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Changing the Conversation about Climate Change: A Theoretical Framework for Place-Based Climate Change Engagement

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In this paper we present and test a theoretical framework for place-based climate change engagement. The framework is based on principles from place attachment theory, place-based education, free-choice learning, and norm activation theory. The framework, which we empirically validate here, demonstrates the power of engaging citizens in action-based learning at physical, material places, which are also symbolic sites for inspiring political action and learning about climate change impacts. Research has shown that climate change will resonate with diverse audiences when: (1) it is situated in cultural values and beliefs, (2) it is meaningful to that audience, and (3) it empowers specific action. We use data collected at 16 national parks and wildlife refuges in the USA; all of which are experiencing the impacts of climate change and struggling to develop climate change communication and outreach activities for their visitors and local communities. Thus, this framework and the empirical validation presented are the result of triangulating quantitative survey data (n = 4,181) and qualitative interviews (n = 359) to argue for the unparalleled potential for America's parks and refuges to inspire civic engagement in climate change through place-based communication.

Keywords: Climate Change; Place-Based Public Engagement Framework; Mixed Method Approach; National Parks; National Wildlife Refuges

America's national parks and wildlife refuges are changing. Climate change has been recognized as possibly the greatest challenge ever faced by the country's land

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management agencies (Delach & Matson, 2010). National parks and national wildlife refuges throughout the country are already beginning to see impacts on natural and cultural resources (Moritz et al., 2008; Salazar-Halfmoon, 2010), and ongoing research continues to reveal how our changing climate is affecting public lands across the country. Specifically, we have spent the past year understanding the array of climate impacts at 16 different places, including sea level rise and ocean acidification in south Florida (e.g., Krauss, From, Doyle, Doyle, & Barry, 2011; Wanless & Vlaswinkel, 2005), changes to estuaries and species range shifts in the greater Washington DC area (e.g., Gonzalez, Neilson, Lenihan, & Drapek, 2010; La Sorte & Thompson, 2007), glacial retreat, drought and species shifts on the Kenai Peninsula in Alaska (e.g., Berg, 2006; Klein, Berg, & Dial, 2005), altered river and marine ecosystems in the Puget Sound region (e.g., Huppert, Moore, & Dyson, 2009; Mote & Salathé, 2010) and snowmelt, streamflow, and vegetation changes in northern Colorado (e.g., Clow, 2010; van Mantgem et al., 2009). With impacts all around us, citizens are exposed to many messages about climate change on a daily basis, yet studies show a declining trend in public understanding of human-caused climate change (Scruggs & Benegal, 2012; Stern, 2007).

We propose a framework for *place-based climate change engagement*. Our framework is based on place attachment, place-based education, free-choice learning, and norm activation theories. We argue that place-based engagement is a framework for transforming public understanding about climate change. We present qualitative (349 interviews) and quantitative (4,181 surveys) evidence to validate the framework, and ultimately propose that creating place-based climate change engagement activities, situated in a meaningful geophysical context, such as the treasured landscapes of America's national parks and wildlife refuges, can inspire deeper public understanding of climate change and engage visitors in public discourse about its impacts.

Results from our interviews and surveys indicate that messages about climate change complexity and impacts resonate when they are nested in the cultural values and beliefs of the audience and are integrated with the experiential meaningfulness of place. Results also reveal that park and refuge visitors are seeking meaningful explanations and experiences to more deeply understand climate change impacts. The foundation of this paper is based on the premise that *place-based engagement about landscape-scale climate change impacts, situated in the contexts of national parks and wildlife refuges, has the potential to deepen public understanding of and engagement with the complex processes of climate change.* The goal of this investigation is to better understand diverse audiences' connection to place, desire for place-based and free-choice learning as well as desire for empowerment when attempting to understand climate change science and impacts. The framework and results presented here are an attempt to enhance the potential for communicators, interpreters, and managers of America's public lands to serve a more prominent and meaningful role in educating diverse members of the public about climate change. Historically, federal land management agencies were known for their conservative conservation behaviors, often seen catering to the needs of middle-class leisure activities and neglecting

marginalized social groups. However, this has changed in the past 30 years, and today one can find tremendous evidence of federal agencies actively reaching out to diverse audiences, from urban youth to rural Latino populations. This shift in agency priority audiences combined with enthusiasm for alternative methods of audience engagement on climate change is a timely opportunity to transcend the political debate about climate change in the USA and engage citizens in meaningful civic dialog about our changing planet.

The Challenge of Communicating and Engaging Citizens in Climate Change

Numerous writers have described climate change as one of humanity's greatest challenges (Silver, 1990; Speth, 2004). However, the public, to date, has paid relatively little attention to climate change, and those trying to create a greater sense of urgency have used some unsuccessful strategies (i.e., overly "balanced" news reporting, jargon-laden and cautious science-speak, and alarmist fear appeals). Since the 1990s, communication and social science scholars have worked to investigate, analyze, and determine what makes for effective communication about climate change. This thread of research began in the early 1990s with numerous studies of the public's understanding of climate change (i.e., Bell, 1994; McComas & Shanahan, 1999; Shackley & Wynne, 1996; Stamm, Clark, & Eblacas, 2000; Trumbo, 1995, 1996; Ungar, 1995, 2000; Williams, 2001; Wilson, 1995, 2000; Zehr, 2000). These studies primarily focused on news media and journalistic reporting traditions.

