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Choosing Green: Explaining Motivations Across Different Environmental Behaviors

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by

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ABSTRACT

Choosing Green: Explaining Motivations Across Different Environmental Behaviors

by

Alexander Howard DeGolia

In this dissertation, I ask a series of questions regarding why people perform different environmental behaviors and how environmental communication can influence individuals' actions and opinions. The first chapter uses a broader range of basic values to explain why people participate in many types of political action. Using a nationally representative sample of US adults, I identify several patterns connecting political actions to individuals' values. One central value that explains many political actions is concern for others (i.e. self-transcendence); I find that people who prioritize this value are more likely to engage in nearly all types of political behavior evaluated, but are no more likely to vote. People who value traditional social norms (i.e. conservation) are more likely to vote, but are less likely to participate in other ways. This indicates a major distinction between voting and other types of participation like contacting elected officials, attending demonstrations, and others. Two other central values, concern for one's own well-being and pursuit of excitement, do not consistently influence political participation.

In chapter two, I begin by evaluating the structure and psychological drivers of different types of behaviors specifically related to environmental protection. To do so, I collected a large (N=1077) sample of Californians via Qualtrics that was representative of the California population in terms of income, education, and party identification. Whereas existing literature suggests three categories of environmental behavior, my survey analysis shows the presence of as many as six distinct types of common environmental behaviors.

These behavioral types include household environmental conservation, green consumer behaviors, support for environmental policies, communications to promote environmental policies, involvement with environmental advocacy organizations, and attendance at environmental rallies. After establishing statistical and theoretical distinctions between these types of environmental behavior, I show that individual's values influence which behaviors people engage in, and that collectively values exert the largest influence on relatively low-cost, non-activist environmental behaviors.

In the third chapter, I apply lessons from chapters 1 and 2 to study the influence different messages can have on public support for an environmental management project. To do so, I fielded a survey experiment (N=1077) in which messages describing a proposed invasive species management project differed both based on whether their primary impacts would be to provide ecological or economic benefits, and differed based on whether those benefits were framed as providing future gains or preventing future losses. I found that ecological- and loss-framed messages were more effective than either economic- or gain-framed messages when communicating the value of invasive species management. The results suggests that communicating how policies influence people (i.e. via economic co-benefits) may not be the most effective strategy in all cases.

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INTRODUCTION

In this dissertation, I ask a series of questions regarding why people perform different environmental behaviors and how environmental communication can influence individuals' actions and opinions. A central focus of the first two chapters of this dissertation is how individuals' values help explain decisions regarding which types of political behavior people choose to engage in. In the course of doing so, I show that our closely-held values animate decisions to perform behaviors that have both personal and social consequences. It is important to very clearly outline how the vocabulary of values is used throughout this dissertation. In the first chapter, I reference individuals' self-transcendence, self-enhancement, conservation, and openness to change values. These four values are part of the theory of basic values (Schwartz 1977, 1992), which has been used in hundreds of studies around the world, to the extent that many scholars refer to them as "universal." In the second chapter, the language of values changes, in particular from self-transcendence and self-enhancement to altruism, biospherism (i.e. altruism toward non-humans), and egoism. This is an artifact of the literatures that each of these chapters speaks to, but the values are no less universal and are measured in the same ways.

The first chapter uses these four basic values to explain why people participate in many types of political action. Using a nationally representative sample of US adults, I identify several patterns connecting political actions to individuals' values. One central value that explains many political actions is concern for others (i.e. self-transcendence); I find that people who prioritize this value are more likely to engage in nearly all types of political behavior evaluated, but are no more likely to vote. People who value traditional social norms (i.e. conservation) are more likely to vote, but are less likely to participate in other ways. This

indicates a major distinction between voting and other types of participation like contacting elected officials, attending demonstrations, and others. Two other central values, concern for one's own well-being and pursuit of excitement, do not consistently influence political participation.

In chapter two, I begin by evaluating the structure and psychological drivers of different types of behaviors specifically related to environmental protection. To do so, I collected a large (N=1077) sample of Californians via Qualtrics that was representative of the California population in terms of income, education, and party identification. Whereas existing literature suggests three categories of environmental behavior, my survey analysis shows the presence of as many as six distinct types of common environmental behaviors. These behavioral types include household environmental conservation, green consumer behaviors, support for environmental policies, communications to promote environmental policies, involvement with environmental advocacy organizations, and attendance at environmental rallies. After establishing statistical and theoretical distinctions between these types of environmental behavior, I show that individual's values influence which behaviors people engage in, and that collectively values exert the largest influence on relatively low-cost, non-activist environmental behaviors.

In the third chapter, I apply lessons from chapters 1 and 2 to a study of the impact of messages that highlight ecological or economic benefits of a specific environmental management project on public support for the project. To do so, I fielded a survey experiment (N=1077) to test how message frames that highlight the economic and ecological advantages of environmental management influence opinion regarding a proposed invasive species management project. Ecological- and loss-framed messages related to an important

were more effective than either economic- or gain-framed messages when communicating the value of invasive species management. As a result, identifying other reasons for pro-environmental government policies (i.e. co-benefits) like economic growth or national security is neither necessary nor effective. Invasive species management shares characteristics with a broad range of environmental issues, and I expect that these results may be used to help inform future environmental communications research and as a practical resource for environmental managers and to help informing future.

CHAPTER ONE

Beyond the Altruistic Voter:
Effects of Individuals' Values on Diverse Political Action

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Abstract

This study evaluates the psychological drivers of individuals' participatory choices. Most research regarding the role that values play in explaining political behavior examines the comparative impacts of self-interest and altruism on voting behaviors. This paper uses a broader range of values to explain why people participate in many types of political action. I identify several patterns connecting political actions to individuals' deeply held values. I find that people who prioritize this value are more likely to engage in nearly all types of political behavior evaluated, but are no more likely to vote. People who value traditional social norms are more likely to vote, but are less likely to participate in other ways. while voting has no relationship with concern for others. This indicates a major distinction between voting and other types of participation like contacting elected officials, attending demonstrations, and others. Two other central values, concern for one's own well-being and pursuit of excitement, do not consistently influence political participation.

Introduction

Why people participate remains an enduring and essential question in the study of politics. People often feel that political participation provides an opportunity to express who they are and what they care about, and to endeavor to create a society that more closely aligns with their personal and social interests and concerns. The individual considerations that underlie these interests and concerns are values; values define our personal and social goals and motivate behaviors that align with those goals. Existing research connecting political participation with values focuses primarily on how individuals' self-interests or societal interests each influence our calculus regarding whether or not to participate, frequently through evaluation of voter turnout rates (Funk 2000; Chong 1996; Fowler and Kam 2007). Models of participation based on self-interest, most notably rational choice theory, begin from the premise that people act based on what is best for themselves, and that all behaviors – even those that appear to be motivated by social interest – are fundamentally tied to the actor's own well-being (Downs 1957; Riker and Ordeshook 1968; Aldrich 1993; Monroe 1991). Models of participation based on social interest, on the other hand, argue that social values lead people to participate in when doing so provides an opportunity to help others, or to create a society that benefits more people generally (e.g. Fowler and Kam 2007; Edlin, Gelman, and Kaplan 2007).

To understand how values influence political participation in a more comprehensive way, it is important to both look beyond the motivational distinction between selflessness and selfishness. The theory of basic values (Schwartz 1977, 1992, 2012), which has been applied extensively in social psychology research, identifies a set of universal, comprehensive value dimensions, each of which expresses different broad individual goals. Political actions are

constrained and motivated by how people prioritize their values in the context of a given situation that presents an opportunity for participation. In addition, it is important to evaluate the effects of values on many types of political actions, not just voting. This is because political participation is far from monolithic, and how political actions are constrained and motivated not only depends on individuals' values, but also *which* behaviors are being evaluated. While the aggregate of participatory decisions is often interpreted as a single measure of *whether* someone participates politically, when we participate we make a series of distinct decisions. In other words, citizens "must not only choose to act politically, but also choose how to act" (Leighley 1995: 198). In this study, I analyze the effects of individuals' basic values on five common political behaviors including campaign volunteering, contacting elected officials, participation in political protest, donating to political causes, and membership in political organizations.

Using a representative sample of US adults from the Measuring Morality Survey (N=1519; Vaisey 2012), I develop a series of models to evaluate the relationships between values and political participation. In addition to concern for oneself and concern for others, Schwartz (1992, 2010) identified two other broad value orientations: tradition and conformity, and pursuit of excitement and new experiences. Results from this study indicate that people who are primarily concerned with helping others engage in nearly all types of political actions, but are no more likely to vote or to volunteer on political campaigns than people who do not prioritize concern for others. This result suggests that participation, particularly non-electoral participation, is perceived as a means of helping other people, which is consistent with past findings. Mediation analysis also showed that people who valued others' well-being were also more likely to participate because they were more

interested in and attentive to politics. People who prioritize their own self-interest were found to be no more or less likely to participate in politics, which contributes to the ongoing debate regarding whether self-interest tends to drive people away from political participation or instead underlies all such participation. People who value conformity and tradition were found to be more likely to vote, but less likely to engage in nearly all other forms of participation. Finally, People who pursue exciting experiences were no more or less likely to participate than others, indicating that excitement or pleasure gained from the act of participating is not a primary motivating force for political participation.

Results suggest a major distinction between voting and other types of political participation. Voting appears to be motivated by the desire to fulfill one's duty as a citizen, while other behaviors appear motivated by a desire to help other people. The study demonstrates the importance of individuals' values for how and why they participate in politics.

Individual Values, Motivations, and Political Action

How Values Motivate Behavior

Values are "the vocabulary" of individuals' goals and motivations as they relate to both their personal and social lives (Schwartz 2010: 223). Values define what is most important to us, and they are fundamental to who we are and how we think of ourselves (Allport 1961; Rokeach 1973; Bardi and Schwartz 2003). Values are both more abstract and more stable than norms (i.e. what one ought to do) and attitudes (i.e. personal feelings or beliefs), both of which are the subjects of specific objects – behaviors or situations, for example (Schwartz 2010). However, while the abstract nature of values means they transcend behavior and context and remain fairly consistent over the course of one's life (Rokeach

1973; Roccas et al. 2002; Schwartz and Bardi 1997; Feather 1985), values nonetheless guide how we act and what we think regarding policy issues, people, and ourselves (Schwartz 2010: 223). The process by which basic values influence our actions, including political actions, involves four basic steps: awareness of the need to act to resolve some problem or concern; awareness of actions that could relieve that need; belief in one's own ability to address that need; and the sense of a responsibility to act (Schwartz 2010). How people prioritize different values dictates how they confront each of these steps toward action, and "actions become more attractive, and more valued subjectively, to the extent that they promote attainment of valued goals" (Schwartz 2010: 231; Feather 1985).

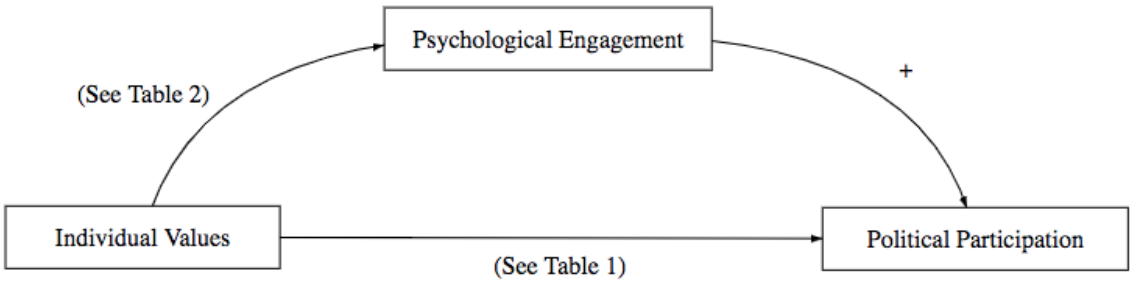
The theory of basic values was developed with the intention of identifying a set of universal values shared across cultures and around the world (Schwartz 1977, 1992, 2012). The result is a system consisting of four motivationally-distinct values dimensions that has been tested in more than 200 samples across 67 countries. These four values are self-transcendence, self-enhancement, openness to change, and conservation. Self-transcendent values lead to beliefs and behaviors that improve others' well-being. Self-enhancement values lead people to choose actions and beliefs that promote personal status and benefits. Openness to change values lead to actions that provide new or exciting opportunities. Conservation values are associated with actions that conform to existing norms and traditions. Self-transcendence and conservation values most commonly influence how individuals care about, interpret, and act on societal issues (i.e. our "macro-worries"; Schwartz 2010). Self-enhancement and openness to change, on the other hand, most commonly influence the way we think about and act on our personal issues (i.e. our "micro-worries"; Schwartz 2010).

Most political participation research argues that people participate in politics based their access to a combination of personal and social resources to explain how engaged people are in politics. The most common representation of this type of participatory model is the Civic Voluntarism Model (CVM; Verba et al. 1995; Brady et al. 1995), which argues that people are more likely to be political active when they have greater access to both personal resources and participatory opportunities – in particular time, money, skills, and networks of recruitment. This model has proved extremely powerful in terms of its ability to explain whether or not someone given a particular profile would be likely to participate in politics. However, because it does not address why individuals make specific behavioral decisions, the CVM and similar participatory models do not effectively explain why people participate in politics, and in particular why the might engage in different types of political behaviors. By incorporating values into a model that relies on many of the same explanatory variables as the CVM, I argue that those models are able to do more than past research to explain why people participate in a variety of political actions. In doing so, an important consideration is that political behaviors differ based on the personal costs required to perform them (Whiteley 1995; Newman and Bartels 2010). It is possible that high-cost participation requires stronger normative motivations than low-cost participation, which would suggest risky or effortful actions like attending demonstrations, volunteering for campaigns, and membership in political organizations would have stronger association with individuals' values. However, the absence of existing work on the topic makes these connections speculative.

There are several mechanisms by which values might influence political participation. The first and most clear is the direct influence that values exert on behaviors: political behaviors offer individuals opportunities to achieve personal or social goals expressed by

those values, and so people engage in those behaviors in pursuit of those goals. Values may also influence political behaviors indirectly, through altering psychological engagement with politics (Augemberg 2008; Verplanken and Holland 2002). Psychological political engagement is the level of interest and knowledge a citizen has about politics, and is typically operationalized through measures of political interest and exposure to political communications. People who are more interested in or knowledgeable about politics tend to be more politically active (Verba, Nie, and Kim 1978; Milbrath and Goel 1977; Verba et al. 1995; Cohen et al. 2001; Krosnick et al. 2009; Augemberg 2008; Burns, Schlozman, and Verba. 2001; Brady, Verba, and Schlozman 1995; Verba et al. 1991; Conway 1991; McCluskey et al. 2004). As a result, to the extent that values influence psychological engagement with politics, they may indirectly influence political actions. The different means by which values influence political participation are shown in Figure 1.

Figure 1: Relationship Between Individual Values, Psychological Engagement, and Political Participation



It is worth keeping in mind several considerations regarding the relationships between values and political participation analyzed in this study. First, there are many ways to measure values and other normative influences on political behavior, and this study only evaluates one such way of measuring values. While the theory of basic values represents a well-established method for measuring values in a way that strives to be both comprehensive and universal, using the theory of basic values represents a choice. Moreover, as compared to

most other research regarding the relationship between values and participation, the values used in this study are less proximate to why people participate in politics than their political beliefs and ideologies. Nonetheless, the advantages of using basic values are significant. Doing so provides opportunities to understand how different people – that is, people who have significantly different personal and social goals, and prioritize different values in accordance with those goals – engage with the political system differently. In addition, the research design used in this study assesses correlations between values and political behavior. It does not attempt to manipulate individuals' values, which might provide more information regarding how values *cause* political behavior. So while individual values are motivational in nature, it is impossible to definitively identify how values motivate political participation given the design of the study.

The next several sections build theoretical arguments about the relationships between each value and different political actions, and suggest how these might motivate these actions differently. An overview of my hypotheses regarding direct relationships between values and participation, which are developed in detail below, is shown in Table 1.

Table 1.1: Hypotheses of Direct Effects of Values on Participation

	Vote	Volunteer	Contact Pol	Demonstrate	Donate	Pol Org
Self-Transcendence	+	+	+	+	+	+
Self-Enhancement	none	none	none	none	none	none
Openness to Change	none	+	+	+	none	+
Conservation	+	-	-	-	-	-

Self-Transcendence and Political Action

People who value self-transcendence are deeply concerned with others' well-being. This concern may be focused toward specific groups like family and close friends, or toward people generally (Schwartz 1977, 1992, 2012). Political actions are often perceived as pro-social – providing a chance to help others – even if doing so comes at personal cost

(Schwartz 2007; Caprara and Steca 2007). As a result, people who prioritize self-transcendence values are more likely to participate in a variety of ways, including voting, signing petitions, and attending protests, among others (Schwartz 2012; Panagopoulos 2010; Fowler and Kam 2007; Edlin, Gelman, and Kaplan 2007; Fowler 2006; Finkel, Muller, and Opp 1989; Finkel and Opp 1991; Knack 1992; Jankowski 2002, 2007; Schwartz 2007; Vyrost, Kentos, and Fedakova 2007; Schwartz, Caprara, and Vecchione 2010; Vecchione et al. 2015; Augemberg 2008). As a result, I anticipate that self-transcendence values will be associated with increased likelihood of engaging in all types of political action evaluated.

However, self-transcendence values should not explain all political behaviors equally. Political actions that involve direct citizen involvement like contacting elected officials, volunteering, signing petitions, attending demonstrations, donating money, and working with political organizations require citizens to play an active role in their political system. This may in turn require additional motivations associated with greater opportunities to help other people. Compared to other political actions evaluated, voting is a "superficial and relatively passive activity," and requires relatively little effort and low psychological engagement (Ehrlich 2000; quoted from Augemberg 2008; Newman and Bartels 2010). Voting is also the most traditional and normative form of political behavior, and many people vote based largely on habit or a feeling that it is their duty (Dalton 2008a, 2008b; Riker and Ordeshook 1968; Blais 2000; Gerber, Green, and Shachar 2003). Most research on the subject indicates that voting is perceived as a means of helping others, and that self-transcendent values increase voter turnout (Fowler and Kam 2007; Edlin, Gelman, and Kaplan 2007; Jankowski 2002, 2007). However, there are both strong theoretical arguments for why voting may be

less reliant on self-transcendent values than other forms of political behavior, and empirical research showing self-transcendence values are associated with increased voting rates.

Evaluating the relationship between self-transcendence values and political behavior also provides an opportunity to understand how different types of concern for others influence political participation. Self-transcendence values consist of both concern for other people generally (i.e. universalism) and concern for specific in-groups (i.e. benevolence).[1] Existing experimental research on the subject shows that universalism is more important to both voting and other political participation than benevolence (Fowler and Kam 2007). Analysis in this study tests those results by applying the most established measures of universalism and benevolence to a large and representative sample of US adults. In line with previous work, I anticipate that people oriented toward universalism will be more likely to participate in all political actions than people oriented toward benevolence.

Self-Enhancement and Political Action

Self-enhancement values lead people to prioritize personal well-being and individual resources. The effects of prioritizing self-enhancement on political participation, however, are complex and existing research provides conflicting accounts. One possibility is that sensitivity to personal well-being leads people to avoid participation when costs are high relative to expected utility. Rational choice theorists have long suggested that people employ a "calculus of voting" in determining whether to participate (Downs 1957; Riker and Ordeshook 1968; Aldrich 1993), in which potential actors evaluate whether the personal cost of participating in terms time or effort will exceed the expected utility of participation.

[1] In other research, universalism and benevolence may be referred to as altruism and social identification. The concepts are identical.

In rare cases, people may legitimately expect that benefits caused by their participation would outweigh the cost of involvement (Citrin and Green 1990; Sears and Funk 1991). For example, seniors are more likely to contact their elected representatives if they are dependent on social security (Campbell 2002), and homeowners are more supportive of restrictions on property taxes (Sears and Citrin 1982). However, these cases typically involve specific policy issues that had the potential to influence their material well-being (Chong, Citrin, and Conley 2001). In most cases, however, the material impact of participation in pursuit of a preferred candidate or policy is likely to be relatively small, and the probability of an individual actually influencing political outcomes approaches zero (Aldrich 1993; Downs [1957] 1985; Fowler and Kam 2007; Chong, Citrin, and Conley 2001). As a result, even when individuals have strong personal preferences for certain political outcomes the cost of engagement usually exceeds expected benefits. In this narrow framework of the calculus of voting, the sensitivity to personal welfare associated with self-enhancement values would make participation less desirable, diminishing macro-level concerns over the well-being of society as a whole and in turn leading people who prioritize self-enhancement to be less likely to participate in politics (Augemberg 2008; Schwartz 2010).

A more expansive definition of self-interest can lead to different conclusions regarding how attentiveness to individual well-being influences participatory decisions. Starting at least with Tocqueville, "self-interest rightly understood" has been noted as a motivation for individual participation in American democracy (Tocqueville 1835). Based on Tocqueville's definition of self-interest, people participate in politics at least in part because they understand that their own stake is connected to that of others. If people understand their

self-interest this way, self-enhancement values may not necessarily make participation less desirable. People may also act in self-interested ways that reflect internalized social values, such as the satisfaction associated with fulfilling one's responsibility to vote (Almond and Verba [1963] 2015; Aldrich 1993). When the expressive utility of fulfilling one's duty as a citizen or otherwise affirming one's political identity are incorporated into self-interest, then rational choice models become much more expansive and powerful for explaining participation. People may also participate in ways that do not offer direct material benefits, but can nonetheless be beneficial to the individual. For example, pro-social behaviors can offer reputational benefits (Ostrom 1998; Benabou and Tirole 2006; Chong 1992). People who engage in political behaviors may be perceived by peers as unselfish and valuable to the community, which offers significant individual benefits (Chong 1992). Internalization of self-interest in this way is exemplified by the influence of visibility on prosocial behavior. People are more likely to engage in prosocial behaviors if those behaviors are more visible, even when the expected material benefits of those behaviors are outweighed by personal costs (Brick, Sherman, and Kim 2017; Nettle et al. 2013). A thorough understanding of the effects of self-interest on political participation is complicated by conflicting definitions of what self-interest means in the context of collective, prosocial behaviors. Most evidence suggests that strictly material self-interest does not explain political participation. However, other potentially self-interested motivations, like conceptions of broad, long-term self-interest or social or reputational benefits, may do more to explain participation.

To understand how self-enhancement may influence different behaviors, I primarily focus on expected costs of engaging in those behaviors as compared to potential benefits – material or otherwise – of those behaviors. For this study, it is important to clearly

distinguish the relationship between self-enhancement values and participation from the relationship between self-interest, either narrowly or broadly defined, and political participation. Self-enhancement values describe not whether a person perceives potential personal benefit from a specific political action, but rather whether that person is generally inclined to pursue behaviors that offer personal benefits like power, authority, or wealth. Voting is the least costly behavior of those analyzed, and therefore is unlikely to have a negative relationship with self-enhancement values. Other behaviors are costlier, but may be perceived as offering greater material, social, or reputational benefits. Volunteering, demonstrating, and membership in political organizations are all costly in terms of time and effort. However, they are also highly visible and offer opportunities for social interaction, and thus may offer personal benefits that are commensurate with these high costs. Donating money to political organizations is clearly personally costly, but may also be used to improve one's reputation, curry favor, or influence at the policy level in pursuit of personal benefits (Becker 1973, Claessens, Jeijen, and Laeven 2006). Contacting elected officials is not visible to peers and so should not offer potential social or reputational benefits. However, people often contact politicians for assistance with government benefits (Verba, Schlozman, and Brady 1995).

There are strong arguments, presented above, for why people inclined to look after their own self-interest might either avoid or seek out different political actions. Given these conflicting motivations, it is difficult to establish clearly defined expectations regarding the relationships between self-enhancement and many different types of participation that involve different costs and potential benefits.

Openness to Change and Political Action

People who value openness to change prioritize their own autonomy and independence, as well as exciting and new experiences. Although openness to change tends to motivate personal rather than social goals, in some cases political participation offers "excitement and chances to meet, work, and socialize with other individuals," though doing so comes with "financial, temporal, and psychological risk" (Kam 2012: 818). People who value openness to change are more likely to accept risk in exchange for opportunities for novel or exciting experiences, and will therefore be more likely to participate in ways that offer those experiences (Vyrost, Kentos, and Fedakova 2007; Vecchione et al. 2015).

However, different types of political participation offer varying opportunities for excitement, and perceptions about how exciting behaviors are should moderate the relationship between openness to change and political participation. Participation in demonstrations, involvement with political groups, and signing petitions are all associated with acceptance of greater risk, and the potential for greater excitement, than other behaviors like voting (Kam 2012). Volunteering on political campaigns likely also offers opportunities for excitement and social interaction. As a result, I expect that people who prioritize openness to change values will be more likely to participate in demonstrations, be involved with political organizations, contact elected officials, and volunteer on political campaigns. However, more banal political actions that do not offer the same kind of excitement, in particular voting and donating money to political causes, may not offer the same opportunities for excitement (Kam 2012), and so I do not expect these behaviors to be associated with openness to change.

