Recommendations for successful watershed displays:

A synthesis report for the Capitol Region Watershed District

Christie Manning, Amanda Wareham, Lisa Hu

Macalester College

1. Introduction

Aptly known as the "Land of 10,000 Lakes," Minnesota takes pride in its abundant natural bodies of water. With official numbers totaling 11,842 lakes and 6,594 streams (MN DNR 2013), the state offers its residents and visitors a wide range of water recreation such as swimming, fishing, canoeing, boating, and waterskiing. In addition, surface waters such as lakes and rivers offer primary sources of drinking water for many Minnesota community water supply systems.

Unfortunately, a large number of Minnesota's natural bodies of water fail to meet the water quality standards set by the Minnesota Pollution Control Agency. These lakes, rivers, streams and wetlands have been declared ***impaired***, which means they contain heightened levels of pollution that limit their use for recreation or water supply (MPCA 2013).

The major sources of these pollutants have changed over the course of Minnesota's industrial and agricultural development. Earlier in Minnesota's history, most pollutants were emitted from so-called point sources. "Point-source" pollution describes pollutant discharge from defined and discrete locations. Point-source pollution sources can vary in size: large ones include industrial facilities, sewage treatment plants, mining operations, or confined animal feeding operations; smaller ones range from a tunnel or single pipe. Given the defined and discrete point of origin for this type of pollution, regulatory and compliance branches of government like the Minnesota Pollution Control Agency (MPCA) typically monitor and mitigate these effects.

While effects of point-source pollution continue to be a concern, "non-point" sources of pollutants have gradually become an even more serious issue. These sources present a larger challenge: rather than occurring at a single or a few specific locations, non-point sources are widespread and diffuse. Typically, no single non-point pollutant source discharges a significant

amount, but when aggregated, the multiple diffuse sources can result in total pollution contributions equaling or surpassing point sources. Minnesotan examples of non-point source pollution include: (a) fertilizers, herbicides, and pesticides from agricultural lands and residential areas; (b) road salt from winter snow clearing; and (c) general stormwater runoff, which carries substances from impervious surfaces (roofs, sidewalks, roads) into storm drains, then directly into rivers and streams. Regulating non-point pollution presents a challenge for two main reasons. First of all, addressing non-point sources requires action from the multiple diverse agents who contribute to the aggregate impacts, many of whom may remain unaware of the negative ramifications of seemingly innocuous actions. In addition, non-point pollution varies strongly with weather conditions. Snowmelt or rainwater frequently carry most non-point pollutants into surface waters; therefore this form of pollution fluctuates largely outside of human control.

Perhaps because its water resources offer such a defining characteristic of the Minnesotan identity, Minnesota boasts several examples of unique initiatives to tackle the challenges of non-point source water pollution. One such initiative created the Capitol Region Watershed District (CRWD), a local unit of government created at the request of the citizens of St. Paul in 1998. CRWD's main responsibility involves the management and protection of water resources of the local Mississippi River Basin, spanning wetlands, creeks, rivers, and lakes.

Part of CRWD's work, therefore, hinges upon public education and outreach, organized initiatives to inform community members of watershed issues, empowering citizens as competent stewards of local water resources. Toward this aim, CRWD has created a set of displays that describe the effects of non-point source pollution on rivers and lakes, specifically stormwater runoff from local urban streets, yards, and sidewalks. These displays aim to accomplish three objectives: (1) to increase public awareness of the threat from stormwater runoff to lakes and

rivers; (2) to educate residents about the various objects and substances that pollute water, including fallen leaves and yard clippings, trash, pet waste, motor oil, or lawn chemicals; and (3) to encourage neighborhoods to help remove and minimize such potential pollutants from streets, yards, and sidewalks.