Many factors have explicitly challenged the effective communication of climate change science to the public. First, there is an enormous time lag in the change in climate and changes in our social system, coupled with the assumption that the impacts of climate change most directly affect the developing world (Lorenzoni & Pidgeon, 2006; Moser & Dilling, 2004). Second, there is a widening gap between the public's awareness of what action is needed and what actions are being taken. Without an understanding of what to do, individuals are left feeling overwhelmed and frightened, or blissfully ignore the magnitude of the issue through denial (Moser & Dilling, 2004).

Compounding an individual's feeling of being overwhelmed, blissfully ignorant, or outright denying climate change is happening is a lack of understanding of the science of climate change. When it comes to climate change literacy in the USA, the average American would score 54% (i.e., they would fail) on an 81-question test about climate science, climate change impacts, and earth systems (Leiserowitz, Smith, & Marlon, 2010). One issue influencing the lack of climate literacy in the USA is that most people get their information about climate change from television news (Maibach, Wilson, & Witte, 2010), and when climate change is reported in the news it is often accompanied by images of weather disasters. From earlier research (i.e., Read, Bostrom, Morgan, Fischhoff, & Smuts, 1994; Trumbo, 1995) we know that the public understands weather and natural disasters as *acts of god* and fails to see that human actions and lifestyle choices are capable of influencing the pace of climate change. Overcoming this challenge requires that climate change communicators

connect human choices and behaviors to the cause of climate change events by educating their audience on the complexity of earth systems, specifically the dynamic relationships and interconnections within our social and ecological systems.

Theoretical Foundation for Place-based Engagement

Four theoretical threads create the foundation for developing a multi-faceted, holistic framework for place-based climate change engagement: (1) place attachment, (2) place-based education, (3) free-choice learning, and (4) norm activation theory (NAT). In the next section we articulate the components of the framework and then introduce the key insights gained from the synthesis of these four theories.

Place Attachment Theory

Place attachment theory suggests that people have an emotional relationship with specific landscapes. The environmental psychology field has defined place attachment as the bonding of people to places (Altman & Low, 1992). Brown and Perkins (1992) discuss the complexity and dynamics of emotions in place attachment. In *Disruptions in Place Attachment,* they note "Place attachments are not static either; they change in accordance with changes in the people, activities or processes, and places involved in the attachments. They are nurtured through continuing series of events that reaffirm humans' relations with their environment" (p. 282).

In creating our climate change engagement framework, we have focused on devising strategies to seek to understand the bonds and different forms of attachment that people have for places, particularly landscapes impacted by climate change. Extensive research has covered place attachment in public space, and nature and wilderness experiences (Bricker & Kerstetter, 2000; Low, 2000; Steel, 2000), but place attachment alone cannot explain the meanings people assign to places and how those meanings are altered as environmental crises arise. Stedman (2003) indicated that there are opportunities to take advantage of people' bonds to specific places; his research explored the place protective behaviors that are likely to result when attachment and satisfaction are based on preferred meanings, which may be threatened by potential changes to the setting. Furthermore, O'Neill and Nicholson-Cole's (2009) study on visual and iconic representations of climate change reinforces the importance of a physical, place-based connection in the communication of climate change:

> All groups made it clear that local impact images are necessary to make people feel empowered to make a difference. They also insisted that a global context should be included, to make the seriousness of the issue resonant, though this should be done carefully so as to avoid making people feel afraid or overwhelmed and totally helpless (p. 374).

Hess, Malilay, and Parkinson (2008) stress the benefits of localizing climate change messages:

> In particular, a focus on place emphasizes the local nature of both exposures and response, and it brings attention to environmental changes where the motivation to address them is strongest: Emphasizing place highlights climate change's effects

where they are most acutely felt, where local strengths are best understood, where place attachment can be leveraged most effectively, where residents will reap the benefits of adaptive measures promoting sustainability and livable communities (p. 476).

Place-Based Education

The practice of learning outside has been called by many names, including bioregional education, environmental education, outdoor education, place-based education, and experiential learning. Despite different labels these concepts are often interconnected and have similar meanings. For the scope of this framework, we focus on place-based education and experiential learning as communication and engagement opportunities to link climate change with places and individual or group-based experiences. Both of these paradigms are based on connecting people to the land through applied learning and experiences in the field. People will remember lessons and adopt behaviors when they feel a sense of responsibility and have knowledge of consequences. Thomashow (2002) states that the most effective way to understand and learn about the changes in the environment is by developing an intimacy with the land around you. Much of the current place-based education research is focused on children's learning experiences, but we believe that the underlying principles are applicable to educating *K-to-Gray* audiences. It is essential that people are encouraged to understand and appreciate natural environmental processes before trying to digest the complexity of global climate change and make appropriate behavior changes. Sobel (2004) observed that:

> Authentic environmental commitment emerges out of firsthand experiences with real places on a small manageable scale (p. 34) . . . What's important is that [people] have an opportunity to bond with the natural world to learn to love it, before being asked to heal its wounds. (p. 9)

Sobel's research also reinforces the importance to develop place-based climate change engagement activities.

Free-Choice Learning Theory

Free-choice learning is guided by the desires and motivations of each idiosyncratic learner, and therefore exhibits different learning outcomes as varied as the learners themselves (Falk, 2005; Falk & Dierking, 2002). Free-choice learning typically occurs in areas such as national parks, national wildlife refuges, aquariums, zoos, and museums where a highly structured learning atmosphere is absent (Falk, 2005; Falk & Dierking, 2002). According to Falk and Dierking (2002), free-choice learning integrates three factors of place, person, and others, also known as the physical, personal, and social contexts. Learning of this nature occurs in particular places where the learner can discuss and form personally relevant knowledge with friends, family, and others. Free-choice learning has been suggested as a major means in which many individuals learn about the environment (Falk, 2005; Heimlich & Falk, 2009). Even though many learners may not receive the intended message from the

venue, the experience is still enriching and continues to sculpt the identity of the individual learner (Falk, 2005; Heimlich & Falk, 2009).