Conservation and Political Action

Conservation values lead people to prioritize tradition, maintenance of the status-quo, and personal security. People who value conservation are committed to group customs and are "especially sensitive to social norms and constraints," which means that conservation is highly relevant to macro-level considerations (Schwartz 2010: 232). Voting is the most strongly normative political behavior, because of its historical importance and perception as a bedrock of democratic systems (see e.g. Almond and Verba [1963] 2015; Patemen 1970). One primary reason that citizens vote is because they feel it is their duty to do so (Dalton 2008a, 2008b; Riker and Ordeshook 1968; Blais 2000). A clear example of the relationship between citizen responsibility and voting is the extensive use of social pressure messages to increase voter turnout (Green and 2010; Gerber and Rogers 2009; Gerber, Green, and Larimer 2008). I expect that people who prioritize conservation values will be more sensitive to social norms, which should strengthen the belief in the duty to vote and make them more likely to vote.

Since people oriented toward conservation are deeply concerned with maintaining tradition and the status quo, they may be less willing participate in other political actions that are not as strongly associated with traditional social norms. Some political behaviors, such as political protest or membership in a political group, may be perceived as risky, subversive, or otherwise disruptive to the existing social order. For example, dutiful citizenship norms decrease the likelihood that people engage in these sorts of political actions (Dalton 2008a). As a result, I expect that conservation values will make people less likely to participate in behaviors that may be perceived as disruptive to traditional political norms, including participation in demonstrations and political group membership. It is possible that political actions that are not overtly subversive may be perceived as disruptive to accepted social

norms as well. However, without existing evidence of this, I do not anticipate that conservation will have negative effects on such behaviors, including campaign volunteering, contacting elected officials, or donating to political organizations.

Values and Political Participation Mediated Through Psychological Engagement

One important way that values can influence political participation is by changing people's psychological engagement with politics, which I define as political interest and knowledge. Some previous studies have evaluated psychological engagement as a type of passive political behavior (Augumberg 2008); however, it is more appropriately treated as a contributing factor to political participation, rather than as a type of participation itself. Political interest plays a prominent role in explaining many types of participation (Verba, Schlozman, and Brady 1995; Abrams 1994; Huddy 2001), and inclusion of psychological factors in common socio-economic- and resource-based models has been shown to increases the power of participatory models (Cohen et al. 2001).

Values influence people's psychological engagement with politics through increasing how interested in, attentive to, and knowledgeable they are about politics and policy issues (Augemberg 2008; Verplanken and Holland 2002). People desire to develop the skills that allow them to effectively express their values and are more likely to believe they possess the ability to act in ways that do so (Caprara and Steca 2007). Because people who are more psychologically engaged with politics are more likely to participate (Verba, Schlozman, and Brady 1995; Abrams 1994; Huddy 2001), I expect that individuals' basic values will in part explain political participation mediated through psychological engagement. This is represented in Figure 1 by the path from psychological engagement to political participation.

Different values have potentially different effects on psychological engagement with politics. For example, people who value self-transcendence are not only more likely to participate in politics, but also more likely to believe their participation has the capacity to help people (Caprara and Steca 2007; Schwartz 2010). As a result, people who value self-transcendence are also more likely to seek out information regarding how to be actively engaged in these behaviors (Augemberg 2008; Schwartz et al. 2014; Verplanken and Holland 2002; Funk 2002), because doing so provides them the necessary means to participate effectively. I therefore expect that people who prioritize self-transcendence values will be more psychologically engaged with politics.

Limited existing empirical evidence points to the nature of relationships between self-enhancement, openness to change, and conservation values and psychological engagement, and the evidence that does exist suggests mostly null relationships between these values and psychological engagement (Augemberg 2008). I expect that self-interest will decrease psychological engagement with politics because they are less likely to be concerned with macro-level societal issues. Though openness to change values also primarily regulate personal concerns, if people who value openness to change see certain political actions as opportunities for new and exciting experiences then openness to change is likely to increase psychological engagement. Like self-transcendence, conservation values tend to regulate considerations regarding societal issues (Schwartz 2010). However, if people oriented toward conservation believe that political action involves questioning authority or other subversive behavior, then conservation values may decrease psychological engagement with politics. This is consistent with my expectations regarding how conservation values will decrease most forms of political evaluated. An overview of hypotheses regarding indirect effects of

values on participation mediated through psychological engagement with politics is shown in Table 2.

Table 1.2: Hypotheses of Indirect Effects of Values on Participation

	Political Interest	Political Attention
Self-Transcendence	+	+
Self-Enhancement	-	-
Openness to Change	+	+
Conservation	none	none

Though mediation analysis offers the opportunity to explore the psychological mechanisms by which values influence political participation, doing so presents a number of statistical concerns that should be considered when evaluating mediation effects. First, observational data cannot provide statistical evidence of the direction of causal effects. However, previous studies have concluded that "the causal influence of basic values on political activism is substantially stronger than the reverse effect [because] values are fundamental, abstract, motivational principles whereas political activism refers to specific behaviors that may express these motivations in particular contexts" (Vecchione et al. 2015: 7). Even if basic values are antecedent to both psychological engagement with politics and political behavior, estimation of mediated effects may be subject to omitted variable bias, and thus biased results. If any measure of psychological engagement is correlated not just with values but also with other variables that explain political behavior, then the estimated effects of psychological engagement and values on participation could be biased (Green, Ha, and Bullock 2010; Bullock, Green, and Ha 2010; Mackinnon et al. 2002). However, I believe that inclusion of mediation results provides useful information regarding how values influence political behavior. In addition, I performed post-hoc evaluation of direct and mediated effects by estimating regression models for all political behaviors that exclude any mediator

variables. Results, which can be found in the appendix, are consistent with those found via the mediation models presented below.

Data and Methods

Procedure and Measures

The Measuring Morality Survey (MMS) is a representative sample of the United States adult population aged 18 and over (N=1519). The survey was fielded in March 2012 by Knowledge Networks/GfK. The MMS surveyed Americans from all fifty states, asking a range of questions regarding their moral beliefs and social and political behaviors. The survey took respondents a median time of 42 minutes, and in total 61% of those sampled completed the survey. Observations were excluded from analysis for incomplete cases, leading to models with sample sizes that vary from N=1,271 to N=1,445.

In order to analyze both direct and mediated effects of values on political behavior, I specify a series of mediation models using ordinary least squares (OLS). Although outcome variables are binary, use of OLS allows for simple interpretation of linear probability models. Similarly specified logistic regression models are presented in the appendix, and show results consistent with those presented in Table 5. In an attempt to confront possible bias associated with multicollinearity, I first calculated variance inflation factors (VIFs) for all covariates in each regression model, using the *vif* function from the package "car" in R. In no instance was any VIF above 1.87, which is within acceptable VIFs (O'Brien 2007). This evaluates the correlation between multiple independent variables and determines whether that correlation significantly biases coefficients, with results indicating they did not.[2]

[2] In an effort to be extra-cautious, I also estimated OLS models that excluded all political variables, because my primary concern with multicollinearity between those variables and values. which are shown in the appendix. Estimates from those models, which can be seen in the appendix, very closely align with the mediation models presented below.

Political Participation. Respondents were asked about their political activity, including whether they had voted in the most recent election and whether they had participated in a range of political activities in the previous twelve months. For analysis, I used the following participation measures: participated in a political demonstration, volunteered for a political campaign or candidate, contacted one of their political representatives, donated to a political cause, and been active with a political organization. Self-reported participation rates for these six behaviors are provided in Table 3.

Table 1.3: Descriptive Statistics of Political Behaviors Measured

	Rate of Behavior	Standard Deviation
Vote	84.5%	36.2%
Volunteer	5.0%	21.7%
Contact Politician	17.7%	38.1%
Demonstration	4.1%	19.8%
Donate	12.1%	32.6%
Political Organization	3.8%	19.1%
At Least Two Actions	27.3%	44.5%
All Six Actions	0.6%	7.8%
Average Number of Actions	1.31	1.03

Eighty-four percent of respondents reported voting in the 2008 presidential election, which was by far the most common political action. Although this is significantly higher than the 64% of eligible adults who voted in the election, it is actually lower than voter turnout rates among registered voters in the same election, which was estimated to be 90% (File and Crissey 2010).[3] Oher than voting, people reported most frequently contacting an elected official (18% of respondents) and donating to a political cause (10% of respondents). All other political behaviors were performed by fewer than 10% of respondents. The least common actions were membership in a political organization and attendance at a political

[3] Though the high voter turnout and use of non-validated voter turnout numbers is not preferable, this was the only data available from the Measuring Morality Survey.

demonstration; approximately 4% of respondents indicated they had performed each within the previous year. Approximately 27% of respondents performed at least two different political actions, while only 0.6% of the sample performed all five political behaviors in the previous year. I also combined all political actions, and found that the average number of actions in the sample was 1.31. This summing approach is commonly used to measure the effects of various factors on political participation (Verba, Schlozman, and Brady 1995; Han 2009) and provides a baseline measure of the effects of values on political participation generally.

Individual Values. Individuals' values are measured in the MMS via the Portrait Values Questionnaire (PVQ, Schwartz 2003; Schwartz, Lehman and Roccas 1999), an abbreviated version of the full Schwartz Value Survey. The PVQ is recommended for measuring values on phone and internet surveys because of its clarity and brevity. It consists of a battery of twenty-one portraits of people and asks respondents to mark "how much each person is or is not like you" on a scale from 1 ("Not at all like me") to 5 ("Very much like me").[4] Descriptive statistics for individual value dimensions are shown in Table 3.

Covariates. Many variables other than values explain political behavior. Table 4 presents descriptive statistics for covariates used in analysis. This includes two measures of psychological engagement with politics, political interest and political attention. Political interest was measured using a four-point scale that asked participants, "In general, how interested are you in politics and public affairs?" and scaled to between 0 and 1. Political

[4] The full Schwartz Value Survey measures ten separate values. These values are shown in a Figure 1 of the appendix. In previous studies using the PVQ, the internal reliability of each of the ten lower-order values is fairly low, which has led Schwartz (2012) to recommend combining adjacent values into the four value orientations I have described in detail throughout this paper. Note that while combining lower-order values into the four value dimensions used in analysis is helpful for increasing construct validity, it is also useful because of the clarify of these four constructs. They also represent major distinctions in motivations for participating in politics.

attention was measured by summing frequency of receiving political news via radio, internet, print newspaper, television, magazines, and internet blogs. Responses varied from "every day" (1) to "never" (6), and were combined and rescaled to a measure from 0 to 1. Two other political variables, strength of party identity and strength of political ideology, were also included in analysis as control variables. Both were measured using a folded seven-point Likert scale, and both were subsequently transformed into variables between 0 (weaker political ideology) and 1 (stronger political ideology).

Age, gender, race, education, and income were all included in analysis. Age is continuous and included participants ranging from 18 to 93 years. Gender is binary, either male (1) or female (0). Education was measured on a 4-point scale from "Less than high school" (1) to "Bachelor's degree or higher" (4). Annual household income is measured on an ordinal scale from "Less than $5,000" (1) to "$175,000 or more" (19). Race was transformed into a binary variable for non-white (1) or white (0).

Table 1.4: Descriptive Statistics for Values and Covariates

	Mean	Standard Error	Min-Max	Cronbach's α
Individual Values				
Self-Transcendence	0.78	0.14	0 - 1	.70
Self-Enhancement	0.56	0.18	0 - 1	.78
Openness to Change	0.64	0.15	0 - 1	.74
Conservation	0.70	0.15	0 - 1	.76
Psychological Engagement				
Political Interest	0.67	0.26	0 - 1	-
Political Attention	0.49	0.19	0 - 1	-
Political Controls				
Party Identification Strength	0.67	0.30	0 - 1	-
Political Ideology Strength	0.42	0.26	0 - 1	-
Social and Demographic Controls				
Education	Some College	-	Less than High School - B.A. or Higher	-
Household Income	$50-60k	-	$0 - 175k+	-
Age	50.19	16.72	18 - 93	-
Race, Nonwhite	28%	-	0 - 1	-
Gender: Male	49.5%	-	0 - 1	-

Note: All variables other than age have been scaled to between zero and one.

Results

Analysis begins by ordinary least squares (OLS) mediation models for each of the six political actions being evaluated, which allows estimation of how relationship between value

orientations and participation differs across behaviors, as well as how the effects of values on each behavior is mediated by psychological engagement. Table 5 shows the results of these six models.

TABLE 5 ABOUT HERE

Though effects of resource and socio-economic variables are not shown, the effects of those values are consistent with past models of political participation in terms of how resources and socio-economic status influence participation. More educated people were also more likely to engage in most behaviors, including voter turnout, participation in demonstrations, contacting elected officials, and donating to political organizations, while income and age both increased voter turnout and donations to political organizations (Verba, Schlozman, and Brady 1995; Brady, Schlozman, and Verba 1995; Dalton 2008a, 2008b). Older people were also more likely to vote, volunteer on campaigns, and donate to political organizations (Dalton 2008b). Partisanship also increased voter turnout (e.g. Powell 1986; Verba, Schlozman, and Brady 1995), though partisanship and strength of political ideology had mostly null effects on non-voting participation. Full results of each model, including demographics, can be seen in the appendix.

Direct Effects of Values on Participation

Self-Transcendence. Self-transcendence values have significant direct, positive effects on contacting elected officials, participating in political demonstrations, donating to political causes, and participation with political organizations. These results mostly support expectations that self-transcendence values increase all forms of participation other than voting. The influence of self-transcendence values on participation varies significantly by behavior. Self-transcendence has the largest direct and overall effects on contacting elected

officials and donating to political organizations, and smaller though still positive relationships with attendance at demonstrations and membership in political organizations. The linear probability models (LPMs) reported in Table 5 show, for example, that an increase over the entire length of the self-transcendence value scale is associated with a 33% increase in the likelihood that a person donated to a political organization in the previous year, and a 31% increase in the probability a person contacted an elected official. Self-transcendence did not have a significant effect on voter turnout. One plausible reason is that voting is the least personally costly of the political actions analyzed and therefore requires less external motivation. An alternative explanation is that voting is not be perceived to be as important for helping people as other political actions are. Self-transcendence values also did not have any direct effect on campaign volunteering. The reasons for this null relationship are unclear and should be evaluated further in future research.

Overall, self-transcendence increased the likelihood that respondents engaged in four of the six political behaviors evaluated. Results provide strong support for the argument that a primary motivation of political action is the opportunity to help others. The contrast between electoral political action (both voting and volunteering) and non-electoral action based on pro-social motivations is interesting and important, particularly in light of previous research that shows that concern for others leads to increased voter turnout (e.g. Fowler 2006; Edlin, Gelman, and Kaplan 2007; Finkel, Muller, and Opp 1989).

Self-Enhancement. Conflicting theoretical and empirical arguments for how self-enhancement might influence participation led to establishment of no clearly defined expectations regarding the relationship between self-enhancement and each political action evaluated. Results suggests that focus on personal well-being does not have meaningful

impacts on the likelihood that people engage in most types of political action participating in politics. Self-enhancement values also did not influence psychological engagement with politics.

Self-enhancement did have a *positive* and significant effect on volunteering behavior, which suggests that in certain cases political actions may provide opportunities for self-interested outcomes. Though this single case of self-enhancement increasing participation should be approached with some skepticism, the result suggests that people may participate in specific ways if they believe that doing so is likely to provide them private benefits, whether those are social or material. For example, volunteering can be done with friends and offer reputational benefits; alternatively, it could provide an "in" with a campaign in hopes of future work or other benefits. However, additional analyses are needed to evaluate when people pursue private goods through political action, and whether people who value self-enhancement are more likely to do so than others who do not prioritize self-enhancement.

Openness to Change. Contrary to expectations, openness to change has no significant direct or indirect effects on any political action. I anticipated that people oriented toward openness to change would be more likely to engage in political actions that they perceived to be exciting such as attending demonstrations, volunteering, and being a member of a political organization as exciting; and that people who valued openness to change would be no more or less likely to engage in less exciting political actions. Instead, openness to change has no relationship with political behavior at all. The result could be interpreted as indicating that people do not perceive political actions as exciting, though this contradicts existing research that shows people inclined to pursue new and exciting experiences or who

are willing to accept risk in order to do so are more inclined to engage in political actions because they offer new, exciting opportunities (Kam 2012; Schwartz 2007).

Conservation. People who prioritize conservation were more likely to vote than others, which aligned with expectations based on the argument that conservation values are associated with strong social norms toward dutiful citizenship. I anticipated that conservation would also decrease participation in political demonstrations and membership in political groups, though instead people who value conservation were less likely to engage in every political behavior analyzed other than voting. While I do not have measures of perceived potential social disruption associated with each of these behaviors, the result suggests the range of political behaviors perceived as a threat to the status quo broader than anticipated. These results provide further distinction between voting and other political actions. While concerns over tradition and conformity increased the likelihood of voting in the previous election, the same values decreased all other forms of behavior.

Mediated Effects of Values on Participation

To explore the mediated effects of values on participation further, I specified two additional OLS regressions, which estimate relationships between values and psychological engagement. Results are shown in Table 6.

Table 1.6: Effects of Values on Psychological Engagement Measures

	Political Interest	Political Attention
	(1)	(2)
Self Transcendence	0.23***	0.18***
	(0.07)	(0.05)
Self Enhancement	−0.01	0.01
	(0.05)	(0.04)
Conservation	−0.16**	−0.08
	(0.06)	(0.04)
Openness to Change	0.04	0.03
	(0.06)	(0.05)
Observations	1,348	1,296

Note: Estimates are based on OLS. They do not correspond directly to effects on each specific political behavior.
*p<0.1; **p<0.05; ***p<0.01

Political interest and attention both mediate the relationship between self-transcendence and political participation. Overall, results suggest concern for others plays an important role in explaining political participation, both through direct effects on individuals' motivations for participating and through increasing interest in and attention to politics. Other results regarding relationships between values and psychological engagement, however, are not supported. I anticipated that self-enhancement values would decrease psychological engagement and that openness to change would increase it. Neither is supported in analysis. Regarding openness to change, I anticipated that people would interpret certain political actions as exciting, and would be more interested in politics as a result. However, given the overwhelmingly null direct results of openness to change on participation shown in Table 5, null mediated results are not surprising. The anticipated negative effects of self-enhancement on psychological engagement were grounded in the belief that the micro-level concerns turn people away from politics. However, both self-enhancement and openness to change, which predominantly regulate micro-level (i.e.

personal) concerns, simply have no impact on psychological engagement. Results also show that conservation values decrease political interest, which leads to a significant negative mediated effect of conservation on attendance at demonstrations, contacting elected officials, and membership in political organizations.

Distinguishing Universalism from Benevolence

By evaluating benevolence and universalism separately, I am able to compare how different types of concern for others influence political behaviors. To compare how each of universalism and benevolence influence political participation, I proceed in a similar manner to the analysis presented above. I estimate models for each political behavior identically to those in Table 5, though now I separate self-transcendence into two separate values. Results are shown in Table 7.

TABLE 7 ABOUT HERE

Universalism has no significant direct effects on political participation, while benevolence directly increases the likelihood that people contact elected officials, attend demonstrations, and are involved with political organizations. These results are contrary to expectations that universalism would be the primary driver of the relationship between self-transcendence and political participation. However, universalism influences participation via its relationship to political interest and attention, while benevolence has no impact on behaviors mediated through psychological engagement with politics. When considering both direct and mediated effects on participation, universalism increases the likelihood that people attend demonstrations and donate to political organizations.

General Discussion

The primary purpose of this study was to analyze the influence that values have on different types of political action in order to improve our understanding of the relationships between different political behaviors and the motivations expressed by individual values. Existing work on the subject takes a fairly narrow view of both which values are potentially important predictors of political action, and what constitutes political action. This research broadens analysis of the relationships between values and participation on both fronts. By using a well-established measure of individuals' values to evaluate a broad range of political behaviors, the present research also offers a more robust examination of how concern for others influences political participation than past studies. Results provide strong support for the presence of important relationships between individuals' values and their political behaviors, suggesting that participation in different behaviors reflect opportunities to pursue different personal and social goals.

This study also evaluates the relationship between different types of concern for others and political action in new ways. While the distinction between concern for people generally and concern for members of an in-group has been explored in depth elsewhere (Fowler and Kam 2007), my results provide new information regarding how different self-transcendent values impact a wide range of political behaviors. In contrast to past research, I find that primary concern for members of one's in-group does more to explain contacting elected officials and membership in political organizations. Meanwhile, universalism only influences participation indirectly, through increasing political interest and attention. These differences suggest that benevolence and universalism each help explain different types of political participation. Helping members of one's in-group offers a clear end in itself by offering the chance to help people that one knows or identifies with closely. Universalism is

associated with greater general concern for social issues, which leads those people to be more interested in and attentive to politics.

Results from this research provide new evidence that voting and other political behaviors are motivated by different considerations, and are performed by different people. While people who valued conformity and tradition were significantly more likely to vote, the same people were significantly less likely to engage in all of the five other political behaviors analyzed. And people who are concerned by others' well-being were more likely to perform four of the six behaviors analyzed, but were no more likely to vote. These distinctions mirror those made regarding how different political actions are influenced by different citizenship norms, in particular between engaged citizenship and dutiful citizenship (Dalton 2008a, 2008b). Engaged citizenship norms typically lead to direct political involvement with actions that require high personal costs but which also provide greater instrumental benefits for others in addition to expressive opportunities for political actors themselves (Newman and Bartels 2010; Dalton 2008a, 2008b). Basic values guide formation of political norms (Schwartz 1977, 2010), and results from this study indicate that self-transcendent values may help explain formation of engaged citizenship norms in particular. Dutiful citizenship norms, on the other hand, typically lead to increased political participation through voting, but may actually lead to decreased participation in other, less socially normative ways. Conservation values appear to help explain formation of dutiful citizenship norms.

Though results are consistent with work on different citizenship norms, the sharp distinction between motivations to vote and to engage in other political behaviors goes well beyond previous research that shows primary differences between voting and other participation based on the comparatively low effort, interest, or knowledge required to vote.

My results suggest that why people vote is fundamentally different from why they participate in other ways. The results also suggest several potential interventions to increase political participation. First, campaigns can attempt to highlight how political participation helps people. Since people who value self-transcendence are more likely to engage in political behavior, connecting participation with political actions would seem to further strengthen that relationship. An alternative method is to change which behaviors are perceived to be normative. This study suggests that people vote because they believe doing so is their responsibility as a conforming member of a democratic society, conservation actually decreasing engagement in other ways. On possibility for addressing this is to change which behaviors are perceived as normative: if people determine it is their responsibility as citizens to engage in all types of actions, then they will be more likely to do so.

Future work could deepen our understanding of several aspects of the relationship between values and participation. First, future work should also why they perform specific political behaviors, rather than just evaluating the relationship between individuals' value orientations and their behaviors. Doing so is important for determining whether the relationships identified in this research reflect conscious decisions to participate in ways that align with individuals' values, or whether they reflect subconscious participatory choices. Second, research to evaluate when and why specific values are activated is necessary to better understand the mechanisms by which values influence political decision-making. In addition, future research should also explore whether and how values can be used by campaigns to motivate specific types of behaviors when they are needed. For example, although people who value conservation are more likely to vote, it is unknown whether messages that highlight tradition frames will be most effective for increasing turnout.

Because values are held by everyone, they have the potential to be a broadly used and effective tool if researchers can demonstrate how to use those values to increase participation in specific ways.