As with many forms of environmental education, CRWD seeks not only to teach people about the natural system that makes up their watershed, but also to encourage new attitudes (such as concern) toward this natural ecosystem, develop motivation to protect the natural system, and instill the intentions for behavioral changes. Such behavioral changes would ideally involve protection of rivers and lakes from stormwater runoff. CRWD's public education work can also be considered a form of interpretation, "an educational activity that aims to reveal meanings about our cultural and natural resources" (Beck & Cable, 2011). Though public education campaigns often report success in changing people's attitudes or fostering intentions to change behavior, such campaigns rarely result in direct or measurable behavior change (McKenzie-Mohr, 2011). However, educational efforts may lay important groundwork for later action by prompting information-seeking behavior, providing people with background knowledge necessary to recognize a previously unnoticed problem, or by offering people the how-to information they need to perform new actions.

A refocusing of a primarily environmental issue like water as a public health concern demands investigation of effective methods of public health messaging. In St. Paul, Minnesota--much like any other geography--educating the public about the relationship between public health, environmental factors, and personal behaviors, requires a careful balance of all these concerns. One of the most crucial hidden systems that could bear the most significant impacts

from climate change here is the water supply. Much of Ramsey County sits within the CRWD, drawing water mostly from the Mississippi River itself but also from neighboring aquifers. Especially with the anticipated consequences of climate change and its impacts here in Ramsey County, an understanding of systems overall and their interactions with one another enables residents to make better choices in the face of change.

In the interest of evaluating and improving the effectiveness of these education displays, CRWD arranged a focus group study through Hamline University's Center for Global Environmental Education (CGEE). CRWD investigated four basic questions: (1) Are the displays equally effective for children and adults? (2) Are the displays appealing? (3) Does the audience understand the intended message? (4) Do the displays prompt behavior change or intention to change behavior?

To best grapple with these questions, we have both analyzed the CRWD focus groups and conducted a literature review. These questions intersect two larger strands of research: one stemming from psychology, specifically psychological literature addressing conservation, environment, and sustainable behavior; and the other rooted in environmental education, focused on public education and interpretation. Relevant studies from both sources are summarized below. By analyzing the interaction between the focus groups and the relevant literature, we hope to provide insight and recommendations for CRWD's educational displays, better equipping them to effectively message to citizens best practices of water protection from non-point source pollution. The two bodies of research distill into a set of questions that overlap with but are more specific than the questions posed by CRWD:

(1) Are the displays equally effective for children and adults? Both applied and scholarly environmental education work, specifically focused on interpretation, suggest that displays for children should be designed to be fundamentally different from displays for adults. Our more specific questions thus include: How should displays for children be designed differently? What makes a display appealing for children? How much should children be made aware of the problem for which the displays are intended to raise awareness? Both the interpretation literature (e.g., Beck & Cable, 2011) as well as applied environmental behavior change literature (e.g., McKenzie-Mohr, 2011) suggest that displays for children must be colorful and vivid. The interpretation literature further suggests that such displays should be very interactive. Finally, psychological research stresses that children, because they have lower efficacy in the world compared to adults, should not be exposed to too much fear-based information.

(2) Are the displays appealing? As noted above, both the environmental education literature relevant to interpretation as well as applied behavior change research suggests that the best and most appealing displays are colorful, captivating, and vivid. These literatures also note that displays are more appealing and effective in communicating if they "know the audience" and frame the message to be most relevant to that audience. More specifically, we explored whether the displays contain enough place-specific information for local residents (either children or adults) to find the displays personally relevant and appealing. We furthermore investigated whether the displays contained the correct amount of "problem-focused" information (i.e., Minnesota waters are facing threats) relative to positive information (i.e., local lakes and rivers support many activities that local residents enjoy, and there is much individuals can do to protect

them). McKenzie-Mohr (2011) has suggested, along with many others (e.g., Moser & Dilling, 2004), that too much fear-based information can backfire.