Norm Activation Theory

Originally, Schwartz (1977) proposed the NAT to explain pro-social behaviors, or behaviors which benefit society or others at the giver's expense, such as donating to charity. This original theory held that personal norms, or self-expectations of performing pro-social behaviors, were activated by four situational variables: (1) problem awareness—an individual's knowledge of a person or subject in need; (2) ascription of responsibility—how responsible an individual feels for the need; (3) outcome efficacy—the usefulness of actions to alleviate the need; and (4) ability to help—an individual's perception of their ability to help alleviate the need (Schwartz, 1977). An activated personal norm thus led to pro-social behaviors. In more recent applications of NAT in the environmental field, personal norms were found to be a better predictor of pro-environmental behavior than the new environmental paradigm scale (Wildegren, 1998). Other studies which have successfully employed NAT involve participation in curbside recycling programs (Schultz, 1998), home water conservation (Harland, Staats, & Wilke, 2007), littering (de Kort, McCalley, & Midden, 2008), and car use (Harland et al., 2007; Klöckner & Matthies, 2009). Relatively few studies have been conducted on NAT and climate change, and studies that have addressed climate change include the issue among other environmental variables (eg. Guagnano, Dietz, & Stern, 1994). Climate change is different from many environmental problems, in that the causes are globally diffused and impacts are not uniformly spread or universally noticeable. Current confusion among much of the American public regarding the causes of and solutions to climate change (Leiserowitz et al., 2010) also acts to deactivate situational variables of problem awareness, ascription of responsibility, outcome efficacy, and ability to help.

The Place-Based Climate Change Engagement Framework

Based on the theoretical threads introduced, place-based climate change engagement should provide a meaningful dialog in a specific place, where audiences interact with each other and the landscape to develop a deeper understanding about ecological and social interrelationships and impacts on the ecosystem. Through this framework, communicators have the opportunity to create a public engagement forum that is place-based and social with an emphasis on learning and personal responsibility. Such engagement has the potential to inspire the necessary behavior change to curb anthropogenic climate change impacts and ultimately change the public conversation through simplifying and connecting climate change impacts to people's values, personal experiences, and daily lives. This framework allows us to integrate multiple dimensions of climate change communication and argue for the potential power of landscapes to assist in telling the story of climate change. Offering place-based illustrations will encourage and influence individuals' perceived response efficacy and self-efficacy to combat climate change on a local, regional, national, and global scale.

Table 1. Response rates from visitor surveys at national parks and national wildlife refuges.

Park/Refuge	Annual visitation (2010)	*n*	%	Response rate (%)	Confidence interval
Olympic NP	2,844,563[a]	425	10	70	±5%
Dungeness NWR	80,263[b]	160	4	58	±8%
Mount Rainier NP	1,191,754[a]	414	10	63	±5%
Nisqually NWR	200,000	295	7	75	±6%
North Cascades NP	24,659[a]	294	7	69	±6%
Kenai NWR	1,021,525[c]	144	3	75	±8%
Kenai Fjords NP	297,596[a]	494	12	68	±4%
National Capital Parks East	1,167,393[a]	162	4	76	±8%
Prince William Forest Park	386,521[a]	174	4	68	±7%
Harpers Ferry NHP	268,822[a]	203	5	68	±7%
Rocky Mountain NP	2,955,821[a]	382	9	54	±5%
Rocky Mountain Arsenal NWR	30,100	58	1	76	±13%
Everglades NP	915,538	416	10	64	±5%
Biscayne NP	467,612	264	6	67	±6%
Ten Thousand Islands NWR	180,520	112	3	82	±9%
Key Deer NWR	95,000	179	4	88	±7%
Total	12,127,687	4,181	100	70	+2%

Note: Response rate was calculated by dividing the number of visitors who agreed to take the survey by the total number of visitors who were asked to take the survey.
[a]Statistics obtained from http://www.nature.nps.gov/stats/
[b]Statistics obtained from Kevin Ryan, Dungeness National Wildlife Refuge (K. Ryan, personal communication, August 8, 2011).
[c]Statistics obtained from Candace Ward, Kenai National Wildlife Refuge (C. Ward, personal communication, August 8, 2011).

Adhering to the framework, communicators or stewards of any place, can (1) illustrate the impacts of climate change by emphasizing impacts in the immediate local context, (2) connect climate impacts to human behavioral choices through systems-based explanations, and (3) provide concrete suggestions for specific actions, thus, overcoming the typical challenges of communicating about climate change. We tested the viability of our framework through extensive national surveys and interviews at 16 national parks and wildlife refuges across the USA (Table 1).

Methodology

We surveyed and interviewed national park and refuge visitors to better understand if our framework matched audience desires and preferences for climate change engagement. Specifically, we assessed (1) audience concern about and willingness to change their behavior in response to climate change (empowerment; connection to human behavior); (2) audience awareness and knowledge about climate change (local

impacts and context); (3) how they want to learn about climate change (audience preferences; empowerment); and (4) how significant the place (park or refuge) is to them (connection to place).