TABLES

Table 1.5: Direct and Mediated Effects of Values on Political Participation

	(Direct Effect)	(Indirect Effect)	(Total Effect)
DV: Voter Turnout (N=1,271)			
Self Transcendence	0.04	0.06*	0.09
	(0.09)	(0.02)	(0.09)
Self Enhancement	−0.001	0.01	−0.09
	(0.07)	(0.02)	(0.07)
Conservation	0.20**	−0.04*	0.16*
	(0.08)	(0.02)	(0.08)
Openness to Change	−0.10	0.02	−0.08
	(0.09)	(0.02)	(0.09)
DV: Campaign Volunteering (N=1,271)			
Self Transcendence	0.05	0.04***	0.09
	(0.06)	(0.01)	(0.06)
Self Enhancement	0.13**	0.001	0.13**
	(0.04)	(0.01)	(0.04)
Conservation	−0.15**	−0.03**	−0.17**
	(0.05)	(0.01)	(0.05)
Openness to Change	0.01	0.01	0.02
	(0.09)	(0.01)	(0.05)
DV: Attend Demonstration (N=1,271)			
Self Transcendence	0.14**	0.04***	0.18**
	(0.05)	(0.01)	(0.05)
Self Enhancement	−0.01	0.001	−0.01
	(0.04)	(0.01)	(0.04)
Conservation	−0.11*	−0.02**	−0.13**
	(0.05)	(0.01)	(0.05)
Openness to Change	0.02	0.004	0.02
	(0.05)	(0.01)	(0.05)
DV: Contact Elected Official (N=1,271)			
Self Transcendence	0.20*	0.11***	0.31**
	(0.06)	(0.03)	(0.10)
Self Enhancement	0.001	0.003	0.004
	(0.04)	(0.02)	(0.08)
Conservation	−0.20*	−0.07**	−0.28**
	(0.08)	(0.02)	(0.09)
Openness to Change	0.07	0.02	0.10
	(0.09)	(0.03)	(0.10)
DV: Pol Org Donation (N=1,271)			
Self Transcendence	0.26**	0.08***	0.33***
	(0.08)	(0.02)	(0.08)
Self Enhancement	−0.08	0.002	−0.08
	(0.06)	(0.01)	(0.06)
Conservation	−0.25***	−0.04**	−0.29***
	(0.07)	(0.01)	(0.07)
Openness to Change	0.04	0.01	0.05
	(0.08)	(0.01)	(0.08)
DV: Pol Org Membership (N=1,273)			
Self Transcendence	0.13*	0.04***	0.18**
	(0.05)	(0.01)	(0.05)
Self Enhancement	−0.03	0.001	−0.02
	(0.04)	(0.01)	(0.04)
Conservation	−0.11*	−0.03**	−0.14**
	(0.05)	(0.01)	(0.05)
Openness to Change	−0.02	0.01	−0.02
	(0.05)	(0.01)	(0.05)

Note: Models estimated using the *Lavaan* package in *R*.
Estimated as linear probability models (LPMs). Each model includes political interest and attention as mediators, and partisan strength, ideological strength, education, income, age, gender, and race as control variables. The full model and a separate logistic model are both shown in the appendix.
*p<0.05; **p<0.01; ***p<0.001

Table 1.7: Effects of Universalism and Benevolence on Political Participation

	Vote	Volunteer	Contact Pol	Demonstrate	Donate	Pol Org
	(1)	(2)	(3)	(4)	(5)	(6)
Direct Effects						
Universalism	−0.01	0.02	−0.04	0.04	0.10	0.01
	(0.07)	(0.04)	(0.07)	(0.04)	(0.06)	(0.04)
Benevolence	0.04	0.02	0.20**	0.08*	0.11	0.11**
	(0.07)	(0.04)	(0.07)	(0.04)	(0.06)	(0.04)
Total Effects, Direct and Mediated						
Universalism	0.06	0.06	0.07	0.07*	0.17**	0.05
	(0.07)	(0.04)	(0.07)	(0.04)	(0.06)	(0.04)
Benevolence	0.01	0.02	0.20**	0.07	0.10	0.10*
	(0.07)	(0.04)	(0.08)	(0.04)	(0.06)	(0.04)

Notes: Models estimated using the *Lavaan* package in *R*. Though not presented above, covariates are identical to those presented in Table 5, including other value priorities. *p<0.05; **p<0.01; ***p<0.001

CHAPTER TWO

Rethinking Environmental Behavior: How People Engage and Why

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Abstract

Solving global environmental problems like climate change will require individuals to engage in many types of collective action. Whereas existing literature suggests three categories of environmental behavior – private activism, public activism, and environmental policy support – an analysis of a California statewide survey (*N*=1077) showed the presence of as many as six distinct types of common environmental behaviors. Analysis indicated that environmental political activism was not strongly motivated by values, while self-transcendent values had large impacts on willingness to engage in non-activist environmental behaviors like purchasing environmental products, household conservation behavior, environmental policy support, and communicating policy opinions to peers and policymakers. Environmental consumer behaviors were also higher among people who prioritized self-enhancement values, suggesting that purchasing decisions may be uniquely motivated by perceived individual benefits, unlike other environmental behaviors. However, value-framed messages that focus on these different values do not appear to inspire environmental behaviors in line with these distinctions, as revealed by a survey experiment (*N=456*).

Rethinking Environmental Behavior: How People Engage and Why

1. Introduction

How and why people engage in environmental behaviors is a fundamental question of environmental social science research. However, the character of environmental behaviors, in particular the distinct ways people pursue pro-environmental outcomes and how those choices are impacted by different personal motivations, remains understudied and poorly understood. Major environmental problems like climate change necessitate individual participation in several important ways. As consumers and private actors, individuals must change daily routines to minimize their carbon footprints and otherwise reduce environmental impacts, and as citizens they must push policymakers to produce environmental policies that help solve these major problems (Hale 2008; Thogersen and Crompton 2009; Kashima, Paladino, and Margetts 2014; Tobler et al. 2012; Stern 2000).

Though a theoretically defensible typological of environmental behavior was proposed nearly two decades ago (Stern 2000), nearly all environmental behavior studies either discount or entirely neglect theoretical and statistical distinctions between types of behaviors. As with political participation generally, the nature of how individuals engage on environmental issues has and continues to evolve. While environmental activism of the past may have primarily involved membership in environmental advocacy organizations like the Sierra Club or supporting certain environmental policies through contacting elected officials, the accessibility of other types of environmental activism has increased dramatically through increased awareness of the environmental consequences of consumer and other everyday decisions (Norris 2002; Copeland 2014), among other means. Even so, environmental behavior research has focused efforts on identifying explanations for either specific

environmental behaviors, or environmental behavior generally. These studies do not consider whether different environmental behaviors organize into meaningful types. As a result, although a large literature examines how causal factors like values and attitudes influence individuals' intentions to perform environmental behaviors, results from those studies are unable to predict how these factors influence different types of environmental behaviors.

This study uses a novel observational survey (N=1077) to examine the character of environmental behavior, including how behaviors organize based on latent factors, how individuals' engagement with certain types of environmental behaviors corresponds to engagement with other environmental behaviors, and how motivations – in particular, those expressed by individuals' values – differ across types of environmental behavior. I find that environmental behaviors differentiate into more types of behavior than past research suggests – from fifteen behavior measures, six categories emerge: household behavior, consumer behavior, political communications, engagement with environmental groups, participation in demonstrations, and support for pro-environmental policies. I then evaluate how motivations differ across these behaviors, and show that self-transcendent values have the largest influence on non-activist environmental behaviors like consumption choices, household behaviors, policy support, and expressing policy opinions to peers and policymakers, while environmental political activism was not strongly motivated by self-transcendent values. Environmental consumer behaviors were also higher among egoists – people concerned with their own well-being – suggesting that purchasing decisions may be uniquely motivated by perceived personal benefits, as compared to other environmental behaviors. I apply these findings to a framing experiment (N=*456*) to test whether value-framed messages can be used as an intervention to motivate specific environmental behaviors. Though estimates are

imprecise and do not reach statistical significance, they suggest that altruistic and egoistic messages are more effective than biospheric messages across most types of environmental behavior.

2. Theoretical Background

2.1. A Typology of Environmental Behavior

Though people may feel powerless to address major environmental problems, the opportunities to influence environmental outcomes are extremely diverse. The expansive and imprecise way that most research discusses "environmental behavior" betrays the fact that different types of environmental behavior are both theoretically and statistically distinct. Stern (2000: 410) developed a conceptual framework for understanding environmental behaviors that proposed three distinct types of behavior: environmental activism, including involvement with environmental organizations and participation in demonstrations; non-activist public sphere behaviors, which include tacit support for pro-environmental policies and active (but not *activist*) public environmental behaviors like signing petitions or making financial contributing to environmental organizations; and private-sphere environmental actions, which include activities like purchasing green products, managing energy usage, and recycling.

The defining characteristic of private behaviors as categorized by Stern (2000) is that they allow actors to directly impact environmental outcomes, rather than relying on government regulation. Private environmental behaviors are the most commonly performed type of environmental behavior, and are also often cited as the most effective way for individuals to protect the environment (Farrer, 2016; Gerring and Thacker, 2008). Changing private environmental behaviors is essential to addressing major environmental problems

because individuals' economic activity is a primary driver of environmental degradation (Stern 1999). Like political consumerism generally, private-sphere environmental actions allow citizens to be engaged on issues that otherwise feel distant or complex or for which government is unresponsive to their demands (Newman and Bartels, 2010; Stolle and Hooghe 2004; Bennett 2004). The federal government has done very little to address climate change, for example; concerned citizens can thus turn to their own actions as means of addressing the problem instead. Government intervention can have significant impacts on both attitudes toward and adoption of private environmental behaviors – for example, better recycling infrastructure has been shown to increase the perceived effectiveness and likelihood of engaging in recycling behavior (Wan, Shen, and Yu 2014). However, it seems less likely that this works both ways – an important defining characteristic of private environmental behaviors, as compared to public actions, is that they are performed without the intent of changing public policy.

Though distinguishing between public and private environmental behaviors is both useful for crafting campaigns and public policies and understanding how and why people attempt to protect the environment, it is also important to evaluate whether different types of private behaviors are distinguishable from one another in important ways. Environmental consumer action requires knowledge of the social and political implications of specific products, and consumers typically pay more for environmentally friendly products than they would for equivalent conventional ones (Newman and Bartels 2010). As a result, consumer actions require either high levels of commitment to environmental issues, or access to resources that make purchasing higher-cost products relatively easy (Gardner and Stern 1996; Stern 2000). Other private environmental actions like recycling and home energy

conservation may be more likely motivated by habit, local ordinance, or market signals (e.g. demand response to electricity pricing).

Environmental political activism attempts to force government policy change. The inherent collectivism of environmental political activism (Lee et al. 2014) means it is the most likely type of environmental behavior to suffer from insufficient public engagement as a result of a free-rider problem (Olson, 2009 [1965]). Environmental political activism may also be perceived by potential actors as a "more committed and riskier form of activism" (Stern 2000: 88; Kashima, Paladino, and Margetts 2014; Stern 1999). Most citizens do not regularly attend environmental group meetings, join protests, or engage in other types of environmental political activism, and those who do are likely to feel highly invested in the political process (Verba, Schlozman, and Brady, 1995; Brady, Verba, and Schlozman, 1995). The motivational measures used to explain other environmental behaviors, such as values and attitudes, often only explain small variation in activist behaviors, which is indicative of the greater contextual and effort-based constraints of public activist behaviors. This is a primary reason research on environmental activism focuses on how organizations recruit and develop activists (e.g. Andrews et al. 2010). As with private environmental behavior, however, environmental political activism may be distinguishable in important ways.

Government also responds to the public's environmental priorities as expressed in less forceful ways. Stern (2000) calls these non-activist environmental behaviors. Surveys of citizens' policy positions are widely distributed by the media and used by policymakers to justify action or non-action on environmental policy proposals (Krosnick, Visser, and Harder 2010). The public makes its opinions known through contacting politicians, signing petitions or sharing opinions with other citizens. These non-activist political behaviors offer "one of

the most important resources for the environmental movement," because they provide cover for activists and elected officials looking to change policy (Stern et al. 1999: 81; Dietz and Guagnano 1998; Skocpol 2013). Support for the goals of the environmental movement may also be a first step toward more personally effortful behaviors (Klandermans and Oegema 1987; Hunt et al. 1994; Stern et al. 1999). While the intention of both environmental political activist and non-activist behaviors are often the same, non-activist behaviors typically require significantly less commitment. Though political scientists typically consider policy opinions as more reflective of attitudes than behavioral intentions, they nonetheless represent an important element of attempts to protect the environment. As a result, I choose to test whether policy opinions represent a distinct "behavior" alongside environmental communication behaviors like contacting elected officials or sharing opinions on social media, as well as the public and private activist behaviors described above.

To my knowledge, only four studies evaluate the fidelity of the a three-factor behavioral framework presented by Stern (2000). The most recent study (Lee et al. 2014) finds three behavioral factors among thirteen measures: environmental consumer behavior, environmental activist behavior, and "citizenship" behavior, which involves private actions like recycling, reducing use of aerosol cans, keeping their local environment clean, and voting for environmental candidates. A second study (Whitmarsh and O'Neill 2010) identifies eight factors from twenty-six behavioral questions, including only two questions about environmental political action and twenty-four private-sphere behaviors, which loaded onto seven separate factors such as eco-shopping, waste reduction, domestic energy consumption, and several others. The two other studies identify factors for environmental consumerism, environmental political behaviors, and support for environmental policies or

willingness to sacrifice for environmental quality (Dietz, Stern, and Guagnano 1998; Stern et al. 1999). My study goes further than these by measuring multiple behaviors across all three types of behaviors outlined by Stern (2000). In addition, I evaluate the motivational distinctions across these types of behaviors, as expressed by values and described in detail in the next section.

2.2. Motivational Influences on Environmental Behaviors

Distinguishing types of environmental behaviors in meaningful ways requires not only identifying statistical differences through modeling linear combinations of individual actions to determine whether they are explained by latent variables. Understanding differences across behaviors also requires knowledge of why people perform different types of environmental behavior. A number of individual motivational factors influence environmental behavior generally, and can help guide a systematic evaluation of how those factors differ across types of behavior. For example, there is evidence of environmental behavior "clustering" based on how frequently environmental behaviors are performed, the effort or commitment required, or individuals' lifestyles (Tobler et al. 2012; Whitmarsh and O'Neill 2010; Thogersen and Olander 2006; Balderjahn 1988). In addition, relationships between individuals' values, attitudes and environmental behaviors are well-established in dozens of published works (Heberlein 1972; Stern and Dietz 1994; Schultz and Zelezny 1998; Schultz 2001; Bamberg and Moser, 2007; De Groot and Steg 2008; Steg et al. 2014). The present research evaluates which behaviors are related to different values and draws conclusions based on what is known about how values influence environmental behaviors generally.

2.2.1. Values and Environmental Behavior

Values define what is most important to each of us. They are fundamental to who we are and how we think of ourselves (Rokeach 1973; Bardi and Schwartz 2003). Values are more abstract than concepts like environmental attitudes or the norms that help govern our environmental behaviors (Stern, Dietz, and Kalof 1993). The relationship between individuals' values and environmental behaviors is most clearly presented in the Value-Belief-Norm (VBN) model of environmental behavior (Stern et al. 1999; Stern 2000). The VBN proposes that individuals' values help guide their ecological worldview, which in turn influences the perceived consequences of actions and ability to influence outcomes.

In the previous chapter, I evaluated the effects of four different value orientations – self-transcendence, self-enhancement, openness to change, and conservation – on general political behaviors. Research evaluating the relationships between values and environmental behaviors has focused primarily on how self-transcendence and self-enhancement values explain behaviors, based on the belief that pro-environmental behavior is primarily motivated by either self-interested or pro-social considerations (Stern, Dietz, and Kalof 1993). Previous literature has evaluated the effects of conservation and openness to change values on environmental attitudes and behaviors (Stern et al. 1999), but typically does not find significant relationships between environmental behaviors and those values. Environmental psychology research has compellingly shown that environmental behavior can be explained by two different self-transcendent value types – altruism (i.e. self-transcendence toward other people) and biospherism (i.e. self-transcendence toward non-human others) (Stern, Dietz, and Kalof 1993; De Groot and Steg 2008). As a result, environmental behavior research that evaluates the relationship between values and environmental behavior most frequently

distinguishes three values that are relevant to environmental behaviors: altruism, egoism,[5] and biospherism[6] (Stern, Dietz, and Kalof 1993; Stern et al. 1999; De Groot and Steg 2008).

Use of these three values is based on extensive research and writing, both empirical and philosophical, regarding what types of values influence environmental beliefs and behaviors (e.g. Leopold 1949; Hardin 1968; Olson 1965; Heberlein 1972; Heberlein and Black 1978; Van Liere 1978; Stern, Dietz, and Kalof 1993; Schultz and Zelezny 1998). Environmental psychology research treats environmental behavior as "a special case within a social-psychological theory of altruism" in which not only social-altruism, but also biospheric-altruism (i.e. biospherism) and egoism may influence environmental behaviors (Stern, Dietz, and Kalof 1993: 324). Altruists are motivated to perform environmental behaviors that provide the opportunity to help other people, for example by fighting to reduce air pollution that causes asthma or mitigating climate change that will impact future generations. Egoists are primarily concerned with their own welfare, and will avoid actions

[5] Altruism and egoism are measured using the same survey questions that are used to measure self-transcendence and self-enhancement in chapter 1 – both studies utilize questions as part of the Portrait Values Questionnaire (PVQ, Schwartz 2003; Schwartz, Lehman and Roccas 1999). Environmental psychology research has primarily referred to altruism and egoism, because in some cases other means of measuring those values are utilized. Self-transcendence and self-enhancement come from the vocabulary specifically developed by Schwartz (1992, 1994). Biospherism is a measure of altruism that establishes a distinction between social-altruism, or concern for the well-being of other people, and bio-altruism, or concern for the well-being of other non-human entities like animals, plants, and entire ecosystems. This distinction has a long history in environmental ethics (e.g. Leopold 1949; Heberlein 1972), and has been the subject of extensive empirical analysis.

[6] Although biospherism may be interpreted as a domain-specific value and thus not particularly different from an environmental attitude, extensive psychological research suggests that biospherism most closely approximates fundamental values like self-transcendence and self-enhancement (De Groot and Steg 2008; Stern, Dietz, and Kalof 1993; Stern et al. 1999). Biospherism is more abstract than attitudes, influencing how individuals interpret and react across situations that might impact the environment. However, the distinction between altruism and biospherism has been the subject of extensive analysis and argument, with many existing studies showing no distinction between altruism and biospherism (Bardi and Schwartz 2003; McCarty and Schrum 1994; Stern and Dietz 1994). The recent consensus is that biospherism and altruism represent distinct fundamental values, and as a result I have opted to measure both, perform factor analysis to evaluate whether they are statistically distinguishable, and evaluate the relationship between each and different environmental behaviors.

that present greater personal costs than benefits. Although pro-environmental behaviors often involve personal sacrifice to produce shared public benefits, leading egoists to engage in fewer pro-environmental behaviors, certain environmental behaviors may be perceived as personally beneficial. For example, NIMBY ("not in my back yard!") issues that influence local environmental conditions may be motivated by egoism (Stern, Dietz, and Kalof 1993). The reputational or social benefits described in Chapter 1 of this dissertation may also lead egoism to motivate environmental behaviors, as is the case with more visible forms of behavior that act as signals to others that a person is environmentally conscientious (Brick, Sherman, and Kim 2017; Griskevicius, Tybur, and Van den Bergh 2010). Biospherism has roots in the "land ethic" (Leopold 1949), which advocates for a system of ethics that values nonhuman species and whole ecosystems. Pro-environmental behaviors like protection of invasive species or mitigating climate change to protect the earth's animals and ecosystems are motivated by biospherism.

Though extensive past research connects individuals' values to their environmental behaviors, that work either evaluates the impacts of values on single behaviors or behaviors that are combined in ways that are neither systematic nor statistically validated. For example, people who are motivated by pro-social considerations like altruism and biospherism are more likely to buy green products, sign environmental petitions, attend environmental rallies, donate to environmental organizations, and support numerous pro-environmental policies (e.g. Stern and Dietz 1994; Stern, et al. 1999; Stern 1999; Stern 2000; Dietz, Dan, and Shwom 2007; Steg, Dreijerink, and Abrahamse 2005). However, no research to my knowledge evaluates how each of these values motivate different types of environmental behavior. Doing so can help identify which behaviors are perceived to primarily impact

people, nature, or both. Egoists, on the other hand, are typically less likely to engage in a range of environmental behaviors. However, pro-environmental behaviors are also at times motivated by self-interest (Bamberg and Moser 2007; Steg and Vlek 2008; Brick et al. 2017; Griskivicius et al. 2010), and egoists will likely be inclined toward behaviors that are perceived as offering personal benefits. Evaluating the impacts of egoism on different types of environmental behavior can help determine which behaviors are perceived to provide personal benefits. Together, these unknowns mean that this analysis provides significant opportunities to add to the significant existing research regarding how individuals' values help explain environmental behaviors.

2.2.3. Other Influences on Environmental Behaviors: Attitudes, Interests, and Ideology

Several other individual characteristics may also motivate individuals to engage in different environmental behaviors, or influence the relationship between values and those behaviors. Environmental orientation, most commonly measured by the New Ecological Paradigm (NEP; Dunlap and Van Liere 1978; Dunlap et al. 2000), is consistently associated with increased environmental behavior (Steg and Vlek 2009; Poortinga, Steg, and Vlek 2004; Schultz and Zelezny 1998). Environmental orientation also often mediates the relationship between individuals' values and intentions to engage in pro-environmental behaviors (Poortinga, Steg, and Vlek 2004; Stern, Dietz, and Guagnano 1995). Though environmental orientation explains many environmental behaviors, some studies suggest that it motivates low-cost, non-activist environmental behaviors more than behaviors that require high individual effort or personal sacrifice (Poortinga, Steg, and Vlek 2004). Models commonly evaluate environmental behaviors by including both values and these measures of environmental orientation, along with other covariates (e.g. Bamberg and Moser 2007; Steg

and Vlek 2009; Dietz and Shwom 2009). By first categorizing environmental behaviors based on their underlying factor structure and then evaluating the effects of environmental orientation on those behaviors, this study evaluates how environmental orientation and other commonly used variables influence different types of environmental behaviors in ways that other studies have not.

Individuals' interest in politics may also influence environmental behaviors. Though many environmental behaviors bypass government intervention altogether (e.g. private environmental behaviors), consumer behaviors share many of the same participatory norms and motivations as other forms of political action (Copeland 2014). As compared to more traditional types of political participation, political and environmental consumerism may actually require higher levels of interest in politics and knowledge of policy issues (Newman and Bartels 2010). Consumer behaviors require actors to understand the environmental implications of their economic activity and to pay higher costs in pursuit of specific environmental outcomes. In addition, political activism is often motivated by general interest in politics (Verba, Schlozman, and Brady 1995).

Political ideology and party identity may also influence decisions regarding whether and how to perform environmental behaviors. Environmental protection has become increasingly partisan in recent decades (Guber 2012; Krosnick et al. 2006), making the effect of individuals' political loyalties more important to their environmental beliefs and actions. Liberals and Democrats tend to be more concerned about the environment, and thus more likely to engage in environmental behaviors, while conservatives and Republicans are less concerned (Guber 2012; Carlisle and Smith 2007; Dunlap et al. 2000; Bain et al. 2004).[7] The

[7] However, see the discussion in Carlisle and Smith (2007) regarding cases in which ideology only weakly explains environmental attitudes.

clearest relationship between political ideology and environmental behavior is with non-activist behaviors like policy support, because of the politicization of environmental policy issues (Daniels et al. 2012; Konisky, Milyo, and Richardson 2008; Dietz et al. 2007; Jones and Dunlap 1992). Political ideology and party identification may also influence private action to reduce personal carbon footprints (Gromet, Kunreuther, and Larrick 2013; Leiserowitz 2005), though that relationship is not consistent across most studies.

3. Study One: Empirically Distinguishing Different Environmental Behaviors

3.1. Procedure

To evaluate the underlying structure of environmental behaviors, and whether environmental behavior categories are motivated by different values and other social-psychological characteristics, I fielded a California-wide survey (N=1077) in April 2017 using an online panel maintained by Qualtrics. This was part of a large survey experiment and used online quota sampling to gather a sample of California residents that was balanced by household income and political party affiliation and oversampled rural residents.[8] There was a significant washout period between treatment and measurement of variables used in this analysis; however, to confirm that experimental treatments from the separate study did not significantly influence environmental behavior responses, a series of robustness checks were performed. After testing twenty different possible treatment effects on different environmental behavior measures, a single case of treatment assignment impacting environmental behavior was found. As a result, I am confident that treatments did not have systematic effects on the variables included in this study.

[8] The survey experiment is not part of the present study. Oversampling of rural residents was performed as part of the separate survey experiment, and residency is controlled for in the present analysis.

After the washout, participants were asked to self-report how frequently they engaged in environmental behaviors and how supportive they are of a number of environmental policy proposals. They were then asked about their individual values, environmental orientation, political interest, political ideology and party identification, and were asked a number of demographic questions. Several attention checks were used in the survey. Responses from any participant who spent less than 33% or more than 300% of mean survey response time were excluded from analysis. In addition, participants were asked two separate control questions, each of which required that they click a specific multiple choice option. Participants who failed any of the attention check questions were excluded from analysis.

Analysis began with a confirmatory factor analysis of Stern's (2000) three-factor framework on the fifteen behaviors measured. As is described in detail below, that confirmatory analysis did not yield a good fit, and so exploratory factor analysis was subsequently performed. Environmental behavior measures in both surveys involved binary and ordinal variables, which led to use of mixed polychoric and tetrachoric correlations for factor analysis. I then evaluated the relationship between environmental behavior categories through a series of Pearson's correlations. Finally, separate regression models were specified for each type of environmental behavior. Each model estimated the effects of values, environmental orientation, political interest, ideology, party identification, and demographic characteristics on environmental behaviors.

3.3. Measures

Environmental behaviors. Each respondent answered fifteen environmental behavior questions, including five questions regarding their support for environmental policy issues and ten questions about their environmental actions. These fifteen were selected based

on an evaluation of the most commonly studied and most frequently performed environmental behaviors that are deemed environmentally significant across a diverse range of behavior types. While private environmental behaviors are surely more common in general than public-sphere behaviors, my interest was in evaluating whether different types of environmental behaviors were explained by different latent factors, and whether they were motivated by different individual values and environmental attitudes. My evaluation of these behaviors was also limited by practical considerations, including survey space.

