	0.03 (.08)
Values, Beliefs, and Norms		
Altruism	-0.21 (.14)	0.01 (.03)
Awareness of Consequences	-0.01 (.09)	0.01 (.02)
New Ecological Paradigm	0.39 (.11)***	0.06 (.03)*
Personal Norms	-0.08 (.13)	-0.03 (.03)
Awareness of Water Restrictions	0.46 (.33)	-0.04 (.08)
Socio-Demographic Characteristics		
Female	0.06 (.24)	0.03 (.05)
Age	0.10 (.06)	0.01 (.01)
White	0.21 (.29)	0.06 (.06)
Educational attainment	-0.18 (.12)	-0.04 (.03)
Income	-0.03 (.11)	0.06 (.03)*
Home ownership	-0.20 (.26)	0.05 (.06)
Behavioral Intentions		
Routine behavior intentions	0.97 (.33)**	0.08 (.08)
Once-and-done behavior intentions	-0.27 (.22)	-0.05 (.05)
Self-reported routine behavior	-1.49 (.84)	-0.19 (.20)
Self-reported once-and-done behavior	0.16 (.69)	0.10 (.16)
Constant	-4.06 (1.27)**	-0.28 (.31)
Pseudo R^2	0.08	
Adjusted R^2		0.04
N	367	149

*p<.05, **p<.01, ***p<.001

Performance of psychological distance

In my analyses, psychological distance, the frame of my experiment, failed to reach statistical significance for any of my models. And in my secondary analyses, nested regressions to isolate when variables' influence overtake my spatial and temporal distance conditions, neither the fixed spatial distance measure of Michigan residence, nor the manipulated temporal

distance measure of forecasted drought effects showed influence on self-reported behaviors or on the amount of donation a subject chose if they chose to donate at all. Spatial distance did, however, show statistically significant positive influence on both types of behavioral intentions and on a subjects' choice to make a donation. For behavioral intentions, the effects of spatial distance are overcome when *awareness of the consequences* of water scarcity is introduced to the model. And, in line with Construal Level Theory, being spatially distant from the drought (i.e. a Michigan resident) increased a subject's likelihood of donating to water conservation organizations. It is not clear from this data whether that is a factor of greater concern about the drought or of greater preference for donating to an organization instead of specific victim groups. However, the spatial distance effect is overcome when NEP beliefs are added in the model suggesting that it is the concern about the drought rather than donation target preference.

Conclusion

The goals of this paper were to evaluate a new measurement instrument through consideration of the effects of traditional psychosocial environmental concern predictors on self-reported home water conservation behavior and on water conservation behavioral intentions, and to report the results of an experiment on the effects of psychological distance on monetary donation to a water conservation program. I did this by answering five questions: (1) Does the proposed instrument perform as expected? (2) What characterizes those who already perform home water-saving behaviors? (3) What characterizes those who intend to perform home water-saving behaviors? (4) What predicts who is likely to donate to a water conservation charity? and (5) What predicts how much a donor will donate to the water conservation charity?

Given these results, I suggest that this water conservation behavior instrument is suitable for replication. My factor analyses and descriptive statistics suggest construct validity, while my regression results document predictive performance in line with research on other, similar pro-environmental behaviors as noted in the literature. Thus, the suggestion from the regression results is that we should expect results from water conservation behavior studies to conform to our existing models of other pro-environmental behaviors and their predictor patterns. To follow this thread, research could be undertaken using other well-known models of pro-environmental behavior such as the Theory of Planned Behavior (Ajzen 1991).

Psychological distance also deserves further study, especially in the context of donation behavior. Though not statistically significant in the final models, the performance of spatial distance is enough to be intriguing, especially with regard to how it affects donation choice – through organizational preference or levels of concern. In all, these results point out that there is more work to be done to understand the drivers behind donations to environmental efforts. Clearly, the explanatory power of my donation models could be improved, perhaps with deeper consideration of subjects' perceptions of the donation receiver and donation in general, and more complete survey of subjects' external constraints.

Overall, greater understanding of home water conservation behaviors, intentions, and constraints to these as examined here will provide better information for policy debates and water scarcity-alleviation programs. More specific characterization of donors could lead to bigger, more, and more effective pro-environmental efforts.

APPENDICES

APPENDIX A

Nested Regression Models

Table 13: Unstandardized coefficients (and standard errors) of nested OLS regression models of routine water conservation behavioral intentions

	Model 1	**Model 2**	**Model 3**	**Model 4**
Forecast Message	0.00	-0.00	-0.01	-0.00
	(0.07)	(0.07)	(0.07)	(0.07)
Michigan Residence	-0.18*	-0.18*	-0.18*	-0.09
	(0.07)	(0.07)	(0.07)	(0.08)
Altruism		0.26***	0.23***	0.20***
		(0.04)	(0.04)	(0.04)
NEP			0.07*	0.06
			(0.03)	(0.03)
Awareness of Consequences				0.06*
				(0.03)
Personal Norms				
Female				
Age				
Income				
White				
Homeowner				
Awareness of Water Restrictions				
Routine Intentions				
Once-and-Done Intentions				
Routine Already				
Once-and-Done Already				
Constant	4.12***	2.71***	2.57***	2.36***
	(0.12)	(0.22)	(0.23)	(0.28)
N	400	400	400	400
F	2.81*	20.49***	16.73***	14.44***
Adj R^2	0.01	0.13	0.14	0.14

Table 14: Unstandardized coefficients (and standard errors) of nested OLS regression models of once-and-done water conservation behavioral intentions

	Model 1	**Model 2**	**Model 3**	**Model 4**
Forecast Message	-0.02	-0.03	-0.03	-0.03
	(0.10)	(0.10)	(0.10)	(0.09)
Michigan Residence	-0.27**	-0.27**	-0.27**	-0.12
	(0.10)	(0.10)	(0.10)	(0.11)
Altruism		0.34***	0.33***	0.30***
		(0.05)	(0.06)	(0.06)
NEP			0.01	-0.01
			(0.04)	(0.04)
Awareness of Consequences				0.10**
				(0.04)
Personal Norms				
Female				
Age				
Income				
White				
Homeowner				
Awareness of Water Restrictions				
Routine Intentions				
Once-and-Done Intentions				
Routine Already				
Once-and-Done Already				
Constant	3.78***	2.00***	1.98***	1.63***
	(0.17)	(0.31)	(0.32)	(0.34)
N	375	375	375	375
F	3.52*	17.77***	13.30***	12.32***
Adj R^2	0.01	0.12	0.12	0.13