From May 2011 through January 2012, the authors and a team of graduate researchers and undergraduate interns conducted 349 visitor interviews and administered 4,181 visitor surveys in 16 different national parks and wildlife refuges across the USA. Nearly half of the participating national parks and wildlife refuges were located in urban, metropolitan areas (Washington, DC, Miami, Denver, and Tacoma). All of the urban parks and refuges are easily accessible by public transportation and frequently used for field trips with local, urban youth. Within these urban contexts, there remains a vast potential for communication and engagement opportunities, especially as urban population centers continue to grow.

The research team used a non-random, intercept sampling method. Researchers administered interviews and surveys at various stages of the visitor experience, from visitor centers near the entrance to popular viewpoints and trailheads, and in the evenings at on-site campgrounds. The researchers conducted surveys and interviews separately, with an interview team conducting research at one park or refuge while a survey team conducted research at another park or refuge within the region. Respondents took an average of 15 minutes to complete the survey and an average of 5 minutes to complete the interview. Although this was a nonprobabilistic sample, efforts were made by the research team to ask every visitor encountered to take a survey. At trailheads, this included asking every visitor who was exiting the trail, while in campgrounds protocol included visiting every inhabited campsite. In approaching every visitor, we increased the chances of a more representative sample since every member of the population had an equal chance of being selected. We also attempted to reduce sampling error by increasing the overall sample size. Inevitably, a few visitors who were able to stealthily avoid taking the survey, though these instances were rare, and when noticed, were noted as a *nonresponse*.

The survey was first created in paper form and was later converted into an electronic form using an online template from iSURVEY and an accompanying app for Apple iPads. The iSURVEY app allows for the electronic survey to be presented on iPads as well as other handheld electronic devices. The survey team was able to administer the survey on 10 iPads and gather an unlimited number of responses within the allowable one-month licence period, which we renewed as necessary. All of the results are saved, synced, and uploaded to an automatically generated data file, accessed on the iSURVEY password-protected website. The interviews were recorded using handheld voice recorders and later transcribed by the researchers. The interviews consisted of seven open-ended questions which included the following: (1) What does climate change mean to you?; (2) How would you describe climate change to a friend?; (3) Have you seen anything in the park/refuge today that makes you think, "that's happening because of climate change"?; (4) Have you received any information about climate change at this park or refuge?; (5) Would you like to learn about climate change in this place and if so, how would you like to learn?; (6) Do you personally do anything to reduce your impact on the earth?; and (7) What motivates you to take these actions?. The ordering

of these questions has most likely led to order effects and social desirability bias where respondents provide answers consistent with the perceived viewpoints of the interviewer (Vaske, 2008). Results should therefore be interpreted with caution.

Typically, researchers spent two weeks in each region and four days at each individual site collecting visitor data. The brevity of time spent at each site was necessary to reach a greater number of sites within each region. Most interviews and surveys were collected during the weekends for greater visitor numbers and convenience; however, efforts were made to have both weekends and weekdays represented at each site. The interview and survey request was presented as a research project and not affiliated with the specific refuge or park at which the survey was being conducted.

Data Treatment and Analysis

Among the primary aims of the on-site qualitative and quantitative research were to assess the extent that visitors are concerned about climate change, willing to engage in mitigating actions, accept responsibility for personal contributions to climate change, aware of site-specific impacts, interested in learning about the subject, and attached to parks and refuges. These topics were addressed through 34 separate items on the survey. Most of the questions on the survey measured participants' level of agreement to a variety of statements regarding parks and refuges and climate change on a five-point scale which ranged from (1) strongly agree to (5) strongly disagree. Other questions on the survey consisted of partially close-ended response choices and close-ended with ordered response choices (Salant & Dillman, 1994). Data were downloaded from the iSURVEY website into an automatically generated SPSS file. The iSURVEY program assigns numeric values to question options based on their order with the first option being assigned a value of 1, the second option being assigned a value of 2, etc. Missing values were omitted from analyses. All analyses were conducted using SPSS 19. Internal consistency scales measuring salience, ascription of responsibility, awareness of consequences, and place attachment were examined using Cronbach's alpha reliability coefficients. The questions used in this study are described below.

Three variables were used to measure concern about: (1) how worried are you about climate change, responses ranging from extremely worried to not worried; (2) how important is the issue of climate change to you personally, responses ranging from extremely important to not important; and (3) how often do you think about climate change, responses ranging from all the time to not at all were combined successfully into one concept of salience ($\alpha = 0.89$, Table 2).

Visitors' willingness to change behavior was measured with a single item indicator. Respondents were asked to respond to the question: how willing are you to change your behaviors in this park/refuge to help reduce the impacts of climate change. Responses options consisted of (1) extremely willing; (2) very willing; (3) somewhat willing; (4) slightly willing; and (5) not willing.

Visitors were also asked to respond to three questions regarding their responsibility for contributing to climate change. The questions specifically asked visitors to agree or disagree with the following statements (1) I feel somewhat responsible for the

Table 2. Reliability analysis of variables used in the regression model.