Stern et al. (1999) asked participants four questions related to environmental consumerism including how often participants buy organic produce, how often they buy products made from recycled materials, how often they buy household items that are environmentally friendly, and how often they avoid products from companies they believe to harm the environment. In the present study, the list of private environmental behaviors that measured was condensed to purchase of organic produce, purchase of environmentally friendly home products, conservation of home energy, and home recycling. They were measured by asking respondents to "Please indicate how often you personally do each of the below actions in an effort to protect the environment." Responses were measured on a Likert scale from "Always" (5) to "Never" (1). Though other behaviors like car ownership, air travel, and meat consumption also have significant environmental impacts (Stern 2000), several of them are less common and may also be more likely to be motivated by other considerations (e.g. job requirements, non-environmental food preferences).

Environmental political actions were measured by asking respondents, "Over the past 12 months, have you engaged in any of the following actions to support environmental protection?" Response options included signing petitions, calling or writing letters to elected

officials, participation in environmental demonstrations, volunteering for an environmental group, and donating money to an environmental group. These five measures represent some of the most common and well-studied forms of environmental political engagement. Large environmental advocacy organizations, which collectively have millions of members in the United States, frequently ask members and the general public to engage in all of these ways. Stern et al. (1999) asked respondents very similar questions, including whether they were a member of an environmental group, had given money to an environmental group in the previous year, had signed a petition in support of environmental protection in the previous year, had called or written a letter to an elected official in the previous year, and had attended an environmental demonstration in the previous year. Stern et al. (1999) also asked respondents whether they had read any environmental publications and whether they had voted for a candidate in an election because of their environmental positions in the previous year, though these questions were excluded from my analysis for brevity.

Stern (2000) distinguishes non-activist public environmental behavior into "more active kinds of citizenship" (Stern 2000: 409) and environmental policy support. "More active" non-activist citizenship behaviors like contacting legislators is captured in the measures described in detail above, while policy support is measured by asking respondents about their support for five environmental policy issues, including cap-and-trade to address carbon emissions, subsidies for renewable energy producers, conservation of sensitive land, protections for endangered or threatened species, and regulations to prevent air and water pollution. Responses were measured on a Likert scale from "Strongly Support" (5) to "Strongly Oppose" (1).

Values. Egoism, altruism, and biospherism were measured using the Portrait Values Questionnaire (PVQ; Schwartz, 2003), an abridged version of the Schwartz Value Survey (SVS; Schwartz, 1977, 1992) that is better-suited to online surveys than the SVS. Confirmatory factor analysis was performed for these values measures and results indicate that three distinct factors are present among the nine values questions, with responses organized as anticipated.[9] Responses were combined into single variables for egoism (three items, $\mu = 3.16$, $\alpha = .68$), altruism (three items, $\mu = 4.15$, $\alpha = .77$), and biospherism (three items, $\mu = 3.98$, $\alpha = .80$).

Environmental Concern. Environmental concern was measured using an abridged version of the New Ecological Paradigm (NEP; Dunlap et al. 2000) that includes five measures as used previously by Stern (1999). Principal component analysis using a polychoric correlation matrix because of the ordinal nature of the variables revealed that the five measures were organized into a single component (five items, $\mu = 3.30$, $\alpha=.64$).[10] Descriptive statistics for both values, environmental orientation, and political ideology and interest are all shown in Table 1.

Table 2.1: Summary Statistics for Explanatory Variables

Statistic	N	Mean	St. Dev.	Min	Max	Cronbach's α
Individual Values						
Altruism	1,077	4.15	0.68	1.00	5.00	0.77
Biospherism	1,077	3.98	0.71	1.00	5.00	0.80
Egoism	1,077	3.16	0.88	1.00	5.00	0.68
Attitude Measures						
NEP	1,074	3.30	0.86	1.00	5.00	0.64
Ideology	1,013	3.68	1.71	1.00	7.00	-
Political Interest	1,077	3.70	1.07	1.00	5.00	-

[9] Results from this factor analysis can be seen in the appendix.
[10] Results from this factor analysis are shown in the appendix.

Political Variables. Political ideology was measured on a seven-point Likert scale, from "extremely liberal" (1) to "extremely conservative" (7). Party identification was measured by asking participants whether they identify as a Democrat, Republican, Independent/Unaffiliated, or Other. Political interest is also included in analysis of environmental behavior, which is atypical of most environmental behavior studies, but is commonly included in general models of political participation. I include political interest both as a way of identifying which behaviors require greater individual initiative and to determine whether people who are more interested in politics seek out specific types of environmental engagement. Political interest was measured on a five-point Likert scale from "not at all interested" (1) to "extremely interested" (5).

Control Variables. Race, income, gender, education, age, and rural or urban residence were all included in regression models. Sample statistics can be seen in the appendix. Race was measured as a categorical variable that included options for participants to indicate whether they self-identify racially or ethnically as White, Black, Latino, Asian, or American Indian. Gender is coded as male (1) or female (0). Age is measured as a continuous variable. Income and education both play significant roles in explaining political participation because they provide people with access to resources that can be important or even requisite for participation (Verba, Schlozman, and Brady 1995). Income may be particularly important for environmental behaviors that require financial sacrifices like green consumer behaviors or donating money to environmental advocacy organizations, while education is associated with greater political knowledge and skills, as well as willingness to engage on issue-based activism due to more awareness of specific issues (Delli Carpini and Keeter 1996; Campbell et al. 1960; Carmines and Stimson 1980; all via Newman and Bartels

2010). Household income was measured on an ordered scale ranging from "Less than $20,000" to "Over $150,000." Education was measured on an ordered scale from "Less than high school" to professional and advanced degrees.

3.4. Results

3.4.1. Evaluating Different Environmental Behaviors

I begin with a factor analysis and descriptive statistics of the fifteen behaviors measured. I began by testing whether the three-factor model (Stern et. al 1999; Stern 2000) fit my fifteen measures of environmental behavior via a confirmatory factor analysis (CFA). Because the behavioral measures are all categorical and ordinal and are not all distributed normally, the most appropriate estimate of fit to the three-factor model is Weighted Root Mean Residual with standardized (*WRMR*; Yu 2002; Schreiber et al. 2006). Analysis revealed poor model fit (*WRMR*=1.60; acceptable *WRMR* is <.90). After the poor fit of the confirmatory factor analysis was revealed, I estimated an exploratory factor analysis (EFA) to determine whether a different factor structure fit the data sufficiently. The EFA revealed six distinct latent factors of environmental behavior.

Cumulatively, the six-factor model explained 72% of variance across all six factors, while the three-factor model only explained 52%. All five environmental policy support measures loaded onto a single factor representing pro-environmental policy support (proportion of variance explained = 0.26). The measures of private environmental behavior are organized into two factors, environmental consumer behavior (0.11 of variance explained) and household environmental behavior (0.10 of variance explained). The distinction between consumer and household behaviors is consistent with previous work that

finds different factors for environmental purchasing and other private environmental actions (Lee et al. 2014; Whitmarsh and O'Neill 2010; Markle 2013).

TABLE 2 ABOUT HERE

Measures of environmental political activism loaded onto three additional factors, suggesting the need to distinguish between more than just environmental political activist and non-activist behaviors. One factor represents environmental communications behavior (0.10 of variance explained) – these behaviors attempt to influence policy by publicizing one's policy opinions, either to peers (e.g. sharing opinions on social media) or policymakers (e.g. contacting representatives, signing petitions). A second factor concerning involvement in environmental advocacy organizations was also identified (0.10 of variance explained), including via volunteering and donating money. Finally, participation in environmental demonstrations loaded onto a factor by itself.

Table 3 shows descriptive statistics for the six latent factors representing types of environmental behaviors that were identified via the EFA described above. Though some variables are measured via Likert scales, others combine dichotomous measures, and participation in demonstrations is a single dichotomous measures, some basic inferences can be made. It is clear that people engage in household environmental behaviors more frequently than environmental consumer behaviors, and that participation in environmental political communications and with environmental organizations are both significantly more common than participation in demonstrations.

Table 2.3: Summary Statistics of Environmental Behaviors, Study 1

Statistic	N	Mean	St. Dev.	Min	Max
Env Consumerism	1,073	3.27	0.88	1.00	5.00
Household Env	1,075	4.43	0.63	1.50	5.00
Env Political Comms	1,077	0.55	0.78	0	3
Env Organizations	1,077	0.24	0.48	0	2
Env Demonstrations	1,077	0.03	0.17	0	1
Policy Support	1,077	4.01	0.86	1.00	5.00

In total, 86% of people indicated they perform household environmental behaviors most of the time or all the time, while only 28% of people made green consumer choices most or all of the time. Those compare to 39% of the sample who engaged in one of three communications behaviors in the past year; 22% who were involved with an environmental organization in the past year, either as a donor or a volunteer; and 3% who attended an environmental demonstration in the previous year. People were generally supportive of environmental policies, with 64% of the sample being generally supportive or strongly supportive of pro-environmental policies.

Table 4 presents a correlation matrix between the different types of environmental behavior identified via factor analysis. Nearly all behaviors that were measured are significantly and positively correlated with one another, though some have much stronger relationships than others. The two private-sphere environmental behaviors have the strongest relationship (r=0.28, p<0.05) of all behaviors. Environmental political communication behavior also has a strong positive association with environmental consumerism (r=0.26, p<.05).

TABLE 4 ABOUT HERE

The primary outlier among behaviors measured is participation in demonstrations. It is the only behavior that is not significantly correlated with all other behaviors – participation in demonstrations had no relationship with either household environmental actions or support for environmental policies.[11] This supports the argument that attending demonstrations requires greater effort and risk, which distinguishes it from most other types of environmental behaviors (Stern et al. 1999).

Together, these results suggest that the three-factor model most commonly used to distinguish different types of environmental behavior may be insufficient. Although the six latent environmental behavior factors found in this analysis represents more than have been reported in previous studies intended to distinguish types of environmental behaviors, the factors identified are consistent with those commonly made by researchers in evaluating independent behaviors. Numerous studies have independently evaluated motivations, interventions, and other factors influencing purchase of green and organic products (e.g. Kim and Choi 2005; Kidwell, Farmer, and Hardesty; Hughner et al. 2007), household environmental conservation behavior (e.g. Poortinga, Steg, and Vlek 2004; Abrahamse et al. 2005, 2007; Oskamp et al. 1991; Guagnano, Stern and Dietz 1995; McCarty and Shrum 1994), involvement with environmental advocacy organizations (e.g. Han 2012; Bosso 2003), and environmental public opinion and policy support (e.g. Dietz et al. 2007; Steg, Dreijerink, and Abrahamse 2005; Krosnick et al. 2006; Daniels et al. 2012). Though this study advances an effort to categorize environmental behaviors in ways that are consistent with past research, much additional work is required to establish an accepted, statistically-

[11] While only a small number of participants indicated they had attended a demonstration in the previous year (32 of 1077 total responses), this is not strictly an issue of statistical power. The size of the correlation between demonstrations and these, as well as most other behavioral measures, is comparatively low.

tested typology of environmental behavior. There is no such thing as "environmental behavior" – there are environmental behaviors, and those may organize into different types. Researchers need to consistently evaluate whether environmental behavior constructs meaningfully represent those types as explained by distinct factors, and if not they should make the effort to evaluate them separately, even if this is laborious.

3.4.2 Relationships Between Values and Environmental Behaviors

To evaluate the relationships between individual characteristics and each of the six categories of environmental behavior identified above, I estimate a series of ordinary least squares (OLS) regression models. For each model, I also estimate the amount of variance explained, ΔR^2, by each block of variables. This allows evaluation of the importance of demographic characteristics, values, and attitudes are for explaining each type of environmental behavior.[12] Table 5 shows results from OLS regressions for environmental consumerism and household environmental behavior. Both models include values, attitudes, and control variables.[13] Biospheric values increase the frequency that people engaged in both green consumer behaviors and household environmental behaviors, although the size of the effect of biospherism on environmental consumption is substantially larger than it is on household behaviors. The effects of altruism and egoism were not consistent across the two behaviors. Altruism increased household environmental behaviors, but had no significant

[12] Note, of course, that the ΔR^2 reported is influenced by the order in which each block of predictor variables is added to the model in the case of variables mediating the relationship between other variables and environmental behavior, as is predicted by the VBN. In some cases, adding values measures to the model before attitudes measures inflates the variance explained by values vis-à-vis a model in which attitudes were introduced first. I've chosen to present results as they are, with values antecedent to attitudes, based on existing environmental values literature.

[13] Due to concern over possible multicollinearity between the NEP and values, in particular biospherism and altruism, I tested for possible misspecification. To do so, I calculated variance inflation factors (VIFs) for all covariates in each of the six models estimated, using the *vif* function from the package "car" in R. In no instance was any VIF above 2.0. This is well within the standard rules of thumb for acceptable VIFs (O'Brien 2007). However, separate models for values and attitudes are included in the appendix.

relationship with consumer behavior. The reverse is true for egoism. Egoism had a *positive* relationship with environmental consumer behavior, but no significant relationship with household behavior.

Results suggests differing motivations for each behavior – the fact that egoists were more likely than non-egoists to purchase environmental products suggests that green purchasing behaviors are perceived as offering some opportunity for personal gain. For household behaviors, however, egoism played no significant role. Environmental concern and political interest both increased green purchasing decisions, but had no impact on household behaviors. These results are consistent with expectations that consumer behaviors require a relatively high degree of effort and are therefore more likely to be performed by people who are invested in environmental outcomes and interested in politics. Surprisingly, Democrats were less likely to perform environmental consumer behaviors, while Republicans were less likely to perform household environmental behaviors. Overall, the model explained much more variance in environmental consumer behavior than household behavior. One possible reason is household behaviors may be largely motivated by habit, leading social-psychological motivators like values to be less important for explaining such behaviors.

TABLE 5 ABOUT HERE

Table 6 shows results of OLS models to estimate effects of the same variables on environmental policy support and environmental communications behaviors.[14] Biospherism significantly increases both behaviors, while altruism only increases environmental communications behaviors. However, analysis of the difference in effects of altruism across

[14] A negative binomial model to estimate engagement in environmental political communication behaviors showed very similar results. The results of that model can be found in the appendix.

the two behaviors using Seemingly Unrelated Regression (SUR) suggest that this difference is not statistically significant at $p<0.05$ ($\chi^2(1) = 2.89$, $p=.09$), suggesting that it would be inappropriate to draw conclusions about motivations based on this distinction. Egoism significantly decreases environmental policy support, though it has no effect on political communications. This suggests people who are primarily concerned with their own well-being may be just as willing as non-egoists to actively speak out in favor of their preferred environmental policies, but are less willing to provide tacit support for government policies to address environmental problems. Though far from conclusive, one potential reason is that policy opinions offer no opportunity for personal benefit, while actions like sharing opinions with friends or signing petitions, particularly if such actions are visible, could plausibly offer relational or reputational advantages (Brick, Sherman, and Kim 2017).

TABLE 6 ABOUT HERE

Attitudes are also important predictors of both policy support and communications actions. Ideology and environmental orientation each significantly increase policy support and environmental communications. This is because people largely rely on their ideological beliefs to inform policy opinions. Political interest increased respondents' communications activities, though it had no impact policy support. As with the comparison between consumer and household behaviors, political interest appears to be an important motivator of high-effort actions, but does not significantly influence behaviors that are less personally costly.

Values play a much smaller role in explaining more activist environmental political behaviors like involvement with environmental advocacy organizations or attendance at environmental demonstrations. Table 7 shows models estimating variation in these two types

of environmental political activism.[15] Biospherism increases engagement with environmental organizations, but plays no role in explaining attendance at demonstrations. Neither altruism nor egoism explain significant variance in either form of activist behavior. Moreover, the total variance explained by values is extremely small in both models, as compared to the other four models evaluated thus far.

Similar to values, attitudes have only a small effect on environmental activism. Political interest increases the likelihood that people participate in demonstrations, but no other attitude or political measure had any impact on activism. Though both models contribute to explaining environmental political activism ($F(17)=4.58, p<.001$ for organization participation, $F(17)=3.05, p<.001$ for the environmental demonstrations model), the total amount of variance explained is small. This is consistent with past research showing activist behaviors are more difficult to model with survey data and participation in such actions may rely more heavily on contextual factors (Stern et al. 1999; Stern 2000).

TABLE 7 ABOUT HERE

Taken together, these results show that values play distinct roles in explaining different types of environmental behaviors. Table 8 summarizes the effects of each value on all six different environmental behaviors evaluated. These results are presented in Tables 5-7, but these figures place the effects of each value in one place.

[15] Linear models were specified using the same predictors as in Table 5. Analysis using a negative binomial model to estimate environmental organization involvement and logistic model for demonstrations found very similar results to those presented below. Results of both models can be found in the appendix.

Table 2.8: Summarizing Effects of Values on Each Environmental Behavior

	Green Consumerism	Household Env	Env Political Comms	Policy Support	Env Organizations	Env Demonstrations
Altruism	0.003	0.11^{**}	0.13^{***}	0.09	0.03	−0.01
Biospherism	0.44^{***}	0.19^{***}	0.10^{*}	0.20^{***}	0.07^{*}	0.02
Egoism	0.14^{***}	−0.04	0.02	-0.14^{***}	0.02	0.01
ΔR^2	0.19^{***}	0.09^{***}	0.09^{***}	0.13^{***}	0.04^{***}	0.02^{***}

$^{*}p<0.05$; $^{**}p<0.01$; $^{***}p<0.001$

Altruism has a positive and significant effect on household environmental behaviors and environmental communications, but does not influence the other four categories of environmental behaviors. Egoists are more likely to engage in green consumer behavior, less likely to support environmental policies. Egoism has no significant effect on the other four types of behavior. Finally, biospherism has the most consistent effects on different environmental behaviors. Biospherists were more likely to engage in all types of environmental behavior other than attending demonstrations.

3.5. Discussion

Results show that existing frameworks for understanding environmental behaviors may underestimate the number of latent environmental behavior categories present among those actions that people regularly engage in. Regression results suggest the six distinct types of environmental behavior identified in exploratory factor analysis (EFA) are not uniformly motivated by the same social-psychological factors. Biospherism has the most consistent, positive effects on environmental behaviors; only participation in demonstrations was unaffected by individuals' biospheric value orientations. This indicates, unsurprisingly, that people who are concerned about the well-being of nature are nearly all types of environmental behavior. Altruism, however, only increased participation in environmental communication behaviors and household environmental behaviors. As compared to public

activist behaviors and environmental consumerism, household behaviors and communications are generally considered to require relatively low effort. Low-cost behaviors are often found to be motivated by normative concerns like altruism and biospherism a greater extent than high-cost environmental behaviors (Tobler et al. 2012; Stern 2000).

Results in the present study provide mixed support for that assertion. The highest-effort behaviors, in particular attending demonstrations and affiliation with environmental advocacy organizations, were least influenced by individuals' values. However, environmental consumer behaviors were more impacted than other behaviors, though they require more effort or other personal cost than behaviors like policy support. Additional research regarding the mediating effect of effort on the relationship between values and different environmental behaviors is necessary.

Egoism had mostly null effects on environmental behavior, which is consistent with findings regarding the relationship between egoism and general political participation explained in the previous chapter of this dissertation. However, egoism had a surprisingly positive effect on environmental consumer behavior. This indicates people may actually perceive environmental consumption as personally beneficial, in spite of that fact that it generally involves paying higher costs to protect the environment, a public good. The number of analyses performed and lack of consistency in effects of egoism make this finding only preliminary, but it demands additional inquiry.

The effects of political attitudes and interest on different behaviors are also noteworthy. In particular, political interest predicted environmental consumerism, both forms of environmental political activism, and environmental communications behavior; however,

it had no effect on household behaviors or support for environmental policies. This suggests that interest in politics is most important for motivating high-cost environmental behaviors.

4. Study Two: Changing Environmental Behaviors Through Targeted Values Messages

Because values help define relationships between what people care about and the specific pro-environmental behaviors they engage in, they may also help policymakers and environmental advocates target specific behavior changes. Relevant message frames change policy opinions and behavior by shifting the focus of a decision to a specific consideration highlighted in the frame (for a review, see Chong and Druckman 2007; see also Slothuus and De Vreese 2010; Verplanken & Holland 2002). Frames can function as heuristics, which are mental shortcuts that enable individuals to make decisions without requiring a more cognitively demanding process of weighing the broad implications of an action (see Brewer and Gross 2005; Feldman and Zaller 1992). Values-focused messages may be uniquely effective for changing opinion and behavior because they allow messages to tap "morally relevant intuitions" (Nisbet, Markowitz, and Kotcher 2012: 17; Brewer and Gross 2005).

To test whether messages that highlight outcomes in line with altruistic, biospheric, and egoistic values motivate behaviors related to those values, I use a message framing experiment that presents value-framed messages regarding the threat of climate change, as well as a control message that provides the same information without referencing value-framed outcomes. The egoism-framed message highlights the potential harm to the participant personally if nothing is done, with the intention of making the reader consider potential personal harm when deciding whether to perform environmental behaviors aimed at addressing climate change. The altruism-framed message highlights potential harm to other

people caused by climate change, while the biospherism-framed message highlights potential harm to animals and ecosystems.

Based on the relationships between value orientations and categories of pro-environmental behavior identified in Study 1, I expect messages highlighting biospheric reasons for engaging in pro-environmental behavior would increase willingness to perform all types of environmental behavior; altruistic frames would increase environmental policy support and willingness to perform low-cost behaviors like household environmental actions and political communications; and egoistic messages would increase willingness to perform environmental consumer behaviors, but decrease support for pro-environmental policies.

4.1. Pre-Testing the Framing Experiment

Prior to fielding the full survey experiment, I performed two pre-tests to evaluate whether people were able to successfully differentiate messages that framed climate change in altruistic, egoistic, and biospheric terms. In pre-tests on Amazon's Mechanical Turk (MTurk) in June 2015 (N=291) and September 2015 (N=217), I provided participants with a mock news article to read and asked them to identify whether the argument being made related primarily to how climate change would impact them, other people, or nature. To evaluate whether people could successfully identify the type of argument presented, participants were asked to select one of three summaries of the argument they had just read. Response options included, a) "Climate change needs to be addressed to avoid negative consequences for people around the world" (altruistic treatment); b) "Climate change needs to be addressed to avoid negative consequences to the planet and its ecosystems" (biospheric treatment); and c) "Climate change needs to be addressed to avoid negative consequences to myself and others like me" (egoistic treatment). Treatment assignment significantly predicted

which category of argument participants identified ($\chi^2(4) = 149.87$, $p<.001$). In all, 80% of people who read the altruistic argument correctly identified it, while 14% thought it was a biospheric message and 6% thought it was an egoistic message; 69% of people who read a biospheric argument correctly identified it, while 27% incorrectly categorized it as altruistic and 5% identified it as egoistic. People were more confused by the egoistic argument, probably because it is hardest to make an egoistic argument regarding something that many people think of as impacting everyone and everything, like climate change. Only 40% of people who received the egoistic argument correctly categorized it, while 50% categorized it as altruistic and 10% categorized it at biospheric. These results make clear that people can distinguish between social-altruistic and biospheric arguments rather easily, but that distinguishing egoistic arguments from altruistic ones is more difficult. The results also suggested that arguments in the egoistic message included some altruistic language, which was addressed prior to fielding the full survey experiment.

I was also interested in evaluating whether certain frames were interpreted as more effective than others. Participants were asked, "Independent of your personal opinion on the threat of climate change, how forceful of an argument did the article make regarding the need to address climate change?" Responses were measured on a Likert-type scale from "Forceful" (5) to "Not at all forceful" (1). Though asking about "forcefulness" may not be a perfect measure of message effectiveness, it was used to avoid use of language that implied agreement with the message. There were significant differences in reported forcefulness of the arguments made in the three messages ($\chi^2(12) = 67.90$, $p<.001$). Biospheric messages were most forceful, with 63% saying of people receiving that message indicating it was "forceful" or "very forceful." In spite of confusion over identifying the type of message, 59%

of people who received the egoistic message said it was “forceful” or “very forceful.” The altruistic language, which was most easily recognized, was also weakest of value frame in the pre-test. Only 49% of people receiving the altruistic frame found it “forceful” or “very forceful.” In response, I edited the message in an attempt to increase the perceived urgency of addressing climate change to prevent harm to people around the world. All of these were perceived to be more forceful than the control. Only 30% of respondents in the control condition indicated it was either “forceful” or “very forceful.”

Pre-tests confirmed that people were able to distinguish different treatments as anticipated and that the messages were generally considered to be effective means of relaying the threat of climate change. Language in the final framing experiment attempted to address both concerns over respondents’ abilities to distinguish value-framed messages from one another, and attempted to strengthen frames that people found less forceful. Together, pre-test results supported moving forward with the message framing experiment.