Table 15: Unstandardized coefficients (and standard errors) of nested logistic regression models of donation behavior

	Model 1	**Model 2**	**Model 3**
Forecast Message	-0.05	-0.05	-0.08
	(0.21)	(0.21)	(0.22)
Michigan Residence	0.43*	0.43*	0.48
	(0.21)	(0.21)	(0.26)
Altruism		0.04	-0.16
		(0.11)	(0.13)
Awareness of Consequences			0.03
			(0.08)
NEP			0.32**
			(0.10)
Personal Norms			
Female			
Age			
Income			
White			
Homeowner			
Awareness of Water Restrictions			
Routine Intentions			
Once-and-Done Intentions			
Routine Already			
Once-and-Done Already			
Constant	-1.01	-1.22	-2.05*
	(0.36)	(0.69)	(0.80)
N	367	367	367
Wald chi^2	4.10	0.12	11.03
LR chi^2	4.13	4.26	15.87
Prob > chi^2	0.13	0.24	0.01
Pseudo R^2	0.01	0.01	0.03

APPENDIX B

Message Slides

Figure 8: Current condition slide

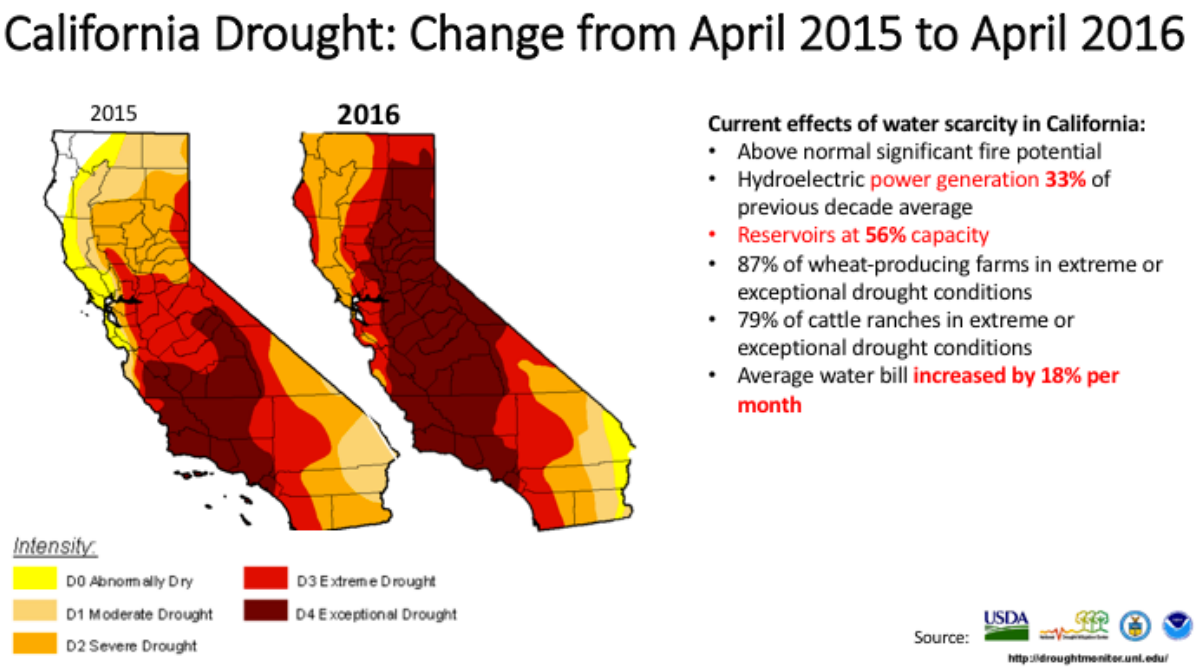
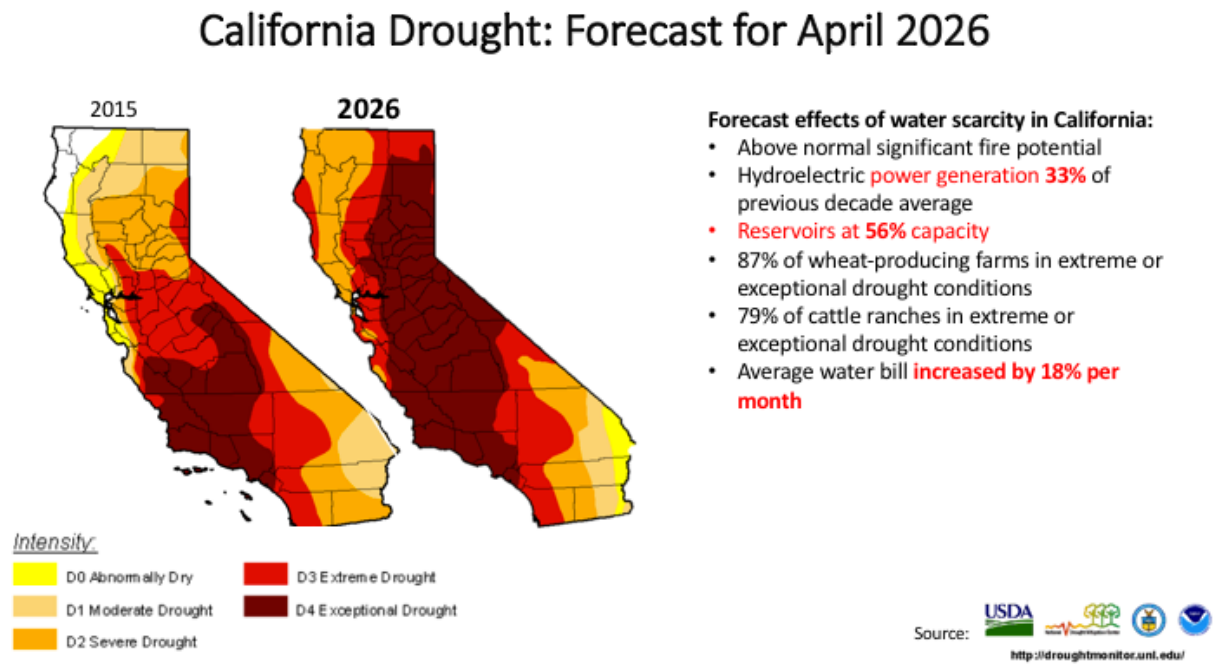