(3) Does the audience understand the intended message? Many factors influence the effectiveness of message communication. One important issue is the scientific literacy of the intended audience. As noted by a number of researchers, the American public tends to demonstrate a fairly low level of scientific literacy (Scheufele, 2013) and thus may not adequately understand messages that feature scientific information. Thus, we focused on whether the amount of science contained in the displays was appropriate for children and/or adults, both with and without some familiarity with study of the environment.

(4) Do the displays prompt behavior change or intention to change behavior? The final question posed by CRWD examines whether the displays are effective in prompting behavioral change or the intention to change behavior. .

Drawing lessons from these various sources, we hope to offer clarity and direction in public health messaging around environmental issues. Such lessons are likely to increase in relevance and necessity here in Ramsey County with the CRWD, but will also extend past our borders and apply to a variety of locations and situations.

2. Results from the literature and focus groups

While we consulted a variety of journal articles, literature in psychology journals particularly discuss the variables that render certain messages more impactful and others less pressing. Everything from the duration of a message to the pairing of positive and negative information, the quality of the arguments and the personalization of situations affect the way an audience truly

hears a public health message. Given the complexity of these interrelated variables, we have distilled lessons from the literature in a few subcategories below. We have also included with each question a review of the literature and a discussion of the CRWD focus groups.

(1) Are the displays equally effective for children and adults?

One critical finding from these focus groups was inconsistent attention to audience. CRWD created two displays, hoping to use these focus groups to learn which display seemed more effective in attracting attention, engaging the reader, and prompting some sort of behavioral response. The primary differences in these displays lay in the particular wording, tone, pictures, and layout of the visual aid—but not in audience. The strongest feedback stressed the importance of targeting either an adult audience or a child audience, rather than hoping to address both simultaneously. These displays hoped to target the general public as one entity, which alienated both adults and children.

Children in particular, quickly noted the relative lack of children identifying actions that could address the problem of water sanitation in the District. One child specifically explained: "On the bottom, it's all basically adults thinking 'Oh, I like to fish' or whatever. I'd like to see kids saying 'I'd like to organize a team or something [taking the initiative]'" (6.13 FG 3). Another student from the same focus group was more specific: "Is there a reason that it is adults?..The interactives are great, but kids can be like 'they're just like me!'…If a child said it, that would make more sense" (6.13 FG 3). Another child remarked: "And on the bottom, I would like some kids saying 'What can I do to protect my family from diseased in the water?'" (6.13 FG 3). Children in our focus groups wanted to see more children in the displays that had hoped to engage their demographic.

Children in these focus groups noted that if children saw these displays and were excited about them, that that may prompt adult participation (6.13 FG 3). Another student explained that "most adults are set in their ways, but if [these displays] tell them then they'll actually teach their kids and do things" (6.13 FG 3). In the other focus group, a child remarked: "I think more parents would look at [the display] than kids," supported by another's speculative comment, "Maybe it would work for kids 12 and up" (5.16 FG 2). Another child offered sincere doubt, however: "I don't think the kids would care, that they would understand" (5.16 FG 2). Compared to the adults' frustration at the relative lack of specificity in the poster displays (see below), these differing opinions clearly support a divided approach between children and adults.

As more and more voices chorused, one child finally pointed out the obvious: "Adults think differently than kids." The focus group ended with a clear message: "Make an adult poster and one for children!" (6.13 FG 3). These solutions echoed concluding thoughts from the other focus group with children: "They should try to pull more people with one sign for kids and one sign for older people…They should use media, because kids are on the internet a lot" (5.16 FG 2). While the adults in these focus groups were not as explicit, one did critique the displays for their "narrow band of age" and "not enough diversity in age and ethnic background" (5.8 FG 1). Another adult instead identified the intended audience for these displays differently: "Your target audience is people who don't understand that ['my street drains to the river']" (5.8 FG 1). The second adult group reflected more on the intended audience of the poster displays:

> A: I think [the poster] is targeted towards adults, but kids are just as responsible, they can also help with cleaning this up, out, or away from the river.
>
> B: My kids wouldn't let me have time to look at everything.
>
> C: I wouldn't drag my kids over to it.