4.2. Procedure

Participants were recruited to participate in the field experiment from Amazon’s Mechanical Turk (MTurk) in April 2016 (N=452). Participants began by answering the same values questions that they were asked in Study 1, via the Portrait Values Questionnaire (PVQ; Schwartz 2003). Although asking values questions first meant participants could have been primed prior to treatment, this was the only way to reliably measure values. Also, if participants were primed by values questions, it would be evenly distributed across the sample and would be likely to increase the potential effect of messages that match individuals’ value priorities. After answering the PVQ, participants were assigned to one of four experimental conditions in which they read a mock newspaper article that outlined

potential threats posed by climate change if the government fails to change policy and highlighted impacts of climate change on other people, on the individual, or on the earth and its ecosystems. The control condition presented the same information without value-framed impacts. After reading the newspaper article, participants were asked to commit to performing a number of environmental behaviors. These included everyday actions that could reduce their carbon footprint, which measured different types of private environmental behavior; a request to pause during the survey and write a letter to their Member of Congress, which measured public environmental activism; and they were asked to indicate support for a climate change-related policy proposals.

The sample was well-balanced along of a number of demographic measures. Forty-eight percent of respondents self-identified as female and 52% self-identified male. Median household income was between $40,000-$65,000, which is consistent with the U.S. median household income of about $52,000. Eighty-six percent of respondents had at least a high school diploma or GED, as compared to 88% of U.S. residents (U.S. Census Bureau, 2015). Where the sample differs significantly from U.S. population averages is regarding ideology and party identification. Fifty-two percent of respondents self-identified as "very liberal," "liberal," or "somewhat liberal," while only 27% self-identified as "very conservative," "conservative," or "somewhat conservative." Similarly, 47% identify as Democrats while only 18% identify as Republicans.

4.3. Measures

Environmental behavior. Questions were developed to evaluate participants' willingness to engage in a range of environmental behaviors related to the issue of climate change, which was the focus of the newspaper articles they read in treatment. In most cases,

behavioral measures mirrored questions from Study 1, although in some cases asking identical questions was impossible.[16] To measure environmental political behavior, participants were asked, "Some people make their voice heard on climate change by contacting their elected representatives directly. Would you be willing to take one minute right now to write a letter to your Congressional representative to let them know how you feel about this issue?" This provided participants an opportunity to engage in environmental political communications. Responses were coded as binary. Participants were also asked about their support for three climate change policies, including their support for government intervention via cap-and-trade, providing subsidies for renewable energy, and regulation of pollution. Responses were recorded on a Likert scale from "Strongly Oppose" (1) "Strongly Support" (5). Private environmental behavior questions were nearly identical to those used in Study 1. Participants were told, "We are collaborating on the Earth Month Project, in which we ask people to reduce their personal impact on climate change over the next month. The program is aimed at making a real difference by asking people to commit to reducing their individual carbon footprint during the course of the challenge." They were then asked to commit to reducing their personal carbon footprint by buying more organic product, buying more green consumer products, conserving home energy, and recycling. Responses were recorded on a Likert-style scale from "Definitely able to do this" (5) to "Definitely not able to do this" (5). Table 9 shows an exploratory factor analysis of the behavioral measures included in Study 2.

TABLE 9 ABOUT HERE

[16] For example, to measure public activist behaviors in Study 1, I asked respondents whether they had engaged in those behaviors in the previous 12 months. This would not have been a plausible way to evaluate the effects of a message framing experiment on political activism.

Environmental political activism, which was measured via a request for participants to write to politicians, did not load onto sufficiently onto any of the three factors, and is analyzed independently ($\mu = 0.21$). Private behavior questions loaded slightly differently than in study 1, with organic purchasing representing its own factor and purchase of green products loading with household behaviors.[17] However, to maintain continuity with Study 1, environmental consumerism ($\mu = 3.55$, Cronbach's $\alpha = .75$) and household behaviors ($\mu = 4.23$, Cronbach's $\alpha = .64$) will be evaluated separately. Climate change policy support loaded onto a single factor and thus a single measure of policy support was constructed ($\mu = 4.00$, Cronbach's $\alpha = .84$). Table 10 shows summary statistics for the environmental behavior measures. As with study 1, household behaviors were more common than environmental consumer behaviors. People were generally supportive of pro-environmental climate policies, which is also consistent with findings from study 1.

Table 2.10: Summary Statistics of Environmental Behaviors, Study 2

Statistic	N	Mean	St. Dev.	Min	Max
Env Consumerism	455	3.55	0.97	1.00	5.00
Household Env	455	4.23	0.84	1.00	5.00
Policy Support	452	4.00	0.90	1.00	5.00
Env Political Comms	459	0.21	0.41	0	1

Treatment Messages. The newspaper articles presented to participants were meant to elicit concerns related to altruism, egoism, and biospherism, respectively. The control condition presented the same information about climate threats but did not reference to its

[17] When performing factor analysis on the four private behavior independent of other behavioral measures, results suggest separating them into two latent factors organized as household and consumer behaviors.

effects on any target group or individual. Language used for each message can be found in the appendix.

Individual Values. Individual values were measured via the PVQ,[18] and measures of altruism ($\mu = 3.97$, Cronbach's $\alpha = .86$), egoism ($\mu = 2.88$, Cronbach's $\alpha = .64$), and biospherism ($\mu = 3.74$, Cronbach's $\alpha = .88$) were all constructed. A factor analysis of PVQ responses indicated three separate factor loadings, one for each value. Results of that factor analysis can be found in the appendix.

Additional Covariates. Environmental orientation was measured via the eleven-question New Ecological Paradigm (NEP; Dunlap et al. 2000). Previous research has questioned the validity of the NEP as a unidimensional measure of environmental attitudes (Amburgey and Thoman, 2012), and in this case factor analysis revealed that the eleven items did not all load onto a single factor. Moreover, the NEP provides a well-understood means of incorporating environmental orientation in analysis of survey data, and given the importance of being able to use surveys to measure environmental orientation in some way I have chosen to combine the five measures into a single measure of environmental concern ($\mu = 3.32$, Cronbach's $\alpha = .74$). Additional covariates of interest were measured the same as in study 1 and include political interest, ideology, and party affiliation.

Control Measures. Nearly all the same demographic controls were included in Study 2 as in Study 1. Education, income, gender, age, and race are all measured as in Study 1. Rural or urban residency was not measured, and thus is not included in analysis.

4.3. Results

[18] Factor analysis of values measures can be seen in the appendix.

Table 11 shows mean effects of treatment assignment on the four environmental behavior measures. Altruistic and egoistic frames consistently outperform both the biospheric frame and the control frame. However, ANOVA revealed that none of the treatments had statistically significant effects on environmental behaviors.[19]

Table 2.11: Willingness to Engage in Environmental Behaviors, By Message Frame

	Mean Stated Willingness to Engage in Behavior			
	(Env Consumerism)	(Env Household Behavior)	(Public Activism)	(Policy Support)
Altruistic Frame	3.62	4.26	0.23	4.14
	(0.94)	(0.83)	(0.42)	(0.83)
Egoistic Frame	3.60	4.40	0.22	4.00
	(1.01)	(0.75)	(0.42)	(0.82)
Biospheric Frame	3.45	4.10	0.20	3.91
	(1.06)	(0.94)	(0.40)	(0.99)
Control Frame	3.54	4.14	0.18	3.95
	(0.89)	(0.80)	(0.38)	(0.88)

In spite of non-significant results, it is compelling that willingness to engage in all environmental actions was higher among participants who read altruistic or egoistic messages, as compared to people who read biospheric messages. This presents the possibility that while people who value biospherism may be most likely to be motivated to engage in environmental behaviors, messages focused on how environmental protection benefits them or benefits others may be more effective than those focused on benefits to nature.

4.4. Discussion

In this study, message frames that focused on how climate change might affect people broadly (i.e. altruistic goals), the individual reading the message (i.e. egoistic goals), and the

[19] In addition, I evaluated whether treatment assignment influenced environmental behavior broadly via MANOVA, which revealed no statistical relationship between treatment assignment and environmental behavior (Pillai's Trace = 0.005, $F = 0.595$, $df = (447)$, $p = .67$). Post-hoc power analysis reveals that, for linear models estimating each type of behavior, a sample of approximately $N=992$ would be required to identify at least one significant treatment effect for each model.

natural world (i.e. biospheric goals) did not differ significantly from a control frame in terms of their influence on people's willingness to engage in environmental behaviors to address climate change. Messages highlighting egoistic and altruistic goals appeared to be more effective than either biospheric or control messages, but those results were imprecise. If future research can convincingly show that egoistic and altruistic messages have larger overall effects, this would suggest that while people who value the well-being of nature are most likely to engage in environmental behaviors, messages that are consistent with those values are not necessarily the most effective means of mobilizing people.

5. General Discussion

In this paper, I began by evaluating the empirical structure of environmental behavior through an exploratory factor analysis of ten self-reported environmental behaviors and five policy support measures. I found more categories of environmental behavior than are typically used in evaluating environmental behavior. I found latent factors for environmental consumerism, household environmental behavior, participation in environmental demonstrations, participation with environmental advocacy organizations, environmental communications behavior, and support for environmental policies. The presence of diverse opportunities for environmental action has implications for environmental protection broadly, as well as whose environmental interests and concerns are represented by government and industry. Diverse participatory opportunities offer citizens the chance to influence outcomes and express beliefs with respect to how society should prioritize environmental protection, and can improve representational disparities if citizens feel they cannot adequately articulate through traditional political channels (Togeby 1993).

After establishing six dimensions of environmental behavior, I evaluated how individuals' values and other social-psychological covariates explain and motivate each of these dimensions. I found that biospheric values and environmental orientation increase nearly all dimensions of environmental behavior, while altruism only increased fairly low-effort behaviors including household action and environmental communications behavior. Egoism had a surprisingly positive effect on environmental consumerism and a decreased support for pro-environmental behaviors, but otherwise did not influence environmental behavior. One opportunity for future work lies in evaluating how altruism and egoism each influence environmental consumer behavior and household environmental behavior differently. The different relationships each of these behaviors were found to have with altruism and egoism in this study suggest a potentially major rift in what motivates different types of private environmental behaviors. A better understanding of this distinction could provide important information to policymakers, environmental advocates, and marketers attempting to promote more environmentally responsible everyday behaviors.

The survey experiment in study 2 tested whether highlighting values could effectively mobilize behavior. Egoistic and altruistic messages appeared to be broadly more effective at encouraging pro-environmental behavior than the biospheric message, but these results were not significant and demand additional study. Understanding the effects of value-framed messages on environmental behavior is important because it provides opportunities to target individuals' values and specific behaviors that may be motivated by those values, but also because people's reasons for being engaged on environmental issues have implications for intentions to engage in other or future actions (i.e. spillover). Altruistic and biospheric motivations tend to contribute to positive spillover from one environmental behavior to

another, while self-interested motivations are unlikely to do so (Evans et al. 2012; Thogersen and Crompton 2009). When people are encouraged to perform environmental actions for their own self-interest (i.e. conserve home electricity to save money), there is less opportunity to affirm one's identity in a way that might encourage future actions absent continued personal benefits. The fact that consumer environmental actions may be motivated by egoistic values, as shown in study 1, suggests that such behaviors may not always be an effective way of moving people toward other forms of environmental activism.

This paper challenges a number of assumptions regarding how researchers think about environmental behavior. While the relationship between individual characteristics and environmental behavior has been explored extensively, the nature of what we call "environmental behavior" requires additional research in order to better understand the nature of such behaviors and how to influence them. There is no accepted understanding of how environmental behaviors are organized, and I have only presented a few possible options for such organization, and significantly more research is required to establish how behaviors should be distinguished from one another.

Table 2.2: Exploratory Factor Analysis of Environmental Behaviors, Study 1

	Env Consumerism	Household Env	Env Political Comms	Env Organizations	Env Demonstrations	Policy Support
Buy Green Consumer Goods	**0.83**	0.18	-0.01	-0.08	0.06	0.02
Buy Organic Produce	**0.96**	-0.10	-0.06	-0.01	0.10	-0.04
Sort Recycling at Home	-0.10	**0.86**	0.04	0.12	-0.07	0.06
Home Energy Conservation	0.19	**0.80**	-0.01	-0.04	-0.01	-0.04
Contact Politician	-0.12	0.09	**0.71**	0.03	0.24	-0.09
Sign Petition	-.07	-0.11	**0.75**	-0.11	-0.04	0.10
Social Media	0.12	-.0.08	**0.64**	-0.08	0.01	0.01
Volunteer	-0.12	0.09	-0.13	**0.96**	0.23	0.01
Donate	0.19	-0.07	0.19	**0.45**	-0.39	-0.03
Participate in Demonstration	0.15	-0.09	0.11	0.20	**0.87**	0.01
Support Pollution Regulation	-0.04	0.05	0.00	0.01	-0.06	**0.91**
Support Renewables Subsidies	-0.01	-0.02	0.00	0.02	-0.02	**0.87**
Support Land Conservation	0.00	0.03	0.04	-0.02	0.04	**0.90**
Support Threatened Species	-0.10	0.06	0.04	-0.03	-0.01	**0.88**
Support Cap and Trade	0.17	-0.12	-0.06	0.03	0.08	**0.83**
SS Loadings	1.76	1.51	1.51	1.10	1.00	3.89
Prop Variance	0.12	0.10	0.10	0.07	0.07	0.26
Cum Variance	0.12	0.22	0.32	0.39	0.46	0.72
Cum Prop	0.16	0.30	0.44	0.55	0.64	1.00

Table 2.4: Correlations Between Types of Environmental Behavior, Study 1

	Env Consumerism	Household Env	Env Political Comms	Env Organizations	Env Demonstrations	Policy Support
Env Consumerism	1.00	-	-	-	-	-
Household Env	**0.28**	1.00	-	-	-	-
Env Political Comms	**0.26**	**0.15**	1.00	-	-	-
Env Organizations	**0.21**	**0.07**	**0.20**	1.00	-	-
Env Demonstrations	**0.17**	0.05	**0.15**	**0.09**	1.00	-
Policy Support	**0.18**	**0.16**	**0.22**	**0.15**	0.00	1.00
N	1073	1071	1075	1075	1075	1075

Table 2.5: Predicting Private Environmental Behaviors with Values and Attitudes

	Green Consumerism	Household Environmentalism
	(1)	(2)
Demographic Controls		
Education	0.05*	−0.003
	(0.02)	(0.02)
Income	0.04***	0.03*
	(0.01)	(0.01)
Age	−0.01***	0.01***
	(0.002)	(0.001)
Gender: Female	−0.07	0.02
	(0.06)	(0.05)
Race: Black	−0.001	−0.04
	(0.15)	(0.11)
Race: Latino	0.15*	0.01
	(0.08)	(0.06)
Race: Asian	0.12	−0.03
	(0.08)	(0.06)
Race: American Indian	0.14	0.12
	(0.12)	(0.09)
Residency: Rural	0.13*	0.01
	(0.07)	(0.05)
ΔR^2	0.05***	0.02***
Individual Values		
Altruism	0.003	0.11**
	(0.05)	(0.04)
Biospherism	0.44***	0.19***
	(0.05)	(0.04)
Egoism	0.14***	−0.04
	(0.03)	(0.03)
ΔR^2	0.19***	0.09***
Attitudes		
NEP	0.07*	0.02
	(0.04)	(0.03)
Ideology: Conservative	−0.02	−0.0005
	(0.02)	(0.02)
Political Interest	0.10***	0.005
	(0.03)	(0.02)
Party ID: Democrat	−0.19**	−0.09
	(0.07)	(0.06)
Party ID: Republican	−0.12	−0.11*
	(0.08)	(0.06)
ΔR^2	0.03***	0.04***
Constant	0.42	3.00***
	(0.29)	(0.22)
Observations	842 [3]	842
R^2	0.27	0.13
Adjusted R^2	0.25	0.11
Residual Std. Error	0.77 (df = 823)	0.60 (df = 824)
F Statistic	16.62*** (df = 18; 823)	6.93*** (df = 17; 824)

Note: Models are both linear.
*p<0.05; **p<0.01; ***p<0.001

Table 2.6: Predicting Environmental Policy Support and Policy Communications with Values and Attitudes

	Policy Support	Environmental Commmunications
	(1)	(2)
Demographic Controls		
Education	0.04*	0.001
	(0.02)	(0.02)
Income	0.03	−0.003
	(0.01)	(0.01)
Gender: Female	0.25***	0.15**
	(0.06)	(0.06)
Age	0.002	−0.004*
	(0.002)	(0.002)
Race: Black	−0.38**	−0.10
	(0.14)	(0.14)
Race: Latino	0.02	0.02
	(0.08)	(0.07)
Race: Asian	0.17*	−0.04
	(0.08)	(0.07)
Race: American Indian	0.01	0.08
	(0.12)	(0.11)
Residency: Rural	−0.05	0.06
	(0.07)	(0.06)
ΔR^2	0.04***	0.03***
Values		
Altruism	0.09	0.13***
	(0.05)	(0.04)
Biospherism	0.20***	0.10*
	(0.05)	(0.04)
Egoism	−0.14***	0.02
	(0.03)	(0.03)
ΔR^2	0.13***	0.09***
Attitudes		
NEP	0.16***	0.14***
	(0.04)	(0.03)
Ideology: Conservative	−0.09***	−0.05*
	(0.02)	(0.02)
Political Interest	−0.03	0.10***
	(0.03)	(0.03)
Party ID: Republican	−0.02	−0.04
	(0.08)	(0.08)
Party ID: Democrat	0.07	−0.05
	(0.07)	(0.07)
ΔR^2	0.08***	0.06***
Constant	2.63***	−1.02***
	(0.29)	(0.27)
Observations	844	844
R^2	0.25	0.18
Adjusted R^2	0.234	0.16
Residual Std. Error (df = 826)	0.77	0.72
F Statistic (df = 17; 826)	16.19***	10.32***

Note: Models are both linear. A negative binomial model to estimate policy communications actions are shown in the appendix.
*p<0.05; **p<0.01; ***p<0.001

Table 2.7: Predicting Participation with Environmental Organizations and Demonstrations with Values and Attitudes

	Env Organization Participation	Env Demonstration Participation
	(1)	(2)
Demographic Controls		
Education	0.02	0.01*
	(0.01)	(0.005)
Income	0.02*	−0.002
	(0.01)	(0.003)
Gender: Female	−0.08*	−0.01
	(0.04)	(0.01)
Age	−0.002	−0.001**
	(0.001)	(0.0004)
Race: Black	−0.04	0.03
	(0.09)	(0.03)
Race: Latino	0.01	0.01
	(0.05)	(0.02)
Race: Asian	0.08	0.02
	(0.05)	(0.02)
Race: American Indian	−0.10	0.002
	(0.07)	(0.03)
Residency: Rural	−0.01	−0.01
	(0.04)	(0.01)
ΔR^2	0.04***	0.03***
Values		
Altruism	0.03	−0.01
	(0.03)	(0.01)
Biospherism	0.07*	0.02
	(0.03)	(0.01)
Egoism	0.02	0.01
	(0.02)	(0.01)
ΔR^2	0.01***	0.01***
Attitudes		
NEP	0.03	0.003
	(0.02)	(0.01)
Ideology: Conservative	−0.01	−0.01
	(0.01)	(0.005)
Political Interest	0.02	0.02**
	(0.02)	(0.01)
Party ID: Republican	−0.03	−0.01
	(0.05)	(0.02)
Party ID: Democrat	−0.01	−0.01
	(0.04)	(0.02)
ΔR^2	0.04***	0.02***
Constant	−0.39*	−0.08
	(0.17)	(0.06)
Observations	844	844
R^2	0.09	0.06
Adjusted R^2	0.07	0.04
Residual Std. Error (df = 826)	0.46	0.17
F Statistic (df = 17; 826)	4.58***	3.05***

Note: Models are both linear, including a LPM to estimate probability of participation in demonstrations. A negative binomial model for group participation and a logistic model for demonstrating are both shown in the appendix.
*p<0.05; **p<0.01; ***p<0.001

CHAPTER THREE

Economic Losses or Environmental Gains?

Framing Effects on Public Support for Environmental Management

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Abstract

Environmental managers face major challenges regarding how to communicate the value of environmental policies and projects to the public. Effective communication can increase public and political support and mitigate opposition. In this study, we field a framing experiment that utilizes a two (economic, ecological) by two (gain, loss) factorial design to evaluate how messages highlighting different goals invasive species management influence public support for the proposed project. We find that ecological messages lead to significantly more support for invasive species management than economic frames and loss frames are more effective than gain frames. The interaction between ecological frames and loss frames are the most effective combination. We also find that treatment responses differ across several covariates; ecological messages were more effective among liberals and people who were deeply concerned about the environment, while ecological and economic messages performed equally well among conservatives and people less concerned with protecting the environment. Results also offer insight regarding how the public perceives policy risk when faced with new government policies generally, and new environmental regulations in particular.

Economic Losses or Environmental Gains?
Framing Effects on Public Support for Environmental Management

Introduction

Active management of environmental resources offers substantial and diverse public benefits. However, how environmental managers should communicate the value of their work to maximize public support remains largely unknown. Public opinion can play an important role in the success or failure of proposed environmental policies; public opposition or indifference can threaten to delay or completely derail environmental projects (Bertolino and Genovesi 2003; Beierle 1999; Eden 1996; O'Faircheallaigh 2010), while support can provide important political capital to elected officials or environmental managers intending as they implement environmental projects (Stern et al. 1999). Better communication strategies can help public environmental agencies and their advocates communicate the value of their work in ways that help ensure projects are funded and successfully implemented.

Ecological and economic benefits represent the two primary goals of environmental management. As a result, they also encompass two of the most common arguments in favor of environmental protection, and the public is generally familiar with ecological and economic frames in environmental policy discourse (Bolsen 2011; Ansolabehere and Konisky 2012). Ecological message frames highlight the need to protect the environment for the sake of its animals and ecosystems. Economic message frames focus on how environmental protection benefit human economic activity. Environmental communications can also be framed as providing opportunities for gains or protecting against losses. Gain-framed messages highlight anticipated increases in economic activity or ecological health as a result of a program. Loss-framed messages, on the other hand, highlight how government environmental projects prevent ecological or economic damages.

In this paper, we present the results of a survey experiment of California residents (N=1077) that utilizes a two (economic, ecological) by two (gain, loss) factorial design. An online sample was gathered by Qualtrics using quota sampling, which resulted in a sample that closely approximates the California statewide population across a number of demographic characteristics including household income, party identification, and age. We also oversampled rural residents to evaluate whether their opinions on invasive species management, and how they responded to communications related to that project, differed significantly from urban residents. The factorial design of the experiment allows us to determine whether gain and loss frames interact with ecological and economic frames as well as how each performs independently to promote support for environmental management. Existing research regarding the efficacy of similar frames on public opinion is almost entirely focused on climate change (Spence and Pidgeon 2010; Bertolotti and Catellani 2014). This study provides new information for environmental managers and advocates regarding how people respond to messages about important but comparatively low-profile and non-partisan environmental policy issues.

We find that people who read a message highlighting the ecological benefits were significantly more supportive of the project than people who read about its economic benefits. These results suggest that the public is more concerned with protecting the environment as a means of influencing ecological outcomes than economic ones. We also find that when benefits are framed as preventing losses people are significantly more supportive when comparable benefits are framed in terms of expected gains. Responses to treatment messages differed significantly based on a number of individual-level covariates, including political ideology and environmental concern. Ecological messages were more

effective among liberals and people who were deeply concerned about the environment, while ecological and economic messages performed equally well among conservatives and people less concerned with protecting the environment. These results contribute to an ongoing discourse regarding whether direct benefits to the environment motivate support for environmental protection or whether human-focused economic co-benefits are necessary to motivate support for environmental policies. Analysis of gain and loss frames also demonstrate the efficacy of prospect theory (Kahneman and Tversky 1979) in the context of environmental public goods problems, and offer insight regarding how people interpret the relative risk of new political action versus non-action in addressing environmental issues.

Using Frames in Environmental Communication

Environmental management suffers when agencies are unable to communicate the importance of environmental protection in ways that convince the public or their elected representatives of their value (Tanentzap et al. 2009, Crowley et al. 2017). Effectively framing policy issues can increase political interest and participation and build trust and collaboration between the public and government. This in turn can improve the quality and perceived legitimacy of agency decisions (Nisbet et al. 2012). One way to overcome public misunderstanding of management goals (McNeely 2001) or lack of support or interest in environmental management is through effectively framing the issue in ways that are more relevant and understandable for the public (Popkin 1994; Nelson et al. 1997; Nelson and Oxley 1999; Nisbet et al. 2012).