Figure 9: Forecast condition slide



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CHAPTER 4: MEASURING PRO-ENVIRONMENTAL BEHAVIOR

Introduction

Scholars across disciplines have studied pro-environmental behaviors—actions that affect, or have the intention to affect, the environment in a "friendly" way—for five decades, gaining more nuanced understanding of the factors that contribute to environmental decision-making. We have studied the relationships between lifestyles and water or energy allocation; participation in and opposition to the environmental movement; and efforts to avoid pollution or other technological hazards (i.e. environmental racism-related behaviors). Scholars also consider resource conservation behaviors, consumption practices, recycling, transportation choices, and technology adoption (e.g., Attari et al. 2010; Dietz 2014; Guagnano, Stern, and Dietz 1995; Steg and Vlek 1997; Stern et al. 2010).

The behaviors that favorably impact the quality or availability of critical natural resources and services occur at a range of scales. Those at the individual level show importance to sustaining the availability and quality of energy (e.g., Poortinga, Steg, and Vlek 2004), water (e.g., Dolnicar, Hurlimann, and Grün 2012), and ecosystems (e.g., Harshaw, Sheppard, and Lewis 2007). Scholars also suggest that individual behaviors, specifically those in the home, could yield savings approaching 48% of current residential energy use in the EU (Fonseca *et al.* 2009) or 31% of U.S. CO_2 emissions (Dietz et al. 2009).

As we study these pro-environmental behaviors as performed by individuals, we have increased our measurement and analytical sophistication. Initial studies of littering, for example, used simple newspaper counts and descriptive statistics in the 1970s. Today, we calculate the most impactful behaviors, deliver surveys with response options that accommodate respondent explanations of their self-reported behaviors, and use causal modeling to compare explanatory

models. And while analysis is assisted by concurrent advances in statistical mathematics and software development, data is improved through enhanced understanding of question formulation, item choice, and response options. In this paper, I report on an analysis of a sample of the empirical pro-environmental behavior (PEB) literature with special attention to how we measure these behaviors and the theoretical implications of those choices. My primary analytical questions while conducting this review were (1) Are there identifiable patterns to how we are conceptualizing and studying these pro-environmental behaviors? (2) When we are interested in measuring pro-environmental behavior, does the literature show a difference in predictor performance if we choose a specific, representative behavior versus using a behavioral scale as the outcome variable? And (3) If there is a difference, how do the predictors perform differently?

To answer these questions, I first describe and discuss the patterns visible in theoretical frame, question stem, and response option choices within this sample. Then, to see whether predictor performance varies by outcome variable (i.e. general scales versus items about one behavior type), I narrow the sample to those models using either the Norm Activation Model/Values-Beliefs-Norms model, or the Theory of Planned Behavior model and identify significant predictors and their performance patterns. Finally, I suggest avenues for future measurement improvements.

Sampling process

I began this examination with four recent, well-cited reviews by senior researchers of pro-environmental behavior (Dietz, 2014; Dietz, Fitzgerald, and Shwom, 2005; Gifford and Nilsson, 2014; Steg and Vlek, 2009). I extracted all references clearly relevant to individual or

household-level PEBs[5]. I excluded review papers, theoretical pieces, and methodological articles as not empirical; meta-analyses in favor of the original research; studies with children as subjects; and studies where the outcome was an attitude rather than a behavior or behavioral intention.

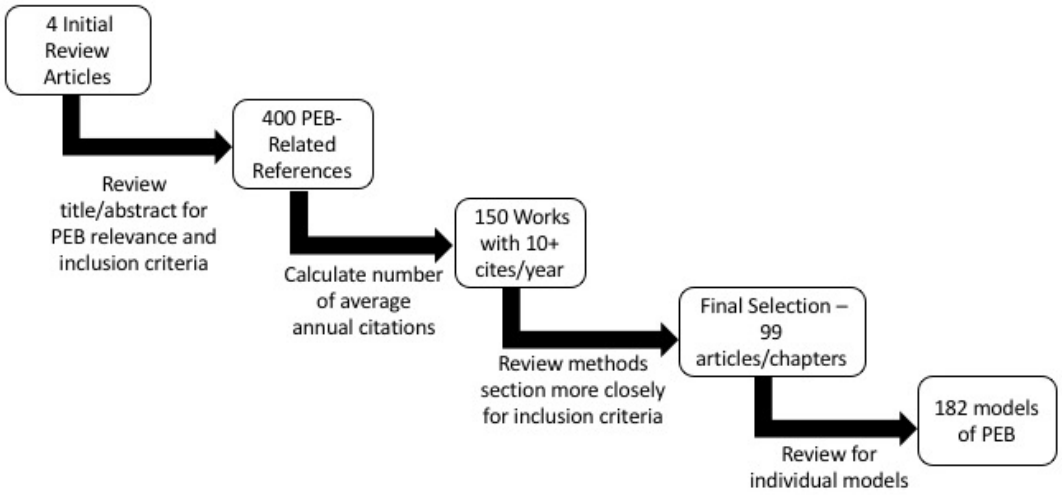
These four initial articles yielded approximately 400 unique references. I further narrowed those 400 papers by deriving the average number of citations per year since their publication. I used Google Scholar's citation count for total citations and divided that number by years since publication date. I gathered citation numbers and calculated the citations per year in December 2016. If a piece received ten or more citations per year on average, I included it in my analysis. This narrowed my sample to 150 articles and chapters. Further review revealed that fifty-one additional pieces belonged to one of my excluded categories, yielding a final sample of ninety-nine articles and chapters (see Appendix A for full listing).

In reviewing these pieces[6], I focused upon models rather than papers. Many include more than one experiment or investigation or outcome variable. For example, Kaiser and Gutscher (2003) included six models of specific behaviors as well as a model examining a general PEB scale. Thus, one paper contributed seven models. Within these ninety-nine articles, there were 182 models of pro-environmental behavior.

[5] I include household-level behaviors in this discussion of individual behaviors because surveys are generally completed by a representative individual within a home rather than reflecting the experiences of all household members. In this way, these surveys are more correctly considered measures of individuals.