> D: I remember a campaign to turn off the lights in elementary school, it was aimed at the kids teaching the parents and that's what I did. In school, they said to tell your parents when the lights were off.
>
> -- 6.25 FG 4

These adult focus groups offered a vague awareness of belonging to the intended audience, creating a clear bias in their level of engagement with the material. These comments also identify the relationship between children and parents as critical to environmental education, suggesting that children teaching adults and getting adults excited works more effectively than adults teaching children.

Curiously enough, both children and adults in focus groups identified the significance of a large photo of a child swimming in green algae. A child responded: "I like the kid with the algae with him. It really sends a message: you shouldn't have algae on you" (6.13 FG 2). Of the same image, an adult replied: "It's good that we can see the problem" (5.8 FG 1). Along with engaging children through the displays initially, adults agreed that the health and safety of kids presented a salient concern for the public (5.8 FG 1). After all, "Children in the Twin Cities have died from the water. Cryptosporidium. St. Paul doesn't have a way to remove that from the water" (5.8 FG 1). Perhaps part of this significance also rests in the immediate relatability for a child to see another child, and the parental urgency for an adult to see an endangered or affected child. When one adult asked in a focus group, "Does it make a difference that it's a kid?" another immediately replied, "Yes, I have a kid and I think of him in there and think, *ugh*" (6.25 FG 4).

Even superficial reviews of literature note a critical difference between messaging towards adults versus messaging towards children. While this realization may hardly seem profound, this fact bears significant consequences for agencies, governments, and nonprofits

trying to educate the public about a public health concern. When funding becomes tight, selecting one target audience (adults or children) should prove the best solution, or a campaign risks "missing" both populations. Encased in and specifically identified in Tilden's Principles of Interpretation: "Interpretation addressed to children should not be a dilution of the presentation to adults, but should follow a fundamentally different approach. To be at its best it will require a separate program" (NPS, 2013; Tilden, 1957).

Many of these observations stem from Larry Beck and Ted T. Cable's book *The Gifts of Interpretation: Fifteen Guiding Principles for Interpreting Nature and Culture.* Besides differences in age, children require different variables from adults: they "also need independence, solitude, adventure, and a sense of wonder" (Louv, 1991). Machlis and Field (1992) note: "The interpretive approach for children...is derived from three basic modes of human expression: action, fantasy, and instruction" (Machlis & Field, 1992). Based on these pieces: "Allowing children to become involved in the interpretation is critical. They learn best through action and appropriate participation. Demonstrations that involve children in an activity are especially effective" (Beck & Cable, 2011: 60). To engage children with interactive displays, however, children need to feel included as the intended audience, which can create new challenges.

Part of the rationale behind protecting and encouraging direct participation of children is to counteract any distancing or helplessness children might experience, especially in the face of such enormous phenomena like climate change. Ojala (2012) posits, then:

> If the reason why children use distancing more than the older age-groups is because it is the most convenient way to regulate negative emotions when one is less capable of using problem-focused coping, then teachers can help the children by providing concrete examples of how they can behave pro-environmentally despite their dependence on their parents.
>
> -- Ojala, 2012: 554

Additionally, the adult instinct to assume that climate change issues are inherently linked to a lack of knowledge, and that therefore "teachers should counter...with more scientific facts" (Ojala, 2012) is misleading. Rather, studies show that "de-emphasizing the seriousness of climate change is not primarily a question of lack of knowledge, but is instead related to specific worldviews" (Ojala, 2012: 554; Feinberg & Willer, 2011; McCright & Dunlap, 2011). Based on this, Ojala (2012) continues, "One can speculate that children who feel unable to influence societal issues in general may be more prone to developing these coping strategies. If this is the case, various ways of trying to improve action competence would appear to be important" (Jensen & Schnack, 1997; Persson et al., 2011).