Frames influence decision-making and have the ability to change policy opinions by both making a certain consideration more accessible *and* influencing the weight given to the accessed concept in the decision process (Nelson et al. 1997), rather than simply introducing

new information to the audience of the frame (i.e. simple persuasion) or by purely making a particular consideration more accessible in a moment of decision or action (i.e. prime). By doing so, frames make policy issues not only more immediately accessible but also make the considerations underlying them more salient (Zaller and Feldman 1992; Nelson et al. 1997; Brewer 2001; Lakoff 2010; Chong and Druckman 2007; Popkin 1994). However, the psychological processes by which attribute frames and outcome frames influence decision-making and opinion formation appear to be different. By altering the context in which a choice is presented, attribute frames target specific beliefs and "lend additional weight to an already accessible concept by influencing its perceived relevance or importance" (Nelson et al. 1997: 228; Chong and Druckman 2007). This "conscious weighting of alternative considerations" distinguishes the psychological processes by which attribute frames influence decisions from those of outcome frames (Druckman 2004: 674; Nelson et al. 1997). Outcome frames influence decision-making through accessibility processes that by which gain and loss frames make positive or negative associations more immediately accessible, respectively (Druckman 2004; Levin et al. 1998). Thus, loss frames associated with species invasion would make negative associations with destruction of native species more accessible, while gain frames would make positive feelings regarding restoration of native species more accessible.

Modifying Attribute Frames: Ecological and Economic Impacts

In this study, attribute frames differ based on the ecological or economic impacts highlighted in communicating the goals of an invasive species management project. Existing environmental communications research has evaluated how problem definition and proposed solutions influence environmental attitudes, behavior change, and policy support (Cantrill

1993; Davis 1995; Spence and Pidgeon 2010; Lakoff 2010; Nisbet et al. 2012; Bertolloti and Catellani 2014). However, limited research evaluates the effectiveness of message frames focused specifically on how benefits to human economic activity or to the ecological system affect public support for that policy.

Economic message frames promote environmental management based on economic co-benefits to humans. Economic issues are much more immediately concerning to most Americans than environmental issues are (Gallup 2017). Historically, about 1-5% of Americans cite environmental issues as the Most Important Problem facing the nation. In comparison, the percentage of people who cite the economy as the nation's Most Important Problem has never dipped below 20%, and during times of economic crisis has crept as high as 80% (Gallup, 2017; Daniels et al. 2012). Use of economic frames therefore has the capacity to link an otherwise relatively unimportant issue to an extremely important issue in the public's consideration. Economic frames also provide an opportunity to broaden perceived benefits of environmental protection, increasing the number of people receptive to these policies. Economic frames also frequently emphasize that environmental protection offers opportunities instead of requiring sacrifices (Vezirgiannidou 2013). The language of risk, guilt, and sacrifice is typically ineffective for both eliciting positive opinions about environmental policies and motivating action in support of them, particularly among political conservatives and others not typically inclined to support those policies (Markowitz and Shariff 2012; Bain et al. 2012). For all of these reasons, reframing environmental issues based on their economic consequences can be highly effective for promoting environmental protection.

Ecological messages promote environmental protection based on its direct benefits to nature. Ecological messages rely on normative biospheric values (i.e. the belief that nature is valuable in and of itself); while research makes clear that many people value nature and develop environmental attitudes based on those values (e.g. Heberlein 1972; Stern and Dietz 1994; Schultz and Zelezny 1998; Schultz 2001; Bamberg and Moser, 2007), the effectiveness of messages highlighting strictly ecological benefits is not well understood. Arguments against nature-focused environmental messaging argue that because people are more concerned with economic issues broadly, messaging to promote environmental protection should highlight economic advantages of doing so. However, in some cases trying to identify ways that environmental protection helps people rather than nature can diminish the perceived urgency of environmental issues (Vezirgiannidou 2013). In addition, if environmental protection is perceived not as an end in itself but rather as a means of promoting economic growth, then environmental management programs face comparisons to other economic growth policies and their perceived importance may be degraded, both politically and in the eyes of the public.

Modifying Outcome Frames: Impacts as Gains or Prevention of Losses

Outcome frames present benefits of environmental management goals in terms of preventing losses or facilitating gains.[20] For example, removal of an invasive species can be interpreted as providing opportunities for native species to reestablish and increase their numbers or to avert further damages to the same native species. Expectations regarding how people will react to gain and loss messages are rooted in prospect theory (Kahneman and Tversky 1979, 1984; Levin et al. 1998; Spence and Pidgeon 2010). Prospect theory proposes

[20] Elsewhere, outcome frames may be called *equivalency frames* or *valence frames* (see e.g. Druckman 2004).

that people are more responsive to potential losses than equivalent potential gains – the psychological effect of losing $100 is greater than the effect of gaining $100. Outcome frames influence decision-making and policy opinions by altering the accessibility and salience of two otherwise equivalent pieces of information, which occurs passively and unconsciously (Jou, Shanteau, and Harris 1996; Higgins and King 1981; Druckman 2004). The present research diverges from traditional prospect theory in that we evaluate whether people respond to gains and losses of public goods. This represents a significant departure in that the psychological drivers of responses to gain and loss. The greater psychological impact of losses, as well as resultant risk-seeking behavior in the face of losses and risk-averse behavior in the face of gains, may not be nearly as powerful when those gains and losses are not borne directly by the decision-maker.

Existing work on the effects of gain and loss frames provide inconsistent evidence for how they influence environmental attitudes and behaviors. Loss frames tend to be more effective for increasing concern or behavior for a number of environmental issues (Davis 1995; Novemsky and Kahneman 2005; Cobb 2005; Loroz 2007; Hardisty and Weber 2009; White, MacDonnell and Dahl 2011; for a review see Cheng et al. 2011). Loss frames increase the salience and perceived consequences of policy issues more than commensurate gain frames (Meyerowitz and Chaiken 1987; Cheng et al. 2011). The result is that loss frames are most effective at influencing opinions related to low-salience issues (Obermiller 1995; Cheng et al. 2011). Gain frames, however, may be more effective at influencing opinions related to high-salience environmental issues (Obermiller 1995; Cheng et al. 2011). This is consistent with findings that gain frames are better than loss frames when attempting to influence opinions regarding climate change policies (Spence and Pidgeon 2010; Gifford and Comeau

2011; Segev et al. 2015; Bain et al. 2012). The already high salience of climate change relative to other environmental issues may mean that communications do not significantly benefit increases salience. In addition, loss frames related to climate change lead people to feel demoralized by the scope of the problem (Feinberg and Willer 2011), while gain frames lead to more optimistic perspectives on our ability to address the problem.

People may also respond to gain and loss frames for certain environmental issues or policies differently based on how they perceive policy risk. People tend to be risk-averse when confronting potential gains and risk-seeing when trying to avoid potential losses (Kahneman and Tversky 1979). When evaluating policy issues or candidates, this generally manifests as preference for the status quo (Quattrone and Tversky 1984). Under the status quo people know what to expect, while the alternative choice is unknown; even if the alternative may be as likely to lead to new benefits as to new losses, those potential losses would have a larger psychological effect. However, when faced with potential significant losses, for example if people are told that maintenance of the status quo may actually lead to significant losses, they will be more willing to take risks (e.g. support the challenger, or new environmental policies) in order to prevent those losses. One possible reason loss frames do not effectively motivate changes to behavior or attitudes regarding climate change is that inaction in the face of climate change is perceived as highly risky (Spence and Pidgeon 2010; Weitzman 2009; Costello et al. 2010) while enacting policies to mitigate climate change is perceived as more cautious. Gain frames are most likely to motivate risk-averse choices, which in the case of climate change is policy action.

Using Message Frames to Promote Invasive Species Management

This study evaluates the impacts of message frames on support for environmental management using a case of invasive species management in California. Like many environmental problems, invasive species pose major economic and ecological threats (Mack et al. 2000; Simberloff et al. 2005). Invasive species are a significant driver of global biodiversity loss (Sala et al. 2000). As of the late 1990s, 400 of the 958 listed endangered species in the United States are primarily at risk due to species invasion (Wilcove et al. 1998; Sala et al. 2000). Invasive species also have significant economic impacts such as damage to private and public property and destruction of crops, fisheries, and other commercial agricultural products. Invasive species also hinder delivery of ecosystem services that contribute to human economic activity. As of 1993, invasive weeds alone were estimated to cause direct costs of $3.6-5.4 billion USD per year (Office of Technology Assessment, 1993), a number that is likely much larger now. Species invasion is also occurring at increasing frequency across the world, and as globalization and trade continue to accelerate in tandem with climate change it is likely that both the economic and ecological consequences of species invasions will become larger and more politically contentious (Hellmann et al. 2008).

Invasive species management is a useful case to test framing effects on public opinion both because it has large economic and ecological consequences, and because similarities to other environmental issues mean that lessons learned in how to frame invasive species management may be transferable to other environmental issues. Invasive species management is not prominent in current national partisan rhetoric, which means that it is a relatively non-partisan issue (Dunlap et al. 2001; Feygina, Jost, and Goldsmith 2010). For highly politicized issues, party cues can overwhelm individuals' own policy considerations,

leading them to make decisions based on their political or social identities and the perceived identities of the entity delivering the message (Cohen, 2003; Kahan 2012; Kahan et al. 2012; Goren et al. 2009; Slothuus and De Vrees 2010). Because the public does not hold strong opinions regarding invasive species management, communications can influence those opinions to a greater extent than they can for highly politicized issues like climate change.

Though opinions on invasive species may be weakly held or non-existent, most Americans maintain at least passing familiarity with environmental conservation issues broadly (Speth 2008; Daniels et al. 2012; Sharp et al. 2011; Bremner and Park 2007). Moreover, the fact that the public understands invasive species issues poorly and does not hold strong opinions on how government should address invasive species (Simberloff et al. 2005; Moser et al. 2009; Bremner and Park 2007; Bertolino and Genovesi, 2003) makes it more like most policy issues, including environmental issues, rather than less (Zaller 1992; Smith 2001). The increasing visibility of arguments regarding the economic value of ecosystem services and natural capital frame environmental management as an economic concern (Costanza et al. 2017; Daily 1997), which increases the likelihood the public is at least somewhat familiar with both ecological and economic benefits of environmental management. This base recognition can be important, as people with more political information tend to be more responsive to policy frames (Druckman and Nelson 2003; Miller and Krosnick 2000).

Framing Invasive Species Management: Economic and Ecological Messages

Evaluating the efficacy of messages highlighting economic or ecological benefits of invasive species management provides important insight for communications related to other environmental issues as well. Most studies regarding how people respond to economic and

environmental frames focus on public attitudes related to climate change. Though climate change is a hugely important issue, public debate is hindered by pervasive, ineffective frames, most notably the pollution frame, which leads to ongoing debate over the science of climate change rather than the benefits associated with addressing the issue (Vezirgiannidou 2013). The ineffectiveness of existing climate frames provides opportunities for significant improvements from re-framing climate change in a way that highlights co-benefits, in particular economic benefits. However, for environmental issues like invasive species management, a lack of dominant existing frames means messages focused on the ecological importance of managing invasive species or other less politicized issues are unlikely to elicit hyper-partisan responses that make people defensive and cause them to "dig in" in response to a common opposition frames.

The means and goals of managing invasive species or similar environmental issues may also be an important factor determining how people respond to ecological and economic message frames. Highlighting the economic value of invasive species management may be perceived as unpalatable or even unethical if people believe animals are being harmed for the purpose of human greed (Sacchi et al. 2014; Sandel 2012). By focusing on how protecting the environment benefits humans, less attention is paid to the intrinsic value of a healthy environment. Although considerations regarding harm to animals may be unique to invasive species management, many environmental issues involve psychological or material tradeoffs between human and ecological benefits, and individuals' beliefs and values will help dictate how they respond to these tradeoffs (Stern and Dietz 1994; Stern 2000; Dunlap et al. 2000; Dietz et al. 2005; Dietz et al. 2007).

As a result, different people will interpret and respond to economic and ecological message frames differently. Conservatives are typically more responsive to messages highlighting economic benefits, while liberals are more responsive to messages that highlight ecological benefits (Clifford and Jerit 2013; Bain et al. 2012). The roots of this discrepancy lie in different moral systems. Conservatives subordinate nature to the will of people who desire to use it for their own ends and believe in market-based systems that evaluate the value of the natural environment for its human use rather than its intrinsic value (Lakoff 2010; Markowitz and Shariff 2012; Feygina et al. 2010). The progressive moral system, on the other hand, is based on empathy and feelings of responsibility toward others (Lakoff 2010). Liberals tend to value caring for and protecting others, including non-human species (Graham, Haidt, and Nosek 2009; Schwartz et al. 2010). As a result, liberals and Democrats are more likely to believe protecting the environment is a moral responsibility (Feinberg and Willer 2012; McCright and Dunlap 2011), which also makes them more likely to reject economic arguments for environmental protection (Sacchi et al. 2014). The result is that liberals should be more responsive to frames that highlight the ecological benefits of environmental policies, while conservatives are more responsive to frames highlighting economic benefits. This leads to two hypotheses:

H1: Among liberals, ecological frames will increase support for invasive species management more than economic frames.

H2: Among conservatives, economic frames will increase support for invasive species management more than ecological frames.

Overall, we anticipate that messages explaining economic and ecological benefits of invasive species management will each increase support for invasive species management. This leads to a third hypothesis:

H3: Overall, people will be more supportive of invasive species management when framed as providing ecological or economic benefits, as compared to a control message.

Finally, people's environmental orientations may play an important role in determining how they respond to different messages related to invasive species management. The dissonance associated with harming animals to help human economic growth may be particularly strong among environmentalists, and thus the opportunities to minimize that dissonance through promoting ecological benefits will also be greater. More generally, people with strong environmental attitudes tend to reject economic arguments for environmental protection. This is true even when benefits of a policy are presented as a "win-win" for both (Sacchi et al. 2014), because environmentalists are more likely to perceive environmental protection as an issue of moral right and wrong and thus one for which co-benefits may be perceived not just as unimportant but inappropriate. This same rejection of economic arguments for to promote invasive species management is not expected of people who do not feel deeply concerned about the environment. This leads to two additional hypotheses:

H4: Among environmentalists, ecological frames will increase support for invasive species management more than economic frames.

H5: Among non-environmentalists, economic frames will increase support for invasive species management more than ecological frames.

Framing Invasive Species Management: Gain and Loss Messages

Evaluation of how the public responds to messages that highlight proposed gains versus prevented losses can provide essential insight regarding how prospect theory applies broadly to environmental public goods problems. Existing research regarding the impacts of gain and loss frames on environmental attitudes and behavior offer mixed results based on

public perceptions of the specific environmental issue evaluated. One way that gain and loss frames influence policy opinions is that they can impact issue salience, with loss-prevention frames typically increasing salience more than comparable gain-oriented frames (Meyerowitz and Chaiken 1987; Cheng et al. 2011). Because invasive species management is not a highly salient issue for most Americans, the opportunity for significantly increasing concern for and awareness of the issue means that loss frames may be particularly effective at influencing support for invasive species management.

Gain and loss frames also influence policy opinions differently based on how people understand the relative risk of policy action to address that issue (Rothman et al. 2006; Spence and Pidgeon 2010). Because people are risk-seeking when confronting potential losses and risk-averse regarding gains, "where an outcome frame is construed as low in risk, there is a systematic advantage when framing information about outcomes in terms of gains" (Spence and Pidgeon 2010: 27). The alternative is also true: when an outcome is perceived as high-risk, loss frames should be more effective at encouraging opinion change or action. Inaction with respect to invasive species appears a priori to be a riskier choice than non-action, because inaction is likely to lead to large ecological and economic damages (Keller et al. 2008; Keller et al. 2009; Pejchar and Mooney 2009). However, new policy action will generally be considered riskier than the status quo. That may not be the case with climate change mitigation because people have a reasonable understanding of the issue. Comparatively, the threats posed by most invasive species are both misunderstood and ignored. As a result, we expect that most people will maintain a conventional perception of new invasive species policy action as the riskier choice.

Based on evaluation of both perceived risks and salience of the invasive species issue, we anticipate that people will be more likely to support the project when framed in terms of potential losses avoided. This leads to our next hypothesis.

H6: People will be more supportive of invasive species management when presented in terms of preventing economic or ecological losses than in terms of offering comparable economic or ecological gains.

We do not anticipate significant differences in treatment effects among subgroups based on outcome frames. There is evidence that conservatives and Republicans are more responsive to gain-framed messages than to loss-framed messages (Feinberg and Willer 2011; Markowitz and Shariff 2012; Bain et al. 2012). However, this is likely an artifact of backlash associated with partisan rhetoric rather than a natural predisposition to respond to gain frames rather than loss frames. Given the non-partisan nature of invasive species management, we do not anticipate political affiliations to substantially influence response to gain and loss frames.

Effects of Covariates on Support for Invasive Species Management

When estimating support for invasive species management, we measure a number of covariates that we expect may have an effect on support for invasive species management. Both political ideology and environmental orientation are measured and used to evaluate heterogeneous treatment effects, as described in detail in the two sections above. We also measure support for animal welfare, gender, age, income, education, and race. Environmental public opinion research suggests these characteristics may influence support for invasive species management. Liberals and Democrats are typically more supportive of pro-environmental policies than conservatives and Republicans. However, majorities of both parties tend to offer broad support to the goals of the environmental movement (Daniels et al.

2012), and how political ideology and partisan identity impact invasive species management specifically is unclear. People who are more concerned about the environment also tend to be more supportive of pro-environmental policies (Dunlap and Van Liere 1980; Dunlap et al. 2000; Daniels et al. 2012).

Younger people, women, wealthier people, and better educated people are all often more supportive of environmental policy support (for a review see Daniels et al. 2012; Jones and Dunlap 1992; Van Liere and Dunlap 1980; Dietz et al. 2007). However, how each of these translates from general environmental policy support to invasive species management is unclear. For example, women are often cited as more supportive of pro-environmental policies in part because they are more nurturing than men (Davidson and Freudenberg 1996). However, invasive species management involves removal or eradication of species, something likely misaligned with a nurturing disposition. Members of different races do not have consistent differences of opinion regarding environmental policy positions (Mohai and Bryant 1998; Daniels et al. 2012). In cases when race has been found to be a significant predictor of environmental policy support, people of color tend to be more likely to support pro-environmental policies than whites (Jones and Dunlap 1992; Whittaker, Segura, and Bowler 2005).

Data and Methods

Procedure

We recruited a sample of Californians (N=1077) using an online panel provided by Qualtrics. The survey was fielded from February 22 to March 16, 2017 using online quota sampling, which allowed us to gather a sample of California residents that was representative of the state population on household income and political party affiliation measures. We also

used quotas to oversample rural residents as part of a separate analysis that will not be discussed in detail in this paper. The age of participants also closely approximated the California population, while the sample overrepresented women, better educated residents, and white residents. A complete review of sample demographic characteristics is available in the appendix.

Several considerations led to the choice to field the survey in California rather than the nation as a whole. First, we expected that public opinion regarding the federal government would be significantly more hostile among certain respondents than regarding state-level environmental management agencies, and we were interested in opinions that were not strictly reflective of larger political or partisan issues. Second, state agencies often address issues like invasive species, which made it appropriate to highlight the work of a state agency. Finally, California is a large, highly diverse state where management of invasive wild pigs is a serious issue. Though California is more politically liberal, more urban, and more racially diverse than the US as a whole, by using quota sampling and controlling for these variables, we believe we are able to successfully isolate effects associated with unique characteristics of California.

The survey experiment began by measuring a number of covariates including participants' demographic information, political beliefs and affiliations, values, and environmental attitudes. Next, participants were randomly assigned to read one of five descriptions of a proposed invasive species management project in California. They were told that the California Department of Fish and Wildlife (CDFW) was considering moving forward with a proposal to manage and ultimately eradicate invasive wild pigs (*Sus scrofa*), and that they would like to know more about the public's opinions on such a project. The five

press releases included four treatment messages that used a full factorial 2 (target frame: ecological vs. economic) x 2 (outcome frame: gain vs. loss) design. A fifth control condition provided participants with information regarding CDFW's planned implementation of the project, but excluded discussion of ecological or economic impacts of the project. We modeled the fictitious press releases after real CDFW communications regarding invasive species. After reading the press release, participants were asked whether they support or oppose the project, and how strongly they hold this position. Responses to these questions are our primary outcome measures. Participants were provided debriefing information and the survey experiment was completed. Several attention checks were used throughout the survey experiment. Responses from any participant who spent less than 33% or more than 300% of mean survey response time was excluded. In addition, two separate control questions were used in which participants were asked to click a specific multiple choice option. Participants who failed either attention check question were excluded.

Measures

Message Frames. Four treatment messages were randomly assigned to participants in the form of different press releases from the California Department of Fish and Wildlife (CDFW). Messages held all language constant other than the expected results from implementation of the management program or failure to do so. Message frames differed in each treatment condition and included the following: 1) ecological gain treatment: highlighted benefits to native California ecosystems and species that would result from implementation of the pig management program; 2) ecological loss treatment: highlighted further loss of native habitat and species destruction if CDFW fails to implement the management program; 3) economic gain treatment: highlighted increase in statewide

economic production and government tax revenue that would result from implementation of the management program; 4) economic loss treatment: highlighted continued loss of economic production and government tax revenue that would result from failure to implement the management program. The primary differences among these four conditions occurred at the end of each project description. The control message used all of the same language as each of the treatment messages, but did not references expected outcomes of the wild pig management project. The language from each fictional press release is provided in the appendix.

Support for invasive species management. The primary dependent variable used in analysis is support for the wild pig management project described in each message frame. To increase the perceived importance and personal connection to the question, participants were asked "As a California resident, do you support or oppose the proposal…" Responses were initially measured as binary (support/oppose) and participants were subsequently asked about their strength of support or opposition. Strength of support for the project is used as a secondary dependent variable. Participants who supported the project were asked how strong their support the project, with response options including "strongly support," "support," and "only slightly support," while opponents of the project were asked how strong that opposition was, with options including "strongly oppose," "oppose," and "only slightly oppose." For analysis, we then coded these responses into a single ordinal measure of strength of support, from "strongly oppose" (1) to "strongly support" (6).

Manipulation checks. We asked participants several questions to measure whether treatments effectively influenced their thinking about the project. First, we asked whether wild pigs primarily present a problem to California because of their economic or ecological

consequences. Results show a significant difference in response choice based on ecological or economic treatment frame ($\chi^2(8) = 167.46$, $p<.01$). Participants who received an ecological treatment were then asked whether the program would "prevent further declines" or "allow for increases" in native species and habitat; participants who received the economic treatment were asked whether the program would "prevent further economic damages" or "allow additional economic benefits." Responses were combined across the economic and ecological conditions, and responses differed by gain or loss outcome frame ($\chi^2(1) = 14.48$, $p<.01$).

Covariates. Environmental orientation was measured using an abridged version of the New Ecological Paradigm (NEP; Dunlap et al. 2000; Stern et al. 1999). Principal component analysis using a polychoric correlation matrix because of the ordinal nature of the variables revealed that the five measures were organized into a single component (five items, $\mu = 3.30$, $\alpha=.64$).[21] We also used NEP in subgroup analysis in order to determine whether people who exhibit high levels of environmental concern (i.e. "environmentalists") responded to treatments differently than those exhibiting low levels of environmental concern (i.e. "non-environmentalists"). For subgroup analyses we used a median split, defining environmentalists as those with NEP scores in the top half and non-environmentalists as those with NEP responses in the bottom half. Political ideology was included in models to account for possible influences of general political beliefs about government on support for a government program like invasive species management measured on a seven-point Likert scale, from "extremely liberal" (1) to "extremely conservative" (7). To evaluate subgroup effects by political ideology, we subset participants

[21] Results from this factor analysis are shown in the appendix to Chapter 2.

into liberals, conservatives, and moderates. Liberals are defined as anyone who responded they were "extremely liberal," "liberal," or somewhat liberal on the Likert scale (1-3). Conservatives are defined as participants who self-identified as "extremely conservative," "conservative," or "somewhat conservative" on the Likert scale (5-7). Finally, moderates indicated they were "moderate; middle of the road" on the scale (4).

Several other variables were used as controls but are not the subject of detailed analysis. Concern for animals' well-being was measured via a series of questions which we used to construct a single measure (four items, Cronbach's α=.61). Party identification was measured by asking whether participants identify as a Democrat, Republican, Independent/Unaffiliated, or Other. Education was measured by asking participants to identify their highest level of education achieved, from "Did not finish High School" (1) to advanced degrees (8). Annual household income was measured on an ordinal scale from "Less than $20,000" to "Over $150,000." The survey matched household income quotas that were consistent with existing U.S. Census information for California residents. Information on participants' race/ethnicity, gender, age, and whether they live in a rural or urban environment were also measured and included in the models described below.

Results

Support for Invasive Species Management

We began analysis by estimating the effects of treatment assignment on support for the wild pig management project by specifying a logistic regression model that included treatment assignment and covariates. Predicted probabilities of support for the pig

management program for each treatment condition and for changes across two covariates that had a significant effect on support are all shown in Table 1.[22]

Table 3.1: Effects of Message Frames on Support for Wild Pig Management

Treatment/Covariate	Predicted Probability	ATE/Δ	N
Treatment Condition			
Control	.68	-	218
Ecological Loss	.87	19pp*	215
Ecological Gain	.79	11pp*	217
Economic Loss	.76	8pp	216
Economic Gain	.73	5pp	211
Animal Welfare Support			
Low Support	.80	-	275
High Support	.72	−8pp*	269
Gender			
Female	.69	-	687
Male	.83	14pp*	390

Results are predicted probabilities of support for the project. ATE is the change in the predicted probability of support for the project between the treatment condition and control, represented as percentage point (pp) change. For animal welfare and gender, treatments are excluded. In a logistic regression, animal welfare is included as a continuous variable and has a significant effect at $p<.05$. However, to show change in predicted probability, we construct high- and low-support measures with the top and bottom quartiles of respondents.