Scale items	Cronbach's alpha	Item total correlation	M	SD
Place attachment	0.92			
This park/refuge is very special to me		0.79	1.82	0.78
I identify with this park/refuge		0.83	2.10	0.86
I am very attached to this park/refuge		0.83	2.25	0.89
This park/refuge means a lot to me		0.85	2.07	0.86
Ascription of responsibility	0.74			
I feel somewhat responsible for the presently occurring environmental problems		0.66	2.60	1.01
I feel responsible for contributing to the condition of the climate		0.70	2.64	1.05
Because my contribution is very small, I do not feel responsible for climate change		0.37	2.55	1.06
Salience	0.89			
How worried are you about climate change		0.83	2.48	1.17
How important is the issue of climate change to you personally		0.84	2.47	1.12
How often do you think about climate change		0.71	2.67	0.97
Awareness of consequences	0.87			
How much do you believe climate change will harm future generations		0.78	1.66	0.99
How much do you believe climate change will harm you personally		0.73	2.47	0.91
How much do you believe climate change will harm this park/refuge		0.74	1.94	1.08
Knowledge of Causes	–			
Assuming climate change is happening, what do you think it is caused by		–	1.80	0.69
Willingness to Change	–			
How willing are you to change your behaviors to help reduce the impacts of climate change		–	2.17	1.04

Note: Scaled survey items were measured using a five-point scale where 1 = "Strongly agree" and 5 = "Strongly disagree". All positive measures were re-coded into negative measures. The concept "Knowledge of causes" was measured on a three-point scale where 1 = "mostly human activities", 2 = both human activities and natural changes in the environment, and 3 = "mostly by natural changes in the environment". The concept "Willingness to Change" was measured on a five-point scale where 1 = "Extremely willing" and 5 = "Not willing".

presently occurring environmental problems, (2) I feel responsible for contributing to the condition of the climate, and (3) because my contribution is very small, I do not feel responsible for climate change. Responses were measured on a five-point scale ranging from (1) strongly agree to (5) strongly disagree. These three questions were combined, after reverse coding the third question, to create an ascription of responsibility concept ($\alpha = 0.74$, Table 2).

In addition to concern about climate change and willingness to take mitigating action, the visitor survey assessed visitors' awareness of climate change and its site-specific impacts as well as their self-reported knowledge about this issue. Visitors were asked: do you think climate change is happening. Response options were on a

seven-point scale ranging from extremely sure climate change is happening to extremely sure climate change is not happening. To further test visitor knowledge of causes, respondents were asked if they believed that climate change is mostly caused by humans, by both humans and natural causes, or by mostly natural causes. With regard to visitors' knowledge about the causes and consequences of climate change, the visitor survey included three items assessing how well informed respondents feel about the different causes of climate change, its consequences, and ways in which we can reduce global warming. Each of these items was measured on a five-point scale ranging from (1) extremely informed to (5) not informed.

Two questions on the survey measured visitors' ability to notice climate change impacts in parks and refuges. Visitors were asked to rate their level of agreement with the following statements: (1) I believe that some of the effects of climate change can already be seen at our parks/refuges and (2) I believe that some of the effects of climate change can already be seen at this park/refuge. In order to measure current actions taken to mitigate climate change, visitors were also asked to select all mitigating actions they currently take from a list of 10 possible actions ranging from planting trees to reducing airplane travel.

Two questions were used to measure visitors' desire to learn about climate change impacts. Visitors were asked to rate their level of agreement with the following statements: (1) I would like to learn more about climate change impacts in our national parks/refuges and (2) I would like to learn more about climate change impacts in this park/refuge. Additionally, visitors were asked to select all of the ways they would like to learn about climate change from a list of 12 different options ranging from ranger-guided walks/talks to trailside exhibits.

Connection to place serves as a powerful ally for galvanizing people to learn of, care about, and mitigate the impacts of climate change in national parks and national wildlife refuges. In this study, place attachment was measured according to four self-reported variables measured on a five-point agreement scale: (1) this park/refuge is very special to me; (2) I identify strongly with this park/refuge; (3) I am very attached to this park/refuge; and (4) this park/refuge means a lot to me. These variables were combined to form the concept of place attachment ($\alpha = 0.92$, Table 2).

To compare park and refuge visitors' engagement with climate change to the average American, an audience segmentation analysis similar to the Yale Project on Climate Change Communication's (YPCC) Six Americas study was conducted using results from our visitor data. Unfortunately, at the time of implementation of the survey instrument, the Global Warming's Six Americas screening tools were not available. However, efforts were made early in development to incorporate many of the questions from the original Six America's study into the survey. A K-means cluster analysis was used to segment respondents into homogeneous groups based on their responses to 11 questions regarding their awareness, knowledge, and concern about climate change (Table 3). The Global Warming's Six Americas 15-item screening tool (Maibach, Leiserowitz, Roser-Renouf, Mertz, & Akerlof, 2011) is available online[1] and can be compared with the questions used in the cluster analysis used in this study. Survey respondents were grouped into six clusters similar to those

Table 3. Means and standard deviations for items used in K-means cluster analysis ($n = 4,181$).

Variables	M	SD
(1) Do you think climate change is happening	2.49	1.59
(2) Assuming climate change is happening, what do you think it is caused by	1.86	0.77
(3) How well informed do you feel about the different causes of climate change	2.34	0.88
(4) How well informed do you feel about the different consequences of climate change	2.34	0.87
(5) How well informed do you feel about the ways in which we can reduce climate change	2.45	0.90
(6) How worried are you about climate change	2.48	1.17
(7) How important is the issue of climate change to you personally	2.47	1.12
(8) How often do you think about climate change	2.67	0.97
(9) How much do you think climate change will harm you personally	2.41	0.83
(10) How much do you think climate change will harm future generations of people	1.57	0.83
(11) When do you think climate change will start to harm people in the USA	2.87	1.82