Upon further examination of emotional distancing, especially in young people, Ojala (2012) also notes: "Research has found that among young adults, ambivalence and uncertainty about environmental engagement in everyday life are often handled with hyperactivation-like strategies that impede engagement, for instance "black-and-white" thinking whereby one argues that if not *everyone* is behaving pro-environmentally then it is *totally* meaningless to do anything oneself, or that if one is not able to behave pro-environmentally *all the time* it is *totally* meaningless to do anything (Ojala, 2008; Ojala & Rikner, 2010). It is, however, important to realize that this is not the only way to cope with ambivalence; more constructive strategies were also employed by some young people" (Ojala, 2012: 555).

While hopefulness remains a central goal in conveying and representing information, preserving and encouraging hope in children is most important. Beck and Cable (2011) write: "This heartfelt conviction that we can make change for the better feeds our dedication. Without hope, there would be no purpose; without purpose, there would be no passion; and without passion, interpretation is hollow" (Beck and Cable, 2011: 168). Thus, for these reasons the

literature supports the observed feedback that children and adults fundamentally demand different materials to foster engagement, given that children require less fear-driven information, less scientific rationale, and more hope and perceived efficacy in the face of such large environmental pressures.

(2) Are the displays appealing?

Another constant theme in environmental education efforts, also observed through these focus groups, revolves around the role of personal relevance and therefore salience in these educational materials. Although specific comments differed, many expressed the desire for more personally relevant and engaging references to motivate residents to see the local scope of these concerns over water.

Adults largely advocated for a stronger link between their own actions, their personal stormdrains, the local water supply, and the immediate impact upon the local water supply. One noted: “A lot of times you don’t actually realize that the storm drain goes to the river” (5.18 FG 1) or “My street drains to the river”; these statements become increasingly significant here in St. Paul, given the strong role water plays in the local identity. “Plus it’s an economic driver in the state of Minnesota,” another adult added (5.18 FG 1). Even in the other focus group, virtually the same comment echoed: “I think that people don’t realize that even if you don’t live by the street, then it still drains to the river” (6.25 FG 4). In addition, other adults recommended using familiar locations to better connect with an audience: “I’ve never seen that bird, it would be like looking at a polar bear. Symbolizing a lake near us would be better” and “[Seeing] the pavilion and Lake Harriet...would bring the message closer to home” (6.25 FG 4). Another adult agreed: “It would be nice if you could tell the people were in their neighborhoods” (6.25 FG 4) since “People like

to see their house, it should capture the personal nature of it" (6.25 FG 4). For example, although one resident connected trash on the streets as a water sanitation issue, another replied that such a specific example was site-specific (6.25 FG 4). Even particular details about the nearest water source varies depending on location: "I would not just say the Mississippi, I would say all lakes and everything, I don't really think of the Mississippi" (6.25 FG 4). Overwhelmingly, adults insisted that they wanted specific, local, identifiable reasons to care about this issue.

Personal relevance for children was largely masked by the initial feelings of frustration that children were not displayed with concrete actions that help the environment or heed the displays' advice, as mentioned above. Given this, however, personal relevance seemed less focused specifically on this local geography and more on the immediacy of hygiene and cleanliness. One girl, referencing the display, explained: "You can see the girl and the dirty water and it's not…good for you to swim in" (5.16 FG 2). Visceral reactions mostly stemmed from concerns that the pictures included various bodily fluids, which combined with the "gross-looking" water, created huge concern (5.16 FG 2): "It gives me chills 'cause it's nasty" and "Makes me want to take a shower right away." These focus groups suggest that for children, body hygiene proves a more salient topic than local geography or place attachment for adults.