* Effect is significant at $p<.05$ in logistic model

Both ecological gain and ecological loss frames had positive and significant effects on support for invasive species management, as compared to the control. Neither of the economic frames had a significant effect on project support, though in both cases the direction of the effect was positive. Only two covariates – concern for animal welfare and gender – had a significant effect on support for the project. People who were more concerned about animal welfare were less supportive of the project, likely because they find the prospect of killing animals to be unacceptable. Men were more supportive of the project than women, which is consistent with existing invasive species opinion research (Fitzgerald et al. 2007; Bremner and Park 2007).

[22] Results of a full logistic regression can be found in the appendix.

Pooled effects of each treatment condition are shown in Table 2. Support for the invasive species management project differed significantly by attribute frame ($\chi^2(4) = 29.22$, $p<.001$), which highlighted ecological or economic consequences of the program. *H3* proposed that overall support for invasive species management would increase given either ecological economic message frames, as compared to a control frame that does not highlight these impacts. Post-hoc analysis revealed that ecological frames, but not economic ones, had a significant and positive effect on support for the project when compared to the control. People who read the ecological message were more supportive of the invasive species management project than either people who read the control message (Kruskal-Wallis $\chi^2(1) = 21.45$, $p<.001$) and as compared to the economic message (K-W $\chi^2(1) = 10.16$, $p=.004$).[23] Support for the wild pig management program did not differ significantly between the economic frame and the control frame (K-W $\chi^2(1) = 3.66$, $p=.17$).[24]

Table 3.2: Effects of Pooled Treatments on Support for Wild Pig Management

Treatment (Pooled)	Predicted Probability	ATE	N
Control	.68	-	218
Ecological Treatments	.83	15pp*	432
Economic Treatments	.74	6pp	427
Loss Treatments	.82	14pp*	426
Gain Treatments	.76	8pp*	433

Results are predicted probabilities of support for the project. ATE is the change in predicted probability of support between the treatment condition and control, presented as percentage point (pp) change.

* Effect is significant at p<.05 in logistic model

Outcome frames, which highlighted expected gains or avoided losses, also had a significant effect on participants' support of the project ($\chi^2(2) = 19.52$, $p<.001$). Support for

[23] When referencing comparisons of effects of different treatments to one another, we use a Bonferroni correction to $p<.05$. When *p-values* are reported, they are Bonferroni-adjusted.

[24] Full regression results for pooled treatments can be found in the appendix.

the project was significantly greater among people who read the loss frames than in the control frame (Kruskal-Wallis $\chi^2(1) = 19.21$, $p<.001$). Loss frames were also significantly more effective at increasing support (Kruskal-Wallis $\chi^2(1) = 6.95$, $p<.05$). Thus, the null hypothesis for *H6* can be rejected – loss frames are more effective than gain frames across the entire sample. In the logistic model cited above, gain frames also had a positive effect on project support as compared to the control message. However, when controlling for family-wise error, the effect of gain frames does not remain significant (Kruskal-Wallis $\chi^2(1) = 4.64$, $p=.09$).

Together, these results indicate that messages highlighting the ecological impacts associated with invasive species management increase support among participants more than economic frames, and that people are more responsive to messages highlighting opportunities to prevent further losses than messages highlighting comparable gains. Moreover, the interaction between ecological and loss frames had a far larger effect than any other message used in the survey experiment.

Understanding not just whether different messages lead to increased support but also whether messages significantly increase how strongly people feel about an issue provides an important test of how these different messages might influence policy outcomes. Strength of support can inform how salient the issue feels for people, and therefore how likely their opinion on the issue is to influence their political behavior (Krosnick and Abelson 1992). To evaluate the effects of different messages on strength of support, we specified an ordered logistic regression with the same predictors as the models used to produce predicted probabilities of support shown in Table 1.[25] Odds ratios for each response option in each

[25] Full ordered logistic models can be seen in the appendix.

message condition are shown in Table 3, and indicate that the effect of different message frames on strength of support for the project reflect their effects on overall support.

Table 3.3: Effects of Message Frames on Strength of Support for Wild Pig Management

Message Frame	Odds Ratio	Standard Error	p-value
Ecological Loss	2.01*	.20	<.001
Ecological Gain	1.51*	.20	.04
Economic Loss	1.18	.20	.42
Economic Gain	0.99	.20	.96

Reported results are odds ratios.

* significant at p<.05

As with the logistic regression modeling overall support, ecological loss and ecological gain frames both had positive and significant effects on strength of support for the project described in the messages. Results are presented as odds ratios, which can be interpreted as the increased likelihood of being one position higher in terms of strength of support as a result of treatment, as compared to the control group. Thus, the odds ratio of 2.01 for the ecological loss message means participants who received the ecological loss message were over twice as likely to have indicated "strongly support" than "support" (or to have indicated “support” rather than “neutral”), as compared to the control. The results presented in Table 3 provide additional evidence that ecological messages are more effective than economic ones for changing opinion regarding invasive species management.

Treatment-by-Covariate Heterogeneous Effects

Next we evaluated how different message frames influenced support for invasive species management among subgroups of participants, including among people with different political ideologies and people with strong or weak environmental orientation (i.e. “environmentalists” and “non-environmentalists”). Among liberals, assignment to different

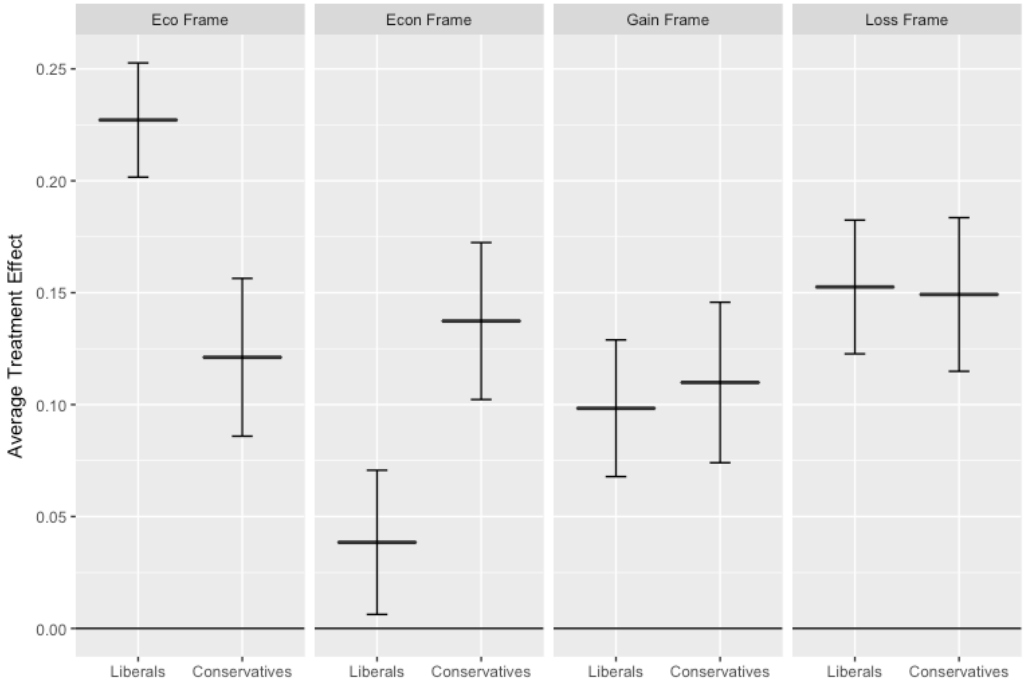
messages had a significant effect on support for wild pig management ($\chi^2(4) = 24.96$, $p<.001$), with ecological loss treatments increasing project support the most as compared to the control, followed by ecological gain and economic gain treatments. Treatment assignment did not have significant effects on conservatives' ($\chi^2(4) = 6.82$, $p=.44$). However, support for the project did differ by treatment condition for self-described moderates ($\chi^2(4) = 14.66$, $p<.05$).[26] Support for the project differed significantly by treatment condition among environmentalists ($\chi^2(4) = 19.80$, $p<.001$) and among non-environmentalists ($\chi^2(4) = 16.01$, $p<.01$).

We also pooled treatments to evaluate the effects of different types of messages among different groups. Figure 1 shows effects of pooled treatments based on respondents' ideology. For liberals, ecological treatments have a large and positive effect on project support, but economic treatments have no effect. This indicates that regarding *H1*, which proposed that liberals would be more responsive to ecological frames than economic frames, the null hypothesis can be rejected. Among conservatives, those who received the economic treatment were significantly more likely to support the project, while those who received the ecological treatment were not more likely than those conservatives who read the control message. Thus, for *H2*, which proposed that conservatives would be likely to support the project if they read an economic message, the null can also be rejected. Among moderates, the ecological message significantly increased support, while the economic message had no impact.[27]

[26] Subgroup analyses were also estimated among Democrats, Republicans, and Independents. Those revealed similar results. Democratic support for the project differed significantly by treatment condition ($\chi^2(4) = 27.93$, $p<.001$), with ecological loss messages having the largest effect on support. Support for the project did not differ by treatment condition among either Republicans ($\chi^2(4) = 4.18$, $p=.38$) or Independents ($\chi^2(4) = 6.10$, $p=.19$). Additional results by party ID can be found in the appendix.

[27] A table showing average treatment effects by ideology can be seen in the appendix.

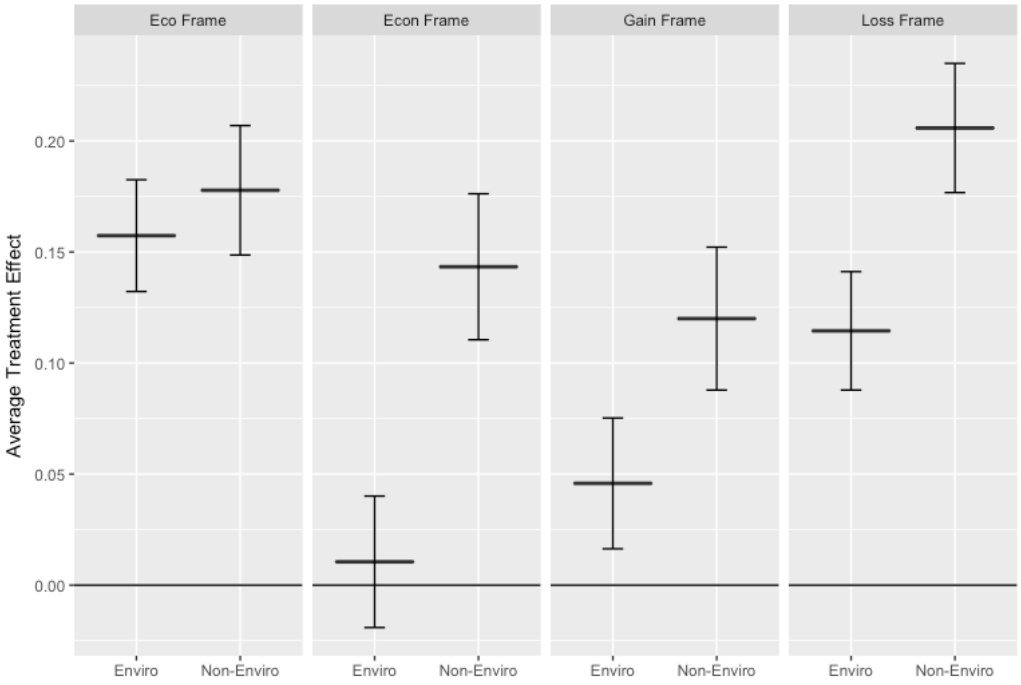
Figure 3.1: Heterogeneous Treatment Effects, By Ideology



Our expectations regarding the effects of gain and loss messages are also largely supported. Loss messages had a significant and positive effect on project support among all three ideological groups, while gain messages had no effect on support among any group. The size of the effect of loss messages was identical among conservatives and republicans, while the effect was slightly larger among moderates. This finding provides additional support for rejecting the null for *H6*. It also supports our expectations that gain and loss frames would not have differential influences on project support based on political ideology.

Figure 2 shows average treatment effects of among environmentalists and non-environmentalists.

Figure 3.2: Heterogeneous Treatment Effects, by Environmentalism



For environmentalists, ecological messages had significant positive effects on support for the project, while economic messages had no significant effects on support. This supports expectations outlined in *H4*, and we can reject the null hypothesis that environmentalists will respond equivalently to ecological and economic frames. People who are most concerned with environmental protection are not only responsive to messaging that highlights ecological benefits; they are also indifferent toward messages highlighting economic benefits. Among non-environmentalists, both ecological and economic messages significantly increased support for invasive species management. Moreover, ecological messages had a slightly larger effect on project support than economic messages, which contradicts expectations outlined in *H5*. Thus, *H5* is rejected – non-environmentalists were not more responsive to economic messages than ecological ones. As with liberals and conservatives, loss frames significantly increased support for invasive species management

among both environmentalists and non-environmentalists. Gain messages, however, had no significant effect among either subgroup.

Subgroup analyses among environmentalists and non-environmentalists suggest that while ecological messages had larger average treatment effects than economic messages among certain people concerned about the environment for its own sake, there was no equivalent backlash against these eco-centric goals among groups who would not be expected to care about ecological outcomes and who might perceive ecological goals as threatening economic growth.

General Discussion

The study provides new evidence regarding how people think about and respond to environmental messages, as well as practical information to environmental managers seeking to communicate their goals. We found that ecological- and loss-framed messages related to an important environmental problem were more effective than either economic- or gain-framed messages when communicating the value of invasive species management. The dearth of a prevailing political rhetoric for invasive species management means people are less likely to respond to communications by reverting to their party line. As a result, identifying other reasons for pro-environmental government policies (i.e. co-benefits) like economic growth or national security is neither necessary nor effective.

We anticipated differences in the efficacy of ecological and economic frames based on political ideology and environmental orientation. The prevailing wisdom is that environmental communications strategies should target "smaller groups of individuals who are homogeneous in terms of demographics, attitudes, or other salient characteristics…to develop messages that specifically address the attitudinal predispositions of the target"

(Davis 1995: 294; Grunig 1989). To some degree, we found that messages did have different impacts on specific audiences. Ecological frames were significantly more effective in building support for the program than economic frames among both liberals and environmentalists, while economic frames were more effective among conservatives. However, while ecological messages had larger average treatment effects than economic messages among certain people concerned about the environment for its own sake, there was no equivalent backlash against these eco-centric goals among groups who would not be expected to care about ecological outcomes and who might perceive ecological goals as threatening economic growth. This suggests that ideology is a more significant cleavage in how people interpreted the messages than environmental attitudes, which is surprising finding given the lack of apparent political attention that invasive species receive.

We also found that loss aversion influences public support for invasive species management more than potential gains. We expected that prevention of losses would be more effective than gains because highlighting losses increases the salience of issues that people do not have strong opinions about more than highlighting gains. The result also suggests that people may be more willing to support new policies if inaction is presented as likely to lead to losses. We caution that this result may be unique to issues that are not highly salient for the public or for which the public has limited information, like invasive species management. However, the result indicates that communications highlighting how new policies to address obscure or non-salient environmental problems can prevent further losses may be most effective, because they induce people to be more willing to take risks to prevent those losses.

This paper represents a significant step forward in understanding how environmental communications can influence public opinion regarding environmental management

generally and invasive species in particular. Invasive species management shares characteristics with a broad range of environmental issues such as wildlife and ecosystem conservation, land use, valuation of ecosystem services, and many others in which humans manage the environment for both their own and ecological impacts. We expect that these results may be used to help inform future environmental communications research and as a practical resource for environmental managers and to help informing future.

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Appendix

Appendix 1: Chapter One Additional Materials

Table A1.1: Effects of Values on Political Behaviors, Full Model

	Vote	Volunteer	Demonstrate	Contact Pol	Donate to Pol Org	Membership in Pol Org
	(1)	(2)	(3)	(4)	(5)	(6)
Values						
Self-Transcendence	0.03	0.05	0.14**	0.20*	0.25**	0.13*
	(0.09)	(0.06)	(0.05)	(0.10)	(0.08)	(0.05)
Self-Enhancement	−0.10	0.13**	−0.01	0.001	−0.08	−0.03
	(0.07)	(0.04)	(0.04)	(0.07)	(0.06)	(0.04)
Conservation	0.20**	−0.15**	−0.11*	−0.20*	−0.25***	−0.11*
	(0.08)	(0.05)	(0.04)	(0.08)	(0.07)	(0.05)
Openness to Change	−0.10	0.01	0.02	0.07	0.04	−0.02
	(0.09)	(0.05)	(0.05)	(0.09)	(0.08)	(0.05)
Psychological Engagement						
Political Interest	0.27***	0.10***	0.07**	0.38***	0.17***	0.11***
	(0.05)	(0.03)	(0.03)	(0.05)	(0.04)	(0.03)
Political Attention	0.10	0.10**	0.12***	0.12	0.19***	0.08*
	(0.06)	(0.04)	(0.04)	(0.07)	(0.05)	(0.04)
Control Variables						
Strength of Party ID	0.18***	0.03	0.004	−0.07	0.09**	−0.003
	(0.03)	(0.02)	(0.02)	(0.04)	(0.03)	(0.02)
Strength of Political Ideology	−0.05	0.03	0.03	0.04	0.06*	0.04*
	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)
Education	0.27***	0.05	0.06*	0.20***	0.13**	0.01
	(0.05)	(0.03)	(0.03)	(0.05)	(0.04)	(0.03)
Income	0.01**	0.0002	−0.003*	−0.002	0.01**	0.0004
	(0.002)	(0.002)	(0.001)	(0.003)	(0.002)	(0.001)
Gender: Male	−0.01	−0.03*	0.01	0.03	0.03	0.01
	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)
Race: Nonwhite	0.02	−0.01	0.001	−0.05*	0.03	−0.01
	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)
Age	0.003***	0.001*	0.0003	0.001	0.003***	−0.0004
	(0.001)	(0.0004)	(0.0004)	(0.001)	(0.001)	(0.0004)
Constant	0.01	−0.17***	−0.14***	−0.32***	−0.50***	−0.08
	(0.08)	(0.05)	(0.04)	(0.08)	(0.07)	(0.04)
Observations	1,159	1,271	1,271	1,271	1,271	1,273
R^2	0.20	0.08	0.07	0.15	0.18	0.06
Adjusted R^2	0.19	0.07	0.06	0.15	0.17	0.05
Residual Std. Error	0.32 (df = 1145)	0.21 (df = 1257)	0.19 (df = 1257)	0.36 (df = 1257)	0.30 (df = 1257)	0.19 (df = 1259)
F Statistic	22.04*** (df = 13; 1145)	8.68*** (df = 13; 1257)	6.98*** (df = 13; 1257)	17.66*** (df = 13; 1257)	21.35*** (df = 13; 1257)	6.42*** (df = 13; 1259)

Note: *p<0.1; **p<0.05; ***p<0.01

Table A1.2: Effects of Values on Political Behaviors, Excluding Political Controls

	Vote	Volunteer	Demonstrate	Contact Pol	Donate to Pol Org	Membership in Pol Org
	(1)	(2)	(3)	(4)	(5)	(6)
Values						
Self-Enhancement	−0.06	0.17**	0.00	0.03	−0.05	−0.02
	(0.07)	(0.04)	(0.04)	(0.07)	(0.06)	(0.04)
Self-Transcendence	0.05	0.07	0.15**	0.27**	0.32***	0.16**
	(0.09)	(0.06)	(0.05)	(0.10)	(0.08)	(0.05)
Conservation	0.22**	−0.16**	−0.13***	−0.29***	−0.29***	−0.14**
	(0.08)	(0.05)	(0.04)	(0.08)	(0.07)	(0.04)
Openness to Change	−0.02	0.05	0.04	0.12	0.10	−0.00
	(0.09)	(0.05)	(0.05)	(0.09)	(0.08)	(0.05)
Control Variables						
Education	0.34***	0.09***	0.11***	0.31***	0.20***	0.06*
	(0.05)	(0.03)	(0.02)	(0.05)	(0.04)	(0.02)
Income	0.01***	0.001	−0.002	−0.001	0.01***	0.002
	(0.003)	(0.002)	(0.001)	(0.003)	(0.002)	(0.001)
Gender: Male	0.01	−0.02	0.02	0.06**	0.05**	0.02*
	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)
Race: Nonwhite	0.02	0.001	0.004	−0.06*	0.03	−0.01
	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)
Age	0.005***	0.002***	0.001***	0.003***	0.005***	0.001
	(0.001)	(0.0004)	(0.0003)	(0.001)	(0.001)	(0.0003)
Constant	0.09	−0.16***	−0.13**	−0.30***	−0.47***	−0.07
	(0.08)	(0.05)	(0.04)	(0.08)	(0.07)	(0.04)
Observations	1,213	1,335	1,335	1,335	1,335	1,344
R^2	0.13	0.05	0.04	0.09	0.13	0.03
Adjusted R^2	0.12	0.04	0.03	0.09	0.13	0.02
Residual Std. Error	0.34 (df = 1203)	0.21 (df = 1325)	0.19 (df = 1325)	0.37 (df = 1325)	0.31 (df = 1325)	0.19 (df = 1334)
F Statistic	19.800*** (df = 9; 1203)	7.681*** (df = 9; 1325)	6.048*** (df = 9; 1325)	14.812*** (df = 9; 1325)	22.318*** (df = 9; 1325)	4.303*** (df = 9; 1334)

Note: *p<0.05; **p<0.01; ***p<0.001

Table A1.3: Logistic Models to Estimate Effects of Values on Political Behaviors

	Vote	Volunteer	Demonstrate	Contact Pol	Donate to Pol Org	Membership in Pol Org
	(1)	(2)	(3)	(4)	(5)	(6)
Values						
Self-Enhancement	−0.71	3.02**	0.11	0.32	−0.43	−0.42
	(0.67)	(1.01)	(1.02)	(0.55)	(0.67)	(1.02)
Self-Transcendence	0.20	1.88	4.29**	2.16**	3.95***	3.94**
	(0.84)	(1.31)	(1.48)	(0.75)	(0.96)	(1.39)
Conservation	1.73*	−2.94**	−2.59*	−1.82**	−2.41**	−2.88**
	(0.72)	(1.01)	(1.08)	(0.60)	(0.74)	(1.07)
Openness to Change	0.03	0.99	1.12	0.84	0.85	−0.23
	(0.81)	(1.23)	(1.30)	(0.69)	(0.85)	(1.27)
Control Variables						
Education	3.03***	2.56***	3.46***	2.47***	2.37***	1.64*
	(0.42)	(0.70)	(0.79)	(0.38)	(0.47)	(0.72)
Income	0.07**	0.04	−0.06	−0.01	0.12***	0.05
	(0.02)	(0.04)	(0.04)	(0.02)	(0.03)	(0.04)
Gender: Male	0.11	−0.40	0.36	0.45**	0.48*	0.64*
	(0.18)	(0.27)	(0.30)	(0.16)	(0.19)	(0.30)
Race: Nonwhite	0.19	−0.09	0.02	−0.58**	0.25	−0.35
	(0.20)	(0.34)	(0.36)	(0.20)	(0.23)	(0.38)
Age	0.04***	0.04***	0.04***	0.03***	0.06***	0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Constant	−4.25***	−9.47***	−9.74***	−5.86***	−10.77***	−6.85***
	(0.71)	(1.41)	(1.55)	(0.73)	(1.05)	(1.40)
Observations	1,213	1,335	1,335	1,335	1,335	1,344
Log Likelihood	−433.24	−227.06	−197.88	−561.22	−391.03	−207.64
Akaike Inf. Crit.	886.49	474.11	415.75	1,142.44	802.07	435.28

Note: *p<0.1; **p<0.05; ***p<0.01

Table A1.4: Effects of Universalism and Benevolence on Political Behaviors, Excluding Political Controls

	Vote	Volunteer	Contact Pol	Demonstrate	Donate	
	(1)	(2)	(3)	(4)	(5)	(6)
Values						
Universalism	0.01	0.04	0.07	0.06	0.16**	0.03
	(0.07)	(0.04)	(0.04)	(0.07)	(0.06)	(0.04)
Benevolence	0.03	0.02	0.05	0.17*	0.10	0.11**
	(0.07)	(0.04)	(0.04)	(0.07)	(0.06)	(0.04)
Control Variables						
Education	0.35***	0.09***	0.11***	0.31***	0.19***	0.06*
	(0.04)	(0.03)	(0.02)	(0.05)	(0.04)	(0.02)
Income	0.01***	0.001	−0.002	−0.001	0.01***	0.001
	(0.003)	(0.002)	(0.001)	(0.003)	(0.002)	(0.001)
Gender: Male	0.01	−0.02	0.01	0.06**	0.05**	0.02*
	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)
Race: Nonwhite	0.02	0.0002	0.004	−0.06*	0.03	−0.01
	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)
Age	0.01***	0.002***	0.001***	0.003***	0.005***	0.001
	(0.001)	(0.0004)	(0.0003)	(0.001)	(0.001)	(0.0003)
Constant	0.09	−0.14**	−0.11**	−0.26***	−0.41***	−0.04
	(0.08)	(0.04)	(0.04)	(0.08)	(0.06)	(0.04)
Observations	1,213	1,335	1,335	1,335	1,335	1,344
R^2	0.13	0.05	0.04	0.09	0.13	0.03
Adjusted R^2	0.12	0.04	0.03	0.09	0.13	0.02
Residual Std. Error	0.33 (df = 1202)	0.21 (df = 1324)	0.19 (df = 1324)	0.37 (df = 1324)	0.30 (df = 1324)	0.19 (df = 1333)
F Statistic	17.81*** (df = 10; 1202)	6.92*** (df = 10; 1324)	5.44*** (df = 10; 1324)	13.44*** (df = 10; 1324)	20.13*** (df = 10; 1324)	4.05*** (df = 10; 1333)

Note: *p<0.1; **p<0.05; ***p<0.01

Table A1.5: Effects of Values on Psychological Engagement Measures

	Political Interest	Political Attention
	(1)	(2)
Universalism	0.21***	0.18***
	(0.05)	(0.03)
Benevolence	−0.03	−0.03
	(0.05)	(0.04)
Observations	1,353	1,301

Note: Estimates are based on OLS. They do not correspond directly to effects on each specific political behavior.
*p<0.1; **p<0.05; ***p<0.01

Figure A1.1: The Structure of Basic Values[28]

[28] Taken from Schwartz (2010).