[6] I coded publication year, number of citations, country of all authors' affiliation, theories used, type of study design, sample location, sample design, sample size, unit of analysis, analytical methods, outcome type, outcome behavior, whether the outcome measure is a single item or composite, and predictor variables. For behaviors used in NAM, VBN, and TPB models, I also coded question stems, items used, and response options.

Figure 10: Literature review selection process



Sample description

The ninety-nine reviewed works span the decades from 1975 until 2012, with the most productive decades being the 1990s (forty-five articles) and the 2000s (thirty-seven articles). Within this sample, there are 182 PEB models. Forty-two (22%) of the models address recycling, thirty-two (17%) focus on transportation choices, and twenty-nine (15%) engage with "general pro-environmental behavior." Another twenty-nine (15%) address consumer behaviors. Twenty-four models (13%) consider energy saving behaviors, eighteen (9%) focus upon littering or pollution-related behavior, seven (4%) model water conservation, one model examines planting native vegetation while another one focuses upon composting.

U.S. scholars produced 43% of the 182 models, with the Netherlands the next largest source at 15%. More than 25% of the U.S.-produced models focused upon recycling, with consumer behaviors, "pro-environmental behavior," and littering/pollution each accounting for around 20% of those U.S. models. Conversely, scholars in the Netherlands focused their work

predominantly upon transportation (42% of their twenty-nine models) and energy savings (28%). Other countries represented in this sample are the UK, Canada, France, Australia, Germany, Switzerland, and Spain.

Surveys are the most frequently used data collection means in this sample with self-reported behaviors the most prevalent outcome type. Of the 182 models, 124 use a self-reported behavior measure for the outcome and twenty used a directly observed behavior. The remaining models used behavioral intentions as the outcome measure. The most-used analytic method is multiple regression (eighty-five of the 182 models), with structural equation modeling the next most prevalent. The majority of studies in this sample are atheoretical (seventy-six of 182). When a theory is tested, it is typically the Theory of Planned Behavior (TPB), Schwartz's Norm Activation Model (NAM), or a combination of these two[7]. The TPB was used in thirty-nine of the 182 models, NAM in another thirty-nine, and Values-Beliefs-Norms (VBN) in sixteen models. Almost all VBN-based models were produced in the United States with Schwartz values the most used values measure. Overall, there is very limited variable replication in the sample except within articles by the same author(s). Similar models are tested, as mandated by authors' theoretical choices, but the tested measures are rarely replication.

[7] TPB is a heavily researched, well-supported framework for predicting behavioral intentions. It postulates that attitude toward a behavior, perceived behavioral control, and subjective norms are the most important predictors of behavioral intentions. Often, scholars append other factors to TPB to test their relative efficacy (Ajzen 1991; Smith and McSweeney 2007). VBN is an extension of Schwartz's model of pro-social behavior, the Norm Activation Model (Schwartz 1977). VBN suggests that values lead to awareness of consequences of a situation and ascription of responsibility to take some action, which then lead to activation of a personal norm to behave in a certain way (Stern and Dietz 1994; Stern 2000). VBN has been used to good effect in environmental and pro-social studies for over twenty years with scholars typically appending new factors onto the model. Recently, scholars have also begun testing TPB and VBN together (Kaiser et al 2005; Bamberg and Möser 2007). In general, the two models seem to work well with VBN factors more distant from behavioral intentions than are the attitudes and norms used in the TPB model.

Measuring Individual Pro-Environmental Behaviors

We can draw conclusions about how we are conceptualizing these pro-environmental behaviors from examining our measurement instruments. To do this, I reviewed each model for items chosen, question stems, response options, and theories used. Question stems, available responses, and theoretical frames were largely consistent across behavior types (recycling, energy conservation, consumer behaviors, and transportation).

Recycling items and question stems are straight-forward, asking whether or not a respondent performs recycling behavior, "Do you…" or "How likely are you to…". Variation occurs in materials indicated (e.g., newspaper, glass, or composting) and location of recycling activity (e.g., curbside or at a recycling center). Asking respondents questions in these ways have specific consequences. "Do you...?" implies current behavior, yet is not specific. This increases the likelihood of a socially desirable response as the respondent may define "current" in a broader way than the researcher intends. Likewise, asking "How likely are you to..." leaves significant room for a socially desirable answer or an answer that does not fully encompass situational constraints. In both cases, these question stems do not create conditions for accurate self-reporting by the respondent.

Twenty of the forty-two recycling models are atheoretical, but among those employing specific theory there is a wide range of traditional and novel models used. NAM/VBN is the most prevalent with TPB a close second; however, there are also studies using identity theory, self-determination theory, and Rogers' protection motivation theory. Theoretical models used can tell us about the dominant conceptualizations of a pro-environmental behavior (PEB). NAM/VBN are models of pro-social/altruistic behavior while TPB assumes a goal-focused process balancing social norms, perceived behavioral control, and attitudes toward the behavior.

Understanding these frames gives insight into how researchers conceptualize the behaviors. In the case of recycling, we see from the majority choice of NAM that recycling is largely an altruistic behavior to U.S. investigators. If they use TPB or another theory it is in conjunction with the NAM model. Reviewed research conducted in other countries use either TPB – suggesting a conceptualization of recycling as a goal-oriented action – or a less well-known theory of personal benefit (e.g., self-determination theory).

Energy conservation items range from the very general, self-reported "participate in an energy program with your utility" to directly observed changes in energy use. Routine items such as using energy saving light bulbs are also present. This behavior type is the most directly observed due to engagement with energy utilities and their monitoring capabilities. Question stems here are "Do you…", "Have you…", or "How likely are you to…". As with recycling, these question stems either leave room for respondents to interpret the implied timeframe to their own benefit or they measure an attitude toward the specific energy conservation behavior.

Twelve of the twenty-four energy conservation models are atheoretical, with the remaining models using NAM or TPB in an even split. Thus, energy conservation studies are split in their conceptualization between pro-social/altruistic and goal-oriented choice. Yet in these models, we see personal norms, values, and external constraints exerting the most influence suggesting that the NAM/VBN model would be a better choice for this category of behavior.

Consumer behaviors include a wide range of items. We see information searches, purchasing based upon attributes such as "green"-ness or "eco-friendly"-ness, and more specific items such as "buying organic food" and "using unbleached paper". Question stems include "Do you…", "How often do you…", and "How likely are you to…". The "Do you..." and "How

likely are you to...” stems remain problematic; however, the “How often do you...” formulation ensures that both researcher and respondent are using a similar time-scale.