Note. Variable (1) was measured on a seven-point scale where 1 = "extremely sure climate change is happening" and 7 = "extremely sure climate change is not happening." Variable (2) was measured on a four-point scale where 1 = "mostly human activities," 2 = "both human activities and natural causes," 3 = "mostly natural causes" and 4 = "none of the above because climate change is not happening." Variables (3–5) were measured on a five-point scale where 1 = "extremely informed" and 5 = "not informed." Variable (6) was measured on a five-point scale where 1 = "extremely worried" and 5 = "not worried." Variable (7) was measured on a five-point scale where 1 = "extremely important" and 5 = "not important." Variable (8) was measured on a five-point scale where 1 = "all the time" and 5 = "never." Variables (9 and 10) were measured on a four-point scale where 1 = "a great deal" and 4 = "not at all." Variable (11) was coded on a seven-point scale where 1 = "now" and 7 = "never."

included in the YPCC's Six Americas studies: *alarmed*, *concerned*, *cautious*, *disengaged*, *doubtful*, and *dismissive* (Maibach, Roser-Renouf, & Leiserowitz, 2009). We labeled our six, comparable clusters of this study: *engaged*, *thoughtful*, *questioning*, *apathetic*, *skeptical*, *and disbelieving*. The resulting clusters are similar to the Six Americas segmentation; however, due to the discrepancy between the questions used in the Six Americas segmentation and the limited questions used in this study, comparison of the results should be interpreted with caution.

Many of the above mentioned concepts were used in a regression model to test the normative function of visitors' willingness to change behavior to mitigate the effects of climate change. Two separate regressions were conducted in order to obtain estimates of the path coefficients and the relative influence of the independent variables on the dependent variables. Variables were entered into the regression equation simultaneously using the *Enter* method in SPSS. Saliency was regressed on ascription of responsibility, place attachment, awareness of consequences, and knowledge of causes. Willingness to change behavior was regressed on all four variables, including saliency. The resulting standardized beta coefficients (β) represent the direct relationship between two concepts. The resulting coefficient of determination (R^2) represents the percent of variability in the dependent variable that is explained by the independent variable (Vaske, 2008).

Table 4. Demographic characteristics of participants (*n* = 4,181).

Characteristic	*n*	%
Gender		
Male	2,065	51
Female	1,945	49
Highest education level completed		
Less than high school	109	3
Some high school	108	3
High school graduate	248	6
Some college	500	13
Two-year college degree	279	7
Four-year college degree	1,133	28
Graduate or professional degree	1,625	41
Ethnicity		
American Indian or Alaska Native	45	1
Asian	186	5
Black or African American	72	2
Hawaiian or Pacific Islander	14	0
Hispanic or Latino/Latina	141	4
White or Caucasian	3,981	86
Other	80	2

Results

Sample Demographics

Demographic characteristics reveal an even representation of male (51%) and female (49%) participants (Table 4). The average age of the participant was 45 years. Most participants had completed a four-year college degree or above (70%). The majority of participants identified their ethnicity as Caucasian (87%). The sample demographics of this study represent visitors to national parks and wildlife refuges and do not reflect the US population as a whole.

Of the visitors surveyed, 56% stated that they are either extremely worried (22%) or very worried (34%) about climate change. When asked how important climate change is on a personal level, 55% of visitors responded that climate change is extremely (21%) or very (34%) important. The third survey item related to concern about climate change regarded how often visitors think about climate change. Survey results indicate that 45% of visitors were cognizant of this issue. Over one-third (36%) stated that they think about climate change frequently, and just under 10% responded that they think about climate change all the time.

Similar results were found in the interviews as well. The following quote from a 73-year-old, retired male reflects the typical level of visitor concern: "Well, I've read quite a bit about it and I'm very fearful of reaching the tipping point which can be devastating . . . There could also be an ice age in this area, I'm concerned about that." The potential for visiting a national park or refuge in vulnerable climate regions to influence the extent that visitors perceive climate change as an important issue is illustrated by a 69-year-old retiree: ". . . [climate change] didn't mean a whole lot until I'm seeing this stuff. It's happening. I guess I didn't think it was that important

before. I see now that it is." This example is evidence that place-based discussions about climate change have the potential to immediately impact individuals' perception and concern about the issue.

Consistent with the qualitative insights, the vast majority of survey respondents (68%) stated that they are willing to change their behaviors in national parks and wildlife refuges to help reduce the impacts of climate change. Nearly 30% of visitors indicated they are extremely willing to change their behaviors, and 38% said they would be very willing to do so.

Most visitors either strongly agreed or agreed with the first question: I feel somewhat responsible for the present occurring environmental problems (50%), and the second question: I feel responsible for contributing to the condition of the climate (54%); and disagreed (55%) with the third question: because my contribution is very small, I do not feel responsible for climate change.

Results from the cluster analysis show that a substantially higher proportion of park/refuge visitors (29%) fall into the "engaged" category relative to the amount of the American public falling into the "alarmed" category (Leiserowitz, Maibach, Roser-Renouf, & Smith, 2011) (Figure 1). Furthermore, 21% of survey respondents were in the "thoughtful" category. According to the most recent YPCC Six Americas study, 39% of the American public is either alarmed or concerned about climate change population (Leiserowitz et al., 2011); therefore, the fact that 50% of park and refuge visitors were grouped in the engaged and thoughtful categories suggests that this audience may be more knowledgeable, concerned, and engaged with climate change than the average American.