A review of relevant literature also overwhelmingly agrees that personal relevance plays a huge role in determining attitudes and behaviors, especially surrounding a phenomenon as overwhelming as climate change. One of the most significant findings from Lorenzoni et al (2006) was that "neither [the American nor the British] public viewed climate change/global warming as personally relevant: the impacts of climate change, and most importantly its causes and solutions, were psychologically distant for most individuals in both nations." Based on this

conclusion, Lorenzoni et al (2006) recommended further research examining "how individuals come to make climate change personally relevant and how individuals effectively assess the risks and benefits of climate change in relation to possible solutions."

To help tackle this question, Scannell and Gifford (2013) summarize their findings thusly: "individuals readily distance climate change from their personal realm, which suggests that effective communication strategies should aim to reduce the gap between climate impacts and personal concerns." Maio and Haddock (2007) argue that personal relevance of a message can increase both interest and the effort used to process the message. Place attachment, a term referencing the attachment of emotional and cognitive bonds with a specific place, potentially offers a way to test this personal relevance. Nordenstam (1994) and Stedman (2002) examined the ability of place attachment to sometimes engender place-protective tendencies. Conflicting reports from Devine-Wright & Howes (2010), Edelstein (1988), and Kyle et al (2004), however, complicate this correlation, suggesting that place attachment does not automatically encourage protective behaviors.

Scannell and Gifford's study found the emergence of three significant predictors of engagement with climate change: place attachment, receiving the local message, and gender (female) (Scannell and Gifford, 2013). They explain that "this study is the first to our knowledge to show that residents who have stronger place attachment are more engaged with climate change issues. In an unhypothesized result, women tend to report higher levels of engagement than men" (Scannell and Gifford, 2013). Scannell and Gifford conclude: "A sense of connectedness to place has broad implications; local ties are relevant to engagement with climate change issues, and thus, individuals with strong place attachment may serve as a promising group to whom adaptation and mitigation strategies could be promoted." This research, they argue, adds

evidence to the body of research surrounding climate change communication and barriers to climate change (Scannell and Gifford, 2013).

Interwoven with this concept of personal relevance is a proposed emphasis on health impacts. British surveys confirm that climate change, broadly imagined, pales in relevance and concern to health, family, safety, finances, and terrorism (Norton & Leaman, 2004; Poortinga & Pidgeon, 2003). Focusing then on the wide variety of health impacts from climate change--ranging from extreme weather events like droughts and floods, to communicable diseases, among others--engages an audience more directly, overcoming perceptions of personal realm boundaries (Semenza, Ploubidis, and George, 2011). The Environmental Protection Agency found in 2009 "that global warming poses public health risks--including increased morbidity and mortality--due to declining air quality, rising temperatures, increased frequency of extreme weather events, and higher incidences of food- and water-borne pathogens and allergens" (Maibach et al, 2010).

A study by Maibach et al (2010) suggests that "redefining climate change in public health terms should help people make connections to already familiar problems such as asthma, allergies, and infectious diseases experienced in their communities, while shifting the visualization of the issue away from remote Arctic regions, and distant peoples and animals." Additionally, these authors conclude: "the public health community has an important perspective to share about climate change, a perspective that potentially offers the public a more salient way to comprehend an issue that has proven deeply difficult for many people to fully comprehend" (Maibach et al, 2010).

Semenza et al (2011) test the appropriateness of health as a framework to prompt behavioral change through a health belief model (HBM) "to gauge respondents' willingness to

engage in voluntary mitigation and adaptation efforts based on their attitudes and beliefs" (Rosenstock, 1900). They conclude that "the majority of the public report awareness of environmental and health risks associated with climate change and that they consider themselves to be susceptible to being affected by it" (Semenza et al, 2011).

(3) Does the audience understand the intended message?

Based on these focus group, we hypothesize that informing the audience of the environmental issue at hand could help create an educational platform. Yet more importantly, the audience must base their eventual level of engagement with personal interest. Such interest must be piqued in a short amount of time, perhaps amidst other stimuli, like at a fair or a child's school.