Fourteen of the twenty-nine models in this category are atheoretical with the majority of the remaining using NAM/VBN. There are no directly observed models of consumer behavior in this sample. The dominance of the NAM/VBN model in these investigations suggests that scholars are thinking about resource expenditures as pro-social activities rather than economic substitution dilemmas, an equally viable possibility.

Transportation items are split between use of alternative transportation and habits when operating a personal vehicle (e.g., limiting speed when on the freeway). As with consumer behaviors, question stems in surveys include “Do you…”, “How likely are you to…”, and “How often do you…”. Nineteen of the thirty-two transportation models are atheoretical. Ten use TPB either alone or in tandem with NAM. The majority of studies use TPB to investigate this topic, indicating a lean toward goal-driven conceptualization. It is also worth noting that only three of the thirty-two models in this sample come from U.S. researchers, perhaps an indicator of cultural influence on research topic choice.

Response option choice and question stem choice have not changed much over the past decades. For all studies, response options correspond to the question stems, varying between the dominant binary choice (yes/no) and a 5, 6, or 7-point Likert-type scale ranging from “rarely” to “frequently”. Behavioral intention outcomes are measured with the same Likert-type scales but with labels gauging likelihood (e.g., “not likely” = 1 to “very likely” = 7). Also of note, response options used do not accommodate “cannot” answers. New work that includes behavioral plasticity - the extent to which perceived difficulty to act constrains behavioral responses across

individuals, behaviors, and contexts – in response option formulation is, however, providing examples of how this may be accomplished (e.g., Allen, Dietz, and McCright, 2015).

Response options for question stems that ask "How often..." are split between the more subjective "rarely" to "always" scale and specifying an arbitrary time period (i.e. "How often in the past 5 years…").

Overall, a question stem such as "How often in the past (X period)..." appears to be more optimal for investigating individual behavior types. This avoids timeframe disconnect between researcher and respondent, avoids slipping into attitudinal measurement, and allows for a more tailored timeframe for each item. Shorter timeframes may be more appropriate for gauging strength of habits or how routinized a behavior is for a respondent while a five or more year timeframe may be appropriate for considering capital improvements and larger investments such as cars. Differing timescales according to the underlying research question – how routine is a consumer behavior or how durable is a behavioral commitment to buying a fuel-efficient car – would allow us to understand a respondent's responses with greater precision and mitigate some social desirability influence.

Among reviewed response options, even numbered Likert-type scales have the most theoretical support (e.g., Croasmun and Ostrom 2011) and facilitate inclusion of behavioral plasticity. I discuss the extensive use of NAM/VBN and TPB models below.

Measuring General Pro-Environmental Behavior with Scales

I now turn to examining scales of "general pro-environmental behavior". Twenty-nine models used a general pro-environmental scale as the outcome measure with six of these asking for behavioral intentions.

The scales range from three items to forty-five items in length. Most scales include multiple items measuring the same behavior in different ways, essentially creating subscales. Included behavior types are water conservation (e.g., shower vs bath), waste avoidance (e.g., saving plastic bags), transportation (e.g., driving at lower speeds on the freeway), recycling (e.g., participating in curbside recycling programs), consumer behavior (e.g., buying organic food), political actions (e.g., voting based on pro-environmental stance), hazardous substance/pollution avoidance (e.g., not using chemical pesticides), energy conservation (e.g., cutting back on heating and air conditioning), and self-education about environmental issues. Not all scales include the full range of these behaviors, however.

As with the specific PEBs, question stems for these scales are either frequency-based (e.g., "How often have you…" or "In the past twelve months…") or simple reports (e.g., "I…") and use 5-point to 7-point Likert type response options, or simple binary options, respectively. Seventeen of the twenty-nine models in this category are atheoretical. Of the remaining, five use NAM/VBN and the rest are split between TPB and Geller's active caring hypothesis (Geller 1995).

Examining how we have conceptualized PEBs in scale creation, we generally elect not to impose a theoretical frame. Altruism (including active caring) seems to be a more common view of PEB motivation. Where scholars have provided measures of dimensionality for their scales, most report uni-dimensionality regardless of their scale's composition. The mix of behaviors included in these scales indicates that behavior types are considered roughly equivalent with regard to pro-environmentalism and accessibility. The General Ecological Behavior scale (Kaiser 1998) of thirty-eight items, for example, is reported by Kaiser and colleagues as uni-dimensional despite including the entire range of PEB categories discussed above.

Comparing Specific and General Behavior Measures

One of the goals of this paper is to examine whether the literature show a difference in predictor performance if we choose a specific, representative behavior versus using a behavioral scale as the outcome variable. While we assume that using scales in survey research improves the likelihood of an accurate self-report and better accommodates a respondent's situational constraints, it is also more time and attention consuming for the respondent and potentially more expensive for researchers. Thus, if the literature indicate that comparable results may be had from using a specific behavior instead of a mix, we may be able to simplify our data collection.

For this comparison, I selected studies that use directly observed or self-reported behaviors[8] and either the NAM, VBN, or TPB model (thus, 29 models of specific behaviors and 6 models of general PEB scales). I then identified the significant predictors in each empirical model. I observed the patterns for specific behavior types (recycling, energy conservation, consumer behaviors[9], and transportation) and for those studies using the general PEB scales.

Referring to Table 16, recycling in this sample is typically conceptualized as an altruistic behavior and is modelled in seven of the ten instances with NAM. When NAM is used by itself or in tandem with the TPB, *personal norms* always appear as significant predictors. When TPB is used to predict recycling behavior, including mixed models with NAM, *perceived behavioral control* (PBC) is significant in four of the five cases. *Behavioral intentions* are significant only when NAM items are not examined or controlled. *Past behavior* also shows significance when it is included.

[8] Previous research indicates that behavioral intentions and actual behaviors have differing prediction patterns, largely because actual behavior must incorporate a range of constraints in order to be accomplished. In this way, intentions can be considered indicators of support rather than commitment to act or an action. In the rest of this paper, I focus on behavior (i.e., directly observed and self-reported behaviors). This has the effect of limiting the models analyzed.

[9] Political behaviors are almost exclusively measured as intentions, except within the general scales, so I do not report on this category.