Audience Awareness and Knowledge of Climate Change and Impacts

The results from visitor interviews provide useful insight regarding the extent that visitors understand the meaning of the term climate change and recognize the relationship between site-specific ecological changes and increasing global temperatures. Of the 4,181 visitors surveyed, the majority (61%) is either very or extremely sure that climate change is happening. Most respondents stated that climate change is caused by both humans and natural causes (49%), whereas 36% answered that climate change is caused mostly by humans.

Based on the survey results, most visitors feel either very or extremely informed about both the causes of climate change (59%) and its consequences (59%). Approximately one-third (33%) of respondents, however, stated that they feel only somewhat informed about each of these concepts. Transcriptions of visitor interviews
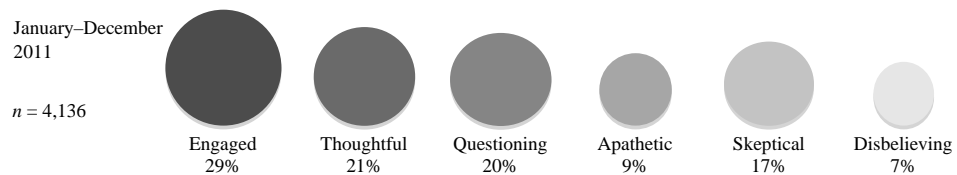
January–December
2011

$n = 4,136$

| Engaged | Thoughtful | Questioning | Apathetic | Skeptical | Disbelieving |
| 29% | 21% | 20% | 9% | 17% | 7% |

Figure 1. National Parks and national wildlife refuges audience segmentation.

corroborated these findings. When asked what climate change meant to them, a male and a female, both in their mid-30s and responding jointly, stated that:

> ...[The earth's] temperatures are warmer now than they used to be probably from the greenhouse gases society has been emitting and that leads to an overall warming, and different areas may experience that differently...[They] started calling it climate change because some areas may experience drought and others may experience more rain and more snow...

This quote demonstrates that visitors have a fairly clear understanding of the meaning of the term climate change as well as some of its general global consequences. Many other quotes from interviews indicate that there was a great deal of awareness among visitors that glaciers are melting because of climate change and that polar bears are being negatively affected by increasing global temperatures due to loss of habitat. Nevertheless, the following quote from a woman in her mid-40s regarding the meaning of climate change reflects the difficulty some visitors experience comprehending an issue that is so large-scale and complex: "It doesn't really mean anything to me because it's too broad for me to really grasp."

As far as the occurrence of place-specific impacts of climate change and ways that we can reduce it, the survey results indicate that park and refuge visitors are well informed. While over half of the visitors surveyed (57%) agreed or strongly agreed that the impacts of climate change are observable in the specific area they visited, survey results demonstrate that more visitors (67%) are aware that the effects of climate change can already be seen in national parks and wildlife refuges across the country. More than half of the visitors (53%) stated that they are either very or extremely informed about ways that climate change can be mitigated. Additionally, most visitors selected 4–5 actions (36%), when asked to select from a list of 10 mitigating actions they were currently taking.

Audience Desire to Learn about Climate Change

Visitor survey and interview results demonstrate significant visitor interest in learning about climate change and its impacts on parks and refuges; 68% of 4,181 visitors surveyed expressed a desire to learn more about climate at parks and refuges. For example, when asked if interested in learning about climate change at Nisqually National Wildlife Refuge one visitor replied, "Yeah...people that come here...are interested in taking care of our world, so I think it's a proper place to teach." Another visitor at Olympic National Park said, "I think that's a very good idea, because [the NPS] is more like...an objective voice...They have a lot of credibility, [like] the whole idea of the rangers."

When provided a list of 12 learning methods, surveyed visitors identified websites as the most preferred method (46%), followed by trailside exhibits (42%) and indoor exhibits (38%). Visitor interviews revealed more scattered interests, with trailside exhibits ranking highest (26%) followed by ranger/interpretive programs (18%) and brochures (16%). A visitor at Kenai Fjords National Park suggested the use of trailside exhibits to "point out the different birds that used to be here or the mile posts where

the glacier has been the past 100 years. I don't think you really need to preach at people but show them what's going on. I like subtle." In addition to identifying preferred methods of learning, 78% of surveyed visitors believe informing visitors of actions they can take is particularly salient and important to communicate in parks and refuges. Articulating interest in action-oriented outreach, a visitor at Biscayne National Park said, "I guess the whole thing about climate change is that it feels so overwhelming...what am I supposed to do about it? It's easier to do nothing. So saying things that you can do [into outreach] that people feel are do-able [is a good idea]." As recommended by this visitor, it is critical that place-based engagement activities focus on bioregional principles and practices, and identify specific actions that visitors can do—today—to slow the impact of climate change.

Audience Connection to Place

Of the 4,181 visitors surveyed, over half (55%) were either strongly attached (21%) or attached (34%) to the park or refuge they were visiting. Surprisingly, these bonds formed rather quickly, and often times within the first visit to these sites; most likely due to the iconic, awe inspiring nature of national parks and wildlife refuges. Place attachment scores also positively and significantly ($p = < 0.001$) correlate with visitors' desire to learn more about the impacts of climate change ($r = 0.27$), their ability to see the impacts of climate change at the park/refuge they were visiting ($r = 0.23$), and their willingness to change behaviors to mitigate climate change ($r = 0.16$, Table 5).

Audience Normative Function Pertaining to Climate Change

Place attachment had a minimal effect of saliency ($\beta = 0.12$, $p < 0.001$). Ascription of responsibility and knowledge of consequences had a typical positive effect on saliency ($\beta > 0.23$, $p < 0.001$, in both cases), whereas awareness of consequences had a substantial positive effect on saliency ($\beta = 0.42$, $p < 0.001$). The total model explained 58% of the variability in salience ($R^2 = 0.58$, $p < 0.001$, Figure 2).