Appendix 2: Chapter Two Additional Materials

Table A2.1: Factor Analysis of Schwartz Values Measures - Study 2

	Altruistic	Egoistic	Biospheric
Altruism Question 1	**0.62**	0.11	0.08
Altruism Question 2	**0.84**	-0.06	0.04
Altruism Question 3	**0.96**	0.01	-0.04
Egoism Question 1	-0.16	**0.32**	0.03
Egoism Question 2	-0.03	**0.84**	-0.02
Egoism Question 3	0.04	**0.82**	0.01
Biospherism Question 1	0.05	0.00	**0.84**
Biospherism Question 2	-0.04	0.08	**0.82**
Biospherism Question 3	0.00	-0.06	**0.94**
SS Loadings	2.07	1.51	2.30
Prop Variance	0.23	0.17	0.26
Cum Variance	0.23	0.40	0.65
Prop Explained	0.35	0.26	0.39

Table A2.2: Sample Demographics

Statistic	Sample Statistics	CA Pop. Statistics
Age		
18-25 yrs	16.5%	14.2%
26-35 yrs	23.8%	19.3%
36-50 yrs	22.0%	28.7%
51-65 yrs	25.1%	23.2%
>65 yrs	16.1%	14.6%
Gender		
Male	36.2%	49.7%
Female	63.8%	50.3%
Household Income		
<$40,000	35.7%	33.7%
$40,000-75,000	25.1%	20.8%
$75,000-150,000	24.9%	27.3%
>$150,000	14.4%	14.0%
Education		
HS Grad or Less	13.8%	38.6%
Some College	40.6%	29.1%
Bachelor's Degree	30.6%	20.3%
Advanced Degree	15.1%	12%
Total Bachelor's or Higher	45.7%	32.3%
Race		
Non-Hispanic White	56.2%	37.8%
Hispanic	20.1%	38.8%
Asian	17.3%	14%
Black	5.9%	5.6%
American Indian	3.7%	<1%
Household Location		
Rural	24.1%	13%
Urban/Suburban	75.9%	87%
Party ID		
Democrat	47.8%	44.8%
Republican	28%	27.3%
Independent	24.1%	23.3%

Data comes from 2010 and 2015 American Community Survey estimates, and from the Public Policy Institute of California Statewide Survey. CA population data for age are estimates, as age bins do not align between the ACS and our survey.

Table A2.3: Correlation Matrix to Evaluate Multicollinearity of NEP and Values

	NEP	Altruism	Egoism	Biospherism
NEP	1.00	-	-	-
Altruism	0.27	1.00	-	-
Egoism	-0.05	0.07	1.00	-
Biospherism	0.40	0.54	0.11	1.00

Table A2.4: Non-Linear Models of Environmental Behavior - Negative Binomial and Logistic

	Environmental Communications	Env Organization	Demonstrate
	Negative Binomial	*Negative Binomial*	*Logistic*
	(1)	(2)	(3)
Demographic Controls			
Education	0.01	0.10*	0.43**
	(0.04)	(0.05)	(0.17)
Income	−0.01	0.08**	−0.08
	(0.03)	(0.04)	(0.13)
Gender: Female	0.27**	−0.31**	−0.25
	(0.11)	(0.15)	(0.45)
Age	−0.01**	−0.01*	−0.06***
	(0.003)	(0.005)	(0.02)
Race: Black	−0.15	−0.17	0.83
	(0.26)	(0.43)	(0.90)
Race: Latino	0.05	0.10	0.50
	(0.13)	(0.20)	(0.61)
Race: Asian	−0.08	0.31*	0.89
	(0.14)	(0.19)	(0.56)
Race: American Indian	0.20	−0.56	0.50
	(0.21)	(0.47)	(1.15)
Residency: Rural	0.11	−0.02	−0.68
	(0.11)	(0.19)	(0.80)
Values			
Altruism	0.32***	0.17	−0.11
	(0.10)	(0.14)	(0.41)
Biospherism	0.22**	0.31**	0.70
	(0.09)	(0.13)	(0.43)
Egoism	0.06	0.05	0.33
	(0.06)	(0.08)	(0.25)
Attitudes			
NEP	0.22***	0.09	0.15
	(0.06)	(0.09)	(0.28)
Ideology: Conservative	−0.08**	−0.06	−0.23
	(0.04)	(0.05)	(0.16)
Political Interest	0.20***	0.09	0.81***
	(0.05)	(0.08)	(0.31)
Party ID: Republican	−0.11	−0.20	−0.94
	(0.17)	(0.24)	(0.83)
Party ID: Democrat	−0.12	−0.07	−0.40
	(0.12)	(0.19)	(0.57)
Constant	−4.18***	−4.14***	−9.40***
	(0.56)	(0.79)	(2.67)
Observations	844	844	844
Log Likelihood	−753.31	−474.36	−90.52
θ	4,732.14 (29,507.14)	3,908.31 (25,733.14)	
Akaike Inf. Crit.	1,542.61	984.73	217.04
Note:			*p<0.1; **p<0.05; ***p<0.01

Message Framing Treatment Language

Egoism Treatment Message:

Please take a minute to read through the following newspaper article, which appeared in the March 23rd, 2016 edition of the Minneapolis Star Tribune:

The federal government's role in addressing climate change has continued to be a topic of major debate among both politicians in DC and people across the country. Opponents point to uncertainty regarding what the future holds on the issue and the costs that would be involved in changing the economy in an effort to decrease fossil fuel consumption.

Supporters of climate change action have focused on the impact climate change is already having on individuals' ways of life. They indicate that soon each of us will be personally affected by climate change in some way, whether in the form of lost income from a number of industries that will be harmed, threats to homes from wildfire or storms, severe water restrictions because of drought, or something else. Some people even say they already notice climate change, and supporters of the legislation suggest that as time goes on each of us becomes more and more likely to be directly impacted in some way. They also say it is in every individual's best interest to support action now in to try to address foreseen or unforeseen potential threats before things get significantly worse.

Neither supporters nor opponents can say exactly what the outcome of the political debating will be. As one federal official said, "it's either a great opportunity to show each of our resolve, or we will suffer major problems due to climate change, none more so than our children and grandchildren."

(265 words)

Biospherism Treatment Message:

Please take a minute to read through the following newspaper article, which appeared in the March 23rd, 2016 edition of the Minneapolis Star Tribune:

The federal government's role in addressing climate change has continued to be a topic of major debate among both politicians in DC and people across the country. Opponents point to uncertainty regarding what the future holds on the issue and the costs that would be involved in changing the economy in an effort to decrease fossil fuel consumption.

Supporters of climate change action have focused on the effects it could have on the world's major ecosystems including oceans, the arctic, and elsewhere. This has led many to believe that we are entering a period of mass extinction, with as many as half the earth's species going completely extinct over the next century. This could result from the catastrophic

collapse of many of the earth's major circles of life, with ecosystems unable to keep up with the speed of change in the climate. A wide variety of species from panda bears, whose food supply (bamboo) is likely to be decimated by warming weather, to penguins, who need sea ice in order to live, are in imminent danger. Supporters of action on climate change also suggest that the impacts of climate change on these ecosystems will continue to get more extreme as time passes, and that the only way to try to rebalance the natural world is to act.

Neither supporters nor opponents can say exactly what the outcome of the political debating will be. As one federal biologist put it, "it's either a great opportunity to show our continued resolve, or we're headed toward a complete ecological disaster with massive consequences for species across the planet."

(289 words)

Altruism Treatment Message:

Please take a minute to read through the following newspaper article, which appeared in the March 23rd, 2016 edition of the Minneapolis Star Tribune:

The federal government's role in addressing climate change has continued to be a topic of major debate among both politicians in DC and people across the country. Opponents point to uncertainty regarding what the future holds on the issue and the costs that would be involved in changing the economy in an effort to decrease fossil fuel consumption.

Supporters of climate change action focus their attention on the harmful impacts it is already having, hurting millions of people's health, financial stability, and overall well-being. Things like larger storms, more severe droughts, and bigger wildfires threaten peoples' homes as well as their lives. Moreover, these impacts do not affect people equally: poorer people around the world are also more vulnerable to being harmed by climate change, even though they have contributed to its cause the least. Supporters of legislation to address climate change have also suggested that timely action is essential, and that the only way to help people facing things like serious food shortages, displacement from their homes due to flooding, and other human catastrophes is to act now before things get much worse.

Neither supporters nor opponents can say exactly what the outcome of the political debating will be. As one federal official said, "it's either a great opportunity to show the continued resolve of the United States to help lead the world or we're headed toward a complete human tragedy."

(256 words)

Control Message:

Please take a minute to read through the following newspaper article, which appeared in the March 23rd, 2016 edition of the Minneapolis Star Tribune:

The federal government's role in addressing climate change has continued to be a topic of major debate among both politicians in DC and people across the country. Opponents point to our lack of knowledge about what the future holds on the issue and the costs that would be involved in changing the economy in an effort to decrease fossil fuel consumption.

In recent weeks, politicians on both side of the aisle have continued to debate the merits of each of their arguments. Neither side has seemed particularly willing to concede ground on the issue, even as both tell voters that they are dedicated to making practical policy changes where appropriate. Meanwhile, while survey data from around the country does suggest that most people have a well formed opinion on the matter, it is also apparent that at this particular moment most are not paying close attention, instead focusing on political issues or tuning out politics altogether. With an election looming, it seems less and less likely that the kind of compromise that would be required will come about anytime soon.

Neither supporters nor opponents can say exactly what the outcome of the political debating will be. As one federal official said, "We hope to get something meaningful done on the issue during this Congress, but so far it hasn't quite happened as we'd hoped."

(248 words)

Appendix 3: Chapter Three Additional Materials

Table A3.1: Sample Demographics

Statistic	Sample Statistics	CA Pop. Statistics
Age		
18-25 yrs	16.5%	14.2%
26-35 yrs	23.8%	19.3%
36-50 yrs	22.0%	28.7%
51-65 yrs	25.1%	23.2%
>65 yrs	16.1%	14.6%
Gender		
Male	36.2%	49.7%
Female	63.8%	50.3%
Household Income		
<$40,000	35.7%	33.7%
$40,000-75,000	25.1%	20.8%
$75,000-150,000	24.9%	27.3%
>$150,000	14.4%	14.0%
Education		
HS Grad or Less	13.8%	38.6%
Some College	40.6%	29.1%
Bachelor's Degree	30.6%	20.3%
Advanced Degree	15.1%	12%
Total Bachelor's or Higher	45.7%	32.3%
Race		
Non-Hispanic White	56.2%	37.8%
Hispanic	20.1%	38.8%
Asian	17.3%	14%
Black	5.9%	5.6%
American Indian	3.7%	<1%
Household Location		
Rural	24.1%	13%
Urban/Suburban	75.9%	87%
Party ID		
Democrat	47.8%	44.8%
Republican	28%	27.3%
Independent	24.1%	23.3%

Data comes from 2010 and 2015 American Community Survey estimates, and from the Public Policy Institute of California Statewide Survey. CA population data for age are estimates, as age bins do not align between the ACS and our survey.

Table A3.2: Estimating Support for Invasive Species Management

	Binary Support for the Project	Strength of Support for the Project
	(Logistic Regression)	(Ordered Logistic Regression)
Treatments		
Ecological Gain	0.57**	0.54***
	(0.23)	(0.18)
Ecological Loss	1.11***	0.99***
	(0.25)	(0.18)
Economic Gain	0.23	0.24
	(0.22)	(0.18)
Economic Loss	0.45**	0.30
	(0.23)	(0.18)
Attitudes/Values		
NEP	0.12	0.21***
	(0.10)	(0.07)
Animal Welfare	−0.36***	−0.23***
	(0.11)	(0.08)
Political Ideology	−0.04	−0.01
	(0.06)	(0.05)
Party ID: Democrat	−0.16	−0.22
	(0.20)	(0.15)
Party ID: Republican	−0.03	0.11
	(0.24)	(0.18)
Resources		
Education	−0.00	−0.02
	(0.06)	(0.04)
Household Income	−0.01	0.02
	(0.04)	(0.03)
Demographic Controls		
Gender: Female	−0.72***	−0.70***
	(0.17)	(0.13)
Rural	−0.05	0.07
	(0.19)	(0.15)
Race: Black	−0.24	−0.07
	(0.39)	(0.31)
Race: Latinx	−0.02	−0.02
	(0.21)	(0.16)
Race: Asian	0.36	0.11
	(0.22)	(0.16)
Race: Other	−0.12	−0.19
	(0.34)	(0.27)
Constant	2.84***	
	(0.68)	
Observations	992	992
Log Likelihood	−537.92	
Akaike Inf. Crit.	1,111.85	3,124.41

Note: *p<0.1; **p<0.05; ***p<0.01

Table A3.3: Estimating Effects of Pooled Treatments on Project Support

	Support for Invasive Species Management Project	
	(Logit)	(Logit)
Ecological Message	0.81***	
	(0.20)	
Economic Message	0.33*	
	(0.19)	
Gain Message		0.39**
		(0.19)
Loss Message		0.75***
		(0.20)
Attitudes		
NEP	0.13	0.11
	(0.10)	(0.10)
Animal Welfare	−0.38***	−0.37***
	(0.11)	(0.10)
Political Ideology	−0.04	−0.04
	(0.06)	(0.06)
Democrat	−0.16	−0.18
	(0.20)	(0.20)
Republican	−0.03	−0.04
	(0.24)	(0.24)
Resources		
Education	0.001	−0.001
	(0.06)	(0.06)
Income	−0.004	−0.01
	(0.04)	(0.04)
Demographic Controls		
Gender	−0.72***	−0.71***
	(0.17)	(0.17)
Rural	−0.05	−0.04
	(0.19)	(0.19)
Race; Black	−0.27	−0.24
	(0.39)	(0.38)
Race: Latinx	−0.03	−0.02
	(0.21)	(0.21)
Race:Asian	0.37*	0.38*
	(0.22)	(0.22)
Race: Other	−0.11	−0.08
	(0.33)	(0.33)
Constant	2.86***	2.91***
	(0.68)	(0.68)
Observations	992	992
Log Likelihood	−540.51	−542.13
Akaike Inf. Crit.	1,113.02	1,116.27
Note:		*p<0.1; **p<0.05; ***p<0.01

Table A3.4: Heterogeneous Treatment Effects By Ideology

Treatment (Pooled)	Predicted Support	ATE	N
Liberals			
Control	.70	-	83
Ecological Message	.89	19pp*	164
Economic Message	.74	4pp	197
Loss Message	.83	13pp*	172
Gain Treatments	.79	9pp	189
Conservatives			
Control	.68	-	63
Ecological Message	.79	11pp	114
Economic Message	.83	15pp*	118
Loss Message	.81	13pp*	115
Gain Message	.80	12pp	117
Moderates			
Control	.68	-	56
Ecological Message	.82	14pp*	125
Economic Message	.74	6pp	93
Loss Message	.86	18pp*	117
Gain Message	.69	1pp	101

Notes: Ideology was measured on a 7-point Likert scale. Moderates were defined as people who responded "Moderate, Middle of the Road (4); Liberals were defined as those who responded "Extremely Liberal," "Liberal," or "Somewhat Liberal" (1-3); Conservatives were responded "Extremely Conservative," "Conservative," or "Somewhat Conservative" (5-7).
* significant at $p<.05$

Table A3.5: Heterogeneous Treatment Effects Among Environmentalists and Non-Environmentalists

Treatment (Pooled)	Predicted Support	ATE	N
Environmentalists			
Control	.72	-	117
Ecological Message	.87	15pp*	221
Economic Message	.75	3pp	245
Loss Message	.83	11pp*	233
Gain Message	.78	6pp	233
Non-Environmentalists			
Control	.63	-	100
Ecological Message	.79	16pp*	211
Economic Message	.75	12pp*	180
Loss Message	.81	18pp*	191
Gain Message	.74	11pp	200

Environmentalists are defined as top half of respondents in terms in NEP.
Non-Environmentalists are defined as bottom half excluding mean.
* significant at $p<.05$

Table A3.6: Heterogeneous Treatment Effects By Party Identification

Treatment (Pooled)	Predicted Support	ATE	N
Democrats			
Control	.61	-	108
Ecological Message	.85	24pp*	193
Economic Message	.74	13pp*	214
Loss Message	.83	22pp*	199
Gain Treatments	.76	15pp*	208
Republicans			
Control	.70	-	60
Ecological Message	.80	10pp	127
Economic Message	.79	9pp	115
Loss Message	.82	12pp	122
Gain Message	.77	7pp	120
Independents			
Control	.84	-	44
Ecological Message	.87	3pp	100
Economic Message	.76	-8pp	85
Loss Message	.84	0pp	92
Gain Message	.81	-3pp	93

* significant at $p<.05$

Chapter Three Treatment Language

Ecological Gain Message:

Program to Eliminate Invasive Wild Pigs in California
For Immediate Release

February 8, 2017

California Department of Fish and Wildlife

Wild pigs or feral pigs (Sus scrofa) were first brought to California by Spanish settlers in the 1700s. Since then, and with many more introduction events, wild pigs have colonized almost every county in the state. Wild pigs are habitat generalists and occupy a variety of habitats, including native California grasslands, oak woodlands, and along creeks and streams.

Control measures have typically been limited to hunting pigs on both public and private lands, requiring the purchase of one tag per animal hunted. The California Department of Fish and Wildlife (CDFW) does not have an active management plan for invasive wild pigs. However, populations have become more and more established across the state, making control through hunting difficult. As of 2017, wild pigs present a major threat to native habitats and the food supply and survival of native California species.

As a result, CDFW is proposing a more rigorous approach to addressing the problem of invasive pigs. The proposal involves a program to trap and cull wild pig populations in every county in the state, with the ultimate goal of eliminating the entire wild pig population across the state.

The Department has identified **major ecological benefits associated with implementation of the program**:

- Increased populations of important native and endangered California species such as coastal elk that still exist and the native plants and reptiles that are eaten by wild pigs.
- Increased oak survival, aiding in efforts to preserve iconic habitat that is home to many native species.
- In total, successful implementation of the project will provide major benefits for nearly three dozen native California species that rely on the same food sources and live in the same habitats as the wild pigs.

CDFW is asking Californians' for their support and input on the project before planned early-stage implementation in Spring 2017.

Ecological Loss Message:

Press Release: Program to Eliminate Invasive Wild Pigs in California
For Immediate Release

February 8, 2017

California Department of Fish and Wildlife

Wild pigs or feral pigs (Sus scrofa) were first brought to California by Spanish settlers in the 1700s. Since then, and with many more introduction events, wild pigs have colonized almost every county in the state. Wild pigs are habitat generalists and occupy a variety of habitats, including native California grasslands, oak woodlands, and along creeks and streams.

Control measures have typically been limited to hunting pigs on both public and private lands, requiring the purchase of one tag per animal hunted. The California Department of Fish and Wildlife (CDFW) does not have an active management plan for invasive wild pigs. However, populations have become more and more established across the state, making control through hunting difficult. As of 2016, wild pigs present a major threat to native habitats and the food supply and survival of native California species.

As a result, CDFW is proposing a more rigorous approach to addressing the problem of invasive pigs. The proposal involves a program to trap and cull wild pig populations in every county in the state, with the ultimate goal of eliminating the entire wild pig population across the state.

The Department has identified **major ecological losses if the program is not implemented**:

- Continued decline in population numbers of important native and endangered California species such as coastal elk that still exist and the native plants and reptiles that are eaten by wild pigs.
- Increased oak death, leading to continued destruction of iconic habitat that is home to many native species.
- In total, the failure to implement the program could lead to further decline of three dozen native California species that rely on the same food sources and live in the same habitats as the wild pigs.

CDFW is asking Californians' for their support and input on the project before planned early-stage implementation in Spring 2017.

(326 words)

Economic Gain Message:

Press Release: Program to Eliminate Invasive Wild Pigs in California
For Immediate Release

February 8, 2017

California Department of Fish and Wildlife

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Control measures have typically been limited to hunting pigs on both public and private lands, requiring the purchase of one tag per animal hunted. The California Department of Fish and Wildlife (CDFW) does not have an active management plan for invasive wild pigs. However, populations have become more and more established across the state, making control through hunting difficult. As of 2016, wild pigs present a major financial burden to farmers and ranchers across the state.

As a result, CDFW is proposing a more rigorous approach to addressing the problem of invasive pigs. The proposal involves a program to trap and cull wild pig populations in every county in the state, with the ultimate goal of eliminating the entire wild pig population across the state.

The Department has identified **major economic benefits associated with implementation of the program**:

- $1.5 billion annual increase in the value of agricultural sales statewide by eliminating the major damages to private farmland.
- Over $12 million increase in annual state revenue from the sale of hunting tags for other animals like deer and elk by reducing competition with pigs.
- In total, successful implementation of the project will mean $15 billion increased state GDP and $120 million increase in state revenue over the next ten years.

CDFW is asking Californians' for their support and input on the project before planned early-stage implementation in Spring 2017.

(308 words)

Economic Loss Message:

Press Release: Program to Eliminate Invasive Wild Pigs in California
For Immediate Release

February 8, 2017

California Department of Fish and Wildlife

Wild pigs or feral pigs (Sus scrofa) were first brought to California by Spanish settlers in the 1700s. Since then, and with many more introduction events, wild pigs have colonized almost every county in the state. Wild pigs are habitat generalists and occupy a variety of habitats, including native California grasslands, oak woodlands, and along creeks and streams.

Control measures have typically been limited to hunting pigs on both public and private lands, requiring the purchase of one tag per animal hunted. The California Department of Fish and Wildlife (CDFW) does not have an active management plan for invasive wild pigs. However, populations have become more and more established across the state, making control through hunting difficult. As of 2017, wild pigs present a major financial burden to farmers and ranchers across the state.

As a result, CDFW is proposing a more rigorous approach to addressing the problem of invasive pigs. The proposal involves a program to trap and cull wild pig populations in every county in the state, with the ultimate goal of eliminating the entire wild pig population across the state.

The Department has identified **major economic losses if the program is not implemented**:

- $1.5 billion annual loss in value of agricultural sales statewide due to continued damage to farm and rangeland.
- $12 million annual state revenue lost from potential sale of hunting tags for other animals like deer and elk that are out-competed by pigs.
- In total, failure to implement the project will mean $15 billion lost state GDP and $120 million lost state revenue over the next ten years.

CDFW is asking Californians' for their support and input on the project before planned early-stage implementation in Spring 2017.

(304 words)

Control Message:

Press Release: Program to Eliminate Invasive Wild Pigs in California
For Immediate Release

February 8, 2017

California Department of Fish and Wildlife

Wild pigs or feral pigs (Sus scrofa) were first brought to California by Spanish settlers in the 1700s. Since then, and with many more introduction events, wild pigs have colonized almost every county in the state. Wild pigs are habitat generalists and occupy a variety of habitats, including native California grasslands, oak woodlands, and along creeks and streams.

Control measures have typically been limited to hunting pigs on both public and private lands, requiring the purchase of one tag per animal hunted. The California Department of Fish and Wildlife (CDFW) does not currently have a management plan for invasive wild pigs. However, populations have become more and more established across the state, making control through hunting difficult. As of 2017, wild pigs present a major financial burden to farmers and ranchers across the state.

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CDFW is asking Californians' for their support and input on the project before planned early-stage implementation in Spring 2017.
(224 words)