Energy conservation behavior is modeled in this subsample always by NAM or its variant VBN, indicating a typical conceptualization as an altruistic behavior. *Personal norms* are significant in three of the five models here. *Values* appear as significant predictors when tested. External constraints almost always show as significant predictors with this topic. Consumer behaviors are also measured largely by the NAM or VBN. *Personal norms* are always significant when included. *Environmental concern* is significant in two models, and *PBC* is significant when included. Additionally, transportation models behave largely according to the theory chosen, with *behavioral intentions* and *personal norms* significant in TPB and NAM/VBN models respectively.

Overall, we see that patterns in prediction of specific behaviors are clear; variables modeled by theory as closest to the behavior of interest (i.e. *personal norms* for NAM/VBN and *behavioral intentions* for TPB) perform as expected. Specific behaviors require predictors to be equally specific, so *personal norms* appear as statistically significant when they are about the behavior of interest rather than a general pro-environmental norm. Similarly, *past behaviors* are significant when they are specific. Demographics show the most influence in energy conservation models, but are not significant when psychosocial factors are introduced.

Table 17 displays information for models using the PEB scales. We see that these models are equally split between NAM and TPB and significant predictors reflect the expected outcomes: *Behavioral intentions* are exclusively significant in TPB models while *values* and *norms* are significant for NAM/VBN models. We also see that psychosocial factors remain the dominant predictors. Demographics do not show statistical significance in these models, either.

Table 16: Predictor performance in selected models of specific beh aviors

				Predictors												
	Article	Behavior Measured	Theory Used	Behavioral Intention	PBC	ATT	SN	PN	AC	EC	Values	Past Behavior	Other Variables			
Recycling	Hopper, J. R., & Nielsen, J. M. (1991)	recyclables left at curb	NAM					Personal Norms x High Awareness of Consequences ++								
	Minton, R.L. Rose, (1997)	"recycling"	NAM				+	++		+						
	Oskamp, S., Harrington, M. J., Edwards, T. C., Sherwood, D. L., Okuda, S. M., & Swanson, D. C. (1991)	participates in curbside recycling or some other recycling	NAM				Recycling by other friends/neighbors ++	++	Denial of Env Problems -				single-family house ++			
	Vining, J. & Ebreo, A. (1992)	participation in recycling program in past year	NAM				++	PN x AC +	+							
	Davies, G.R. Foxall, J. Pallister, (2002)	participation in new kerbside recycling service	NAM + TPB		++			++								
	Oom do Valle, E. Rebello, E. Reis, J. Menezes, (2005)	Separates and recycles	NAM + TPB		++	-	++	++								
	Boldero, J. (1995)	household newspapers recycled in past 2 wks	TPB	++								+	Evaluation of council +	storage space -		
	Kaiser, F. G., & Gutscher, H. (2003)	recycling paper	TPB	++	+											
	Kaiser, F. G., & Gutscher, H. (2003)	recycling glass	TPB	++	++											
	Thøgersen J, Ölander F. (2003)	recycling/composting	VBN									past recycling behavior + / Previously buying organic foods -	currently buying organic foods +			
Energy Conservation	Black, J Stanley; Stern, Paul C; Elworth, Julie T. (1985)	major capital investment in residential energy efficiency	NAM										Home ownership +	Personal benefit of efficiency +	Number of individuals in household +	
	Black, J Stanley; Stern, Paul C; Elworth, Julie T. (1985)	ambient temperature settings	NAM					Personal Norm for energy curtailment --					Number of rooms -		Number people home in daytime +	Age of oldest person +
	Black, J Stanley; Stern, Paul C; Elworth, Julie T. (1985)	minor energy curtailments in residence	NAM					Personal norm for energy efficiency + / Personal norm for energy curtailment						Economic suffering due to energy +		Number of rooms +
	Clark C, Kotchen MJ, Moore MR. (2003)	participate in green energy program with utility provider	NAM							NEP +	altruism ++		Income ++	Number of individuals in household		
	Harland, P., Staats, H., & Wilke, H. (1999)	using energy saving light bulbs	NAM + TPB					++								
	Abrahamse, W., & Steg, L. (2011)	reduction in energy use	TPB + VBN			+					Power value + / Tradition/Security value ++ / Openness to change value +		Region ++	Income +++	Household size +++	Age ++
Consumer Behaviors	Minton, R.L. Rose (1997)	search for information about environmentally friendly products	NAM				+	++		++						
	Minton, R.L. Rose (1997)	purchase based on an environmentally friendly attribute	NAM					+		+						
	Harland, P., Staats, H., & Wilke, H. (1999)	using unbleached paper in household	NAM + TPB		++	++		+++								
	Thøgersen J, Ölander F. (2003)	buying organic food	VBN									previously buying organic food ++	Currently recycling +			
Transportation	Heath, Y., & Gifford, R. (2002)	bus use	TPB	Behavioral Intention ++ / Beh Int x PBC ++	-		- -									
	Hunecke, M., Blobaum, A., Matthies, E., & Hoger, R. (2001)	subway use	NAM				+	++					Free Ticket +			
	Kaiser, F. G., & Gutscher, H. (2003)	No car use downtown	TPB	++	+											
	Kaiser, F. G., & Gutscher, H. (2003)	limit speed on freeways	TPB	++												
	Thøgersen J, Ölander F. (2003)	alternative transportation	VBN									Previous alternative transportation use ++ / Previous recycling +				
	Verplanken,B.,Aarts,H.,VanKnippenberg, A.,&Moonen, A. (1998)	choice to drive a car on a specific journey	TPB	Beh Int x Habit --									Habit +			

Table 17: Predictor performance in selected models using pro-environmental behavior scales

	Article	Behavior Measured	Theory Used	Significant Predictors			
General Pro-Environmental Behavior	Joireman, T.P. Lasane, J. Bennet, D. Richards, S. Solaimani, (2001)	"pro-environmental behavior scale" (political)	NAM	Biospherism ++	Social Consequences ++	Consideration of Future Consequences x Ego +	
	Schultz, P. W., & Zelezny, L. C. (1998).	"pro-environmental behavior index"	NAM	Self-Transcendence ++	Openness ++	NEP +	Ascription of Responsibility ++
	Kaiser, F. (2006)	General Ecological Behavior Scale	TPB	Behavior Intention ++			
	Kaiser, F. G., & Gutscher, H. (2003)	point out others behaving non-conservationally	TPB	Behavior Intention ++	Perceived Behavioral Control ++ (note this does not hold when GEB is used)		
	Kaiser, S. Wölfing, U. Fuhrer (1999)	General Ecological Behavior Scale	TPB	Behavior Intention ++			
	Nordlund, A. M., & Garvill, J. (2002).	"pro-environmental behavior scale"	VBN	Personal Norms for Pro-Environmental Behavior ++			

These results are not surprising and confirm the value of these approaches to understanding specific PEBs. They also suggest that these behaviors types are all motivated similarly, being predictable with the same models with the same predictor patterns. This points to these PEBs, and the scales of these PEBs, being potentially interchangeable as predictors of general environmental activity and concern.