   Place attachment had a minimal positive effect on willingness to change ($\beta = 0.04$, $p = 0.003$). Ascription of responsibility and awareness of consequences had a minimal positive effect on willingness to change ($\beta < 0.15$, $p < 0.001$, in both

Table 5. Means, standard deviations, and intercorrelations of place attachment with place dependent climate change variables ($n = 4{,}131$).

Variables	*M*	SD	1	2	3	4
1. Place attachment	2.30	0.84	–			
2. I would like to learn more about climate change at this park	2.36	0.92	0.27	–		
3. I believe that some of the effects of climate change can already be seen at this park	2.37	0.95	0.23	0.59	–	
4. I am willing to change my behaviors to mitigate climate change in this park/refuge	2.17	1.04	0.16	0.49	0.44	–

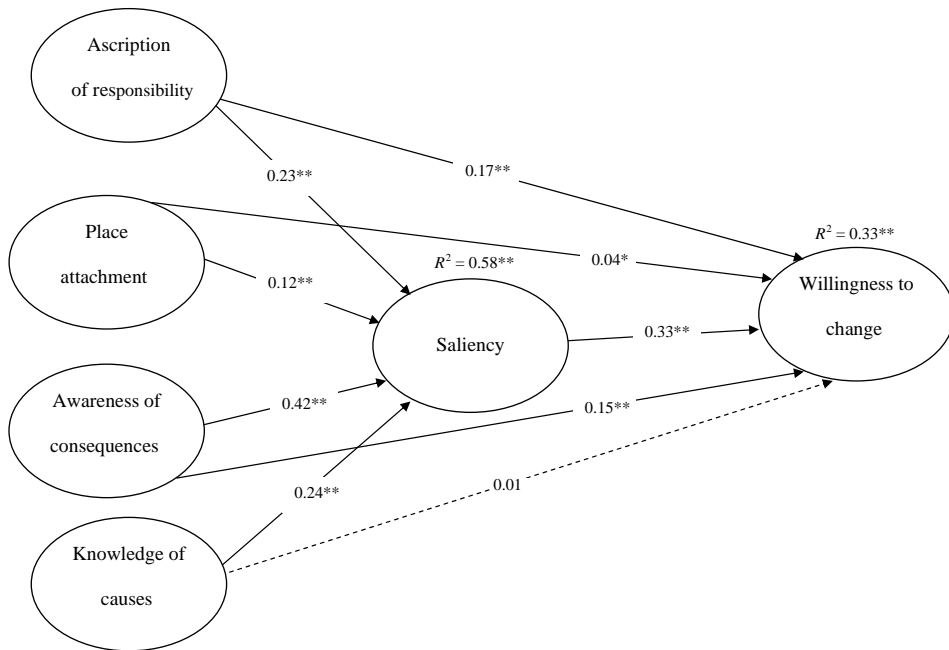Note: All correlations are statistically significant at $p < 0.001$.

Figure 2. Regression model showing norm activation analysis results (dotted lines are not significant, *refers to significant at $p < 0.01$, ** refers to significant at $p < 0.001$).

cases). Knowledge of causes had no direct effect on willingness to change. Saliency had a typical positive effect on willingness to change ($\beta = 0.34$, $p < 0.001$). The total model explained 33% of the variability in willingness to change behavior ($R^2 = 0.33$, $p < 0.001$, Figure 2).

Conclusion

In an effort to advance the application of the growing literature on climate change communication, the place-based climate change engagement framework is a potentially useful approach for academics and practitioners to rethink how they engage audiences in conversations about climate change. The results of this study validate the proposed framework for place-based climate change engagement at national parks and wildlife refuges. Communicators, interpreters, and managers of America's public lands are encouraged to embrace the idea of changing the conversation about climate change by using the landscape as a story telling and engagement tool. The National Park Service and US Fish and Wildlife Service, as federal agencies, have an opportunity to increase awareness of climate change-related issues and promote political action to mitigate further impacts. National parks and wildlife refuges have the power to transcend the typical scientific and political debate to facilitating civic dialog about the places people want to protect.

Specifically, lessons from this empirically validated framework lead us to suggest: (1) use place as a medium and (2) connect that place to emotional and social

meanings through (3) messages about localized impacts of climate change. Creating messages with a systems-based explanation will highlight the changes and impacts observed at a specific site and how those impacts are connected to individual decision-making and behavioral choices. This study demonstrates that many people need to see the effects of climate change before they can believe it is real and make sustainable decisions and behavioral changes. In addition, coupling meaningful social interaction with experiential learning opportunities is a way to build community and facilitate a deeper understanding of climate change impacts through the lens of place.

Climate change is a global issue that is already being felt locally. We recommend future education and outreach initiatives to develop integrated place-based activities such as climate camps, citizen science programs, and mobile and website tools that are locally relevant, empowering, and engaging for diverse audiences. These initiatives are appropriate for any scientist, communicator, or steward of public lands interested in transforming a global phenomenon into salient and tangible messages to community members and decision makers. In phase II of our project we plan to take the next step and assess the effectiveness such place-based engagement programs have on affecting visitors' understanding of climate change and their desire to adopt pro-environmental behaviors.

Acknowledgements

Note

[1]   See   http://environment.yale.edu/climate/files/Six_Americas_Screening_Tool_Manual_July2011.pdf

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