Consequences, Suggestions, and Conclusions

Taken in total, this review offers several insights and related implications of which we should be cognizant and which lead to three further future articles. First, in choosing atheoretical models, we decline to hypothesize why selected predictors operate in specific ways against specific outcomes. Often, we are solution-focused, more interested in testing whether or to what extent a specific variable or intervention influences a behavior; however, these are still opportunities to add to our collective theorizing about such questions as categorizing PEBs,

common predictors across types of PEBs, and the underlying psychosocial reasons why certain predictors perform as they do.

When we do use theory to guide our investigations, we use two well-known frames – NAM and TPB – and receive very consistent results. These models work well. *Perceived behavioral control* and *behavioral intentions* and *personal norms* are important in environmental decision-making. We should now turn more attention to those factors that better explain those very consistent predictors. What else predicts respondents' *perceived behavioral control* in cases of recycling? What develops a respondent's *personal norms* around a specific behavior? This might require a move to using less well-known theories in tandem with TPB. For instance, we can imagine that theories about identity would explain a portion of a respondent's personal norms, and we could consider that habit and goal-framing affect *perceived behavioral control*. Allen and Marquart-Pyatt (*in press*) also provide an example of ways to consider external constraints and their influence on *perceived behavioral control*. If these ideas show significance, we would uncover more detailed and intervention-accessible variables for predicting our behaviors of interest.

Relatedly, in using TPB and NAM/VBN we have established the importance of both altruistic and utility/goal motives to the broad range of PEBs, but have potentially neglected other influences. For example, Steg and colleagues have been advocating for consideration of hedonism as both a motivating value and a behavioral frame (L. Steg, Perlaviciute, van der Werff, and Lurvink, 2014; Lindenberg, S and L. Steg 2007) and habit is a useful though under-explored (in this sample) influence.

As we consider improvements to our measurement instruments, in addition to the suggestions discussed above, we should consider that choosing items that are easy for many

respondents in North America and Western Europe (e.g., recycling glass, buying organic) limits the benefits of some studies. If, instead, we update items to more difficult behaviors we may receive better indications of respondents' levels of concern as indicated by the amount of effort they are willing to expend to behave pro-environmentally in the face of constraints. With the absence of these constraints in our models, Attitude-Behavior-Constraints theory[10] (Guagnano, Stern and Dietz, 1995) suggests that we are measuring only half of the behavioral equation, especially given our demonstrated preference for attitude-driven models (i.e., NAM/VBN and TPB). Perhaps a better question is how far attitudes and their psychosocial antecedents can drive more difficult behaviors in the presence of varying types of constraints. Measuring actual or self-reported behavior means we are studying environmental decision-making in the space between intention and action, where external constraints can have their strongest effects. Of course, we also need to know whether measuring constraints is too hard? If not, whether there is there a minimal set of constraints we should include? And how we might measure constraint difficulty? We are also interested in knowing whether causal modeling could lend more explanation to the study of environmental decision-making. Additionally, better items for gauging a respondent's dedication to pro-environmental behavior among a range of constraints might be comfort-related energy conservation items, specialty food purchasing, hazard/pollution avoidance, and alternative transportation choices.

Studying more difficult or less common yet more environmentally impactful behaviors could provide useful insights into behaviors that research (e.g., Inskeep and Attari 2014; Dietz et

[10] The Attitudes-Behavior-Constraints model considers the interaction between internal behavioral factors such as attitudes and knowledge and external constraints that ease or make more difficult the behavior of interest (Guagnano et al., 1995). Guagnano and colleagues theorize that in instances where there are strong constraints on behavior internal factors will not be significant, whereas in cases of weak constraints, those internal factors will be significant predictors of the behavior.

al 2007; Gardner and Stern 2008) tells us more individuals should be practicing. Our measurement of PEBs, in both general and specific formats, could benefit from greater attention to these impact-oriented items. Stern (2000:408) offered a useful definition of impact in his definition of *environmentally significant behavior*. He suggests that environmentally significant behavior is a behavior that "changes the availability of materials or energy from the environment or alters the structure and dynamics of ecosystems or the biosphere itself." Scholars have not explicitly adopted this definition, remaining instead with the "eco-friendly" focus of pro-environmental behavior, but Stern's focus upon impact over intention for behavioral measurement seems very important. Several studies exist that demonstrate how we might calculate impact. Three excellent examples are Dietz, Gardner, Gilligan, Stern, and Vandenbergh (2009); Gardner and Stern (2008); and Inskeep and Attari (2014), which calculate or discuss the most impactful energy and water conservation measures individuals can take in their daily lives. These items also have the benefit of being up-to-date. With changes in electronics, product supply chains, recycling capabilities, and transportation options, some items may be obsolete as representing impactful pro-environmental behaviors.

Further, as discussed, Stern means any behavior that increases or decreases the naturally occurring levels of any material, being, or energy; or that changes a natural system at any level, should be considered "environmentally significant" and thus of scholarly and policy interest. Stern's definition implies that the significance of such behaviors is assigned by expertise and not by lay-people. It privileges viewing nature as a resource depot over a waste sink.

When we add his exemplar categories to our considerations, more questions emerge. Stern (2000:409) sets out four types of ESBs: "activism," "non-activist public sphere" behaviors, "private sphere environmentalism," and "other" in which he points to influencing organizations.

With these categories, he muddies his definition. The definition and his own discussion emphasize impact over intent, yet all of these categories could be considered intent-focused. Activism success is dependent upon accumulation of political or economic or social leverage. Petitions and policy support, examples of "non-activist public sphere" behaviors, are even further removed from direct impact. Stern places these actions in his list of ESBs because they presumably indirectly impact policy that then indirectly impacts the resources or dynamics of an environmental system. Yet, the act of signing one's name to a petition may or may not have any effect. It may instead be merely a signal of concern or intent. Private sphere environmentalism depends upon accurate knowledge of the impacts of various behaviors to be impact-oriented, which most individuals lack, and organizational impact is very similar to activism in its reliance upon some significant leverage accumulation for impact. Clearly behaviors that directly affect resource availability and ecosystem dynamics should be considered significant, but how to classify those with indirect impacts is less clear.

With this definition, Stern intends to emphasize behaviors that have a detectable impact on natural systems and resources in a concrete, biophysical way. His categories blur this line. Thus, I conclude that Stern wants to articulate behaviors that are directly engaged with the biophysical world AND those that create the social contexts in which those direct engagements are facilitated or constrained. If this is true, it requires a reformulation of the definition and example categories. However, within this sample of the literature, there was very limited factor analysis to support in-depth discussion of dimensionality. Nor was there real empirical evidence within this sample for differentiating environmentally significant behaviors into types beyond the indoor/outdoor and routine/once-and-done that recent work explores.

The results of this investigation suggest three further avenues of research and harken back to my initial comments about understanding and systematizing our ESB literature. An article addressing the dimensionality and typology of ESBs, an article on measurement and analytic techniques, and a paper on possible theoretical approaches to understanding ESBs are all suggested here. Each will need some accompanying empirical data to demonstrate the derivation of effects of these different perspectives.

APPENDIX

Articles Reviewed

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CHAPTER 5: CONCLUSIONS

Predicting environmentally significant behaviors and explaining environmental decision-making generally are highly complex endeavors. Nevertheless, we have attempted these for over forty years. In beginning this dissertation, I focused on explaining the relative and interrelated influence of morals and values on donations to environmental causes and on water conservation behaviors. In the course of my research, results indicated that morals may not add explanatory power to environmental decision-making models, at least as tested here.

In Chapter Two, I reported the results of a between-subjects experiment conducted via Qualtrics and AMT. I investigated how varying the psychological distance in messages about biodiversity conservation influenced subjects' choice of actually donating to a local, national, or international arm of a biodiversity conservation organization. I also examined how moral intuitions from Moral Foundations Theory and key concepts in the VBN model predicted such donation behavior. The results indicated that temporal distance influences spatial targets of donation, while motivating values and moral intuitions weakly influence subjects' choice to donate, amount donated, and spatial target of donation.

In Chapter Three, I created a new survey instrument to measure self-reported water conservation behaviors and behavioral intentions that accounts for behavioral plasticity, or the extent to which perceived difficulty to act constrains behavioral responses across individuals, behaviors, and contexts. Using this new instrument, I conducted another between-subjects experiment that examined how water conservation behavioral intentions and an observed water conservation behavior (donation to an environmental organization) were influenced by psychological distance (i.e., spatial and temporal distance from a drought) and values. Results

support the validity of a new instrument, confirm the VBN model as relevant to home water conservation behaviors, and document that psychosocial factors such as values and norms subsume the effects of psychological distance on donation to a water conservation program.

In Chapter Four, I reported a review of the PEB literature and an analysis of the resultant meanings for the study of PEBs and environmental decision-making. I examined how we have been measuring pro-environmental behaviors and the implications of those measurement methods. My results suggest improvements in question stem and response option formulations, item choices, and expansion of our theoretical repertoire that could lead to deeper understanding of the motivations behind PEBs.

Through this dissertation, my planned scholarly contributions were five-fold. I hoped to give wider sociology some of the first empirical evidence of how values and morals may operate together, both in the specifics Schwartz values and Moral Foundations, as well as the theoretical relationships between values theory and moral foundations theory. I planned to introduce both Schwartz values and morals into the discussion of donation to environmental causes, providing important, more stable predictors of these behaviors then currently exist in the literature. I aimed to introduce the concept of *behavioral plasticity* to the water conservation literature. I also hoped to provide the first evidence of how psychological distance interacts with Schwartz values and morals, both in the specific contexts I have chosen and more generally; and finally, I wanted to help scholars target identified gaps in PEB research, more clearly specify the contributions of their work, and to clarify some perhaps unseen assumptions about ESBs and potentially open new avenues of theoretical exploration.

My findings suggest that there is overlap in the conceptualizations of Moral Foundations and Schwartz value orientations. For example, Chapter Two reported the similarities between

the *Respect for authority* moral foundation and Schwartz's *Traditional* value orientation. This raises the question of defining motivating values versus moral foundations. If morals are conceptualized as intuitive judgments and values are internalized enough to be both trans-situational and enduring, we need to differentiate these two theories to facilitate greater cross-discipline collaboration with psychologists.

There is also likely significant overlap between moral foundations and *personal norms*. Ajzen's recommended formulation of personal norms items focuses upon respondents' gut feelings and sense of guilt. This is quite similar to Moral Foundations Theory in attempting to access the subjects' intuitive response to a particular behavior or topic. I suggest that moral intuitions fall somewhere between the generality of a value and the specificity of a norm. Further study and theorization is needed to clarify these relationships.

I introduced behavioral plasticity to the water conservation literature in Chapter Three. My reported evidence suggests the instrument is suitable for replication and future research should test this. In addition to more easily sorting and characterizing respondents by past behaviors, behavioral intentions, and eligibility for performing a behavior, including these modified response options would partially address a point from Chapter Four about greater consideration of external constraints in our models of environmental decision-making.

Future research should also consider more exploration of the role of psychological distance in environmental decision-making. In Chapters Two and Three, psychological distance did not appear to exert any significant influence on my studied behaviors. However, my secondary analysis in Chapter Three suggests that it may play a role in certain situations or under certain constraints. Regarding specific interactions with values or moral intuitions, there do not appear to be any of note.

My review of pro-environmental literature yielded a robust characterization of our literature and several avenues for future enhancement of our research. By identifying our theoretical tendencies, under-explored frames, and presenting ideas for measurement item improvement, Chapter Four identifies assumptions to go beyond, gaps that could be filled, and clear ways to contribute to knowledge accumulation. We should commit to theorizing, expand our theoretical repertoire past NAM/VBN and TPB, and consider the implications of researching easy behaviors. We can include more impactful behaviors in our studies, use more causal analysis, longitudinal studies, and panel surveys. We can also expand our sample draws to developing and emerging economies. Any of these will expand our literature in fruitful and important ways.

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