One limiting factor of interest stems from the depth and display of scientific information presented. While some might be overwhelmed by a daunting array of fact-rich information, others may not adequately consider a topic without sufficient scientific evidence. Participants from the less scientifically literate adult focus group expressed a desire for increased scientific information: "It might be interesting to see statistics and facts to grab my attention that would be something I would go home and repeat." "They're light on the information, I'm not sure what's really happening, because I wouldn't be able to see that." (6.25 FG 4) Conversely, another participant illustrated concern that an excess of supported information might result in apathy, "I agree that the left on A was more informative even though it did feel like a lecture, if I read that they feel those things I might just be like, 'that's nice'". Reactions to depth of information, of course, will depend on political stance, scientific background, perception of the organization, mood, and present preoccupation.

Ability of the display to sustain engagement for a reasonable amount of time is another important consideration highlighted by one focus group participant:

> "I think the street drain graphic might be more attention grabbing if it wasn't flat. I guess the focus is to educate people about the proper use of the street drain? I think that's somehow... I don't think you get to that until you read down where the flip ups are, down there the message is more prominent. When they're standing up, you understand the message quicker." (6.25 FG 4)

By integrating observations from these focus group with the literature, we posit that displays with scientific information could provide sufficient background to convince audience members of the rationale of recommendations offered. The specific amount or level of adequate information, however, depends on the particular audience: children versus adults, adults with a scientific background versus adults with no scientific background.

The presentation of an argument itself clearly deserves careful thought. Offering scientific information with simplicity and logic makes the information more accessible. For example, research has found causal information to more significantly alter beliefs than statistical or factual information alone (Slusher and Anderson, 1996). The importance of simplicity was further elucidated by one focus group participant : Based on this study, this concrete order makes the most sense: cause of the problem, the problem itself, then the effective solution.

Even child focus group participants sometimes expressed a desire for more factual information:

A: "There's more information."

Facilitator: "More information and that's a good thing?"

A: [Nods] "Yeah." (5.16 FG 2)

This method has proven more effective in altering belief and therefore hope for altering behavior. This step by step explanation and solution for pressing environmental problems is quite productive for our causes, as fear inducing information must be followed by effective methods of addressing and mediating the fear.

(4) Do the displays prompt behavior change or intention to change behavior?

As described in the previous section, levels of personal relevance are crucial to eliciting acceptance of recommendations. However, there are some relevant and conflicting points in the literature in regard to level of personal relevance when fear is involved. Here, we will explore the relevant literature to provide recommendations for persuasive displays, beginning with criticisms of fear-based campaigns as they apply to environmental psychology.

Personal relevance that is powerful enough to challenge an individual's self-definitional beliefs, including their concept of personal safety or health, spiritual belief, and the like, can cause defensive reactions. This results in clinging to pre-established personal beliefs and rejection of recommendations that clearly challenge these beliefs (Chen and Chaiken, 1999). In the case of the Watershed District's campaign to keep the Mississippi and other watersheds clean, this threat might include challenging the idea that the individual or their immediate relations has safe water to swim, boat, and fish in. Notably, it is also important to recognize that fear tactics become less effective before and after a certain point of fear-arousal. The relationship between fear-arousal and defensive or receptive attitude follows a bell shaped curve (de Hoog et al., 2007).

A more severe example of defensive reaction is seen in the Terror Management Theory. For example, acute fear-arousal prompted by threat of the most dire effects of climate change,

with the desired effect of reducing one's use of natural resources, may induce a feeling of mortality salience. This has been shown to cause an individual to become more selfishly motivated, cling to pre-established, self-definitional beliefs, and reject recommendations that are to the contrary (Solomon et al., 1991). For example, an individual may drive, air condition their homes, or cling to needless material wealth more aggressively and frequently, thereby making a short-term and immediate personal gain but behaving in an irresponsible manner with respect to the environment. Thus, the effects of mortality salience directly feed into the social concept documented in the Tragedy of the Commons by Garret Hardin. While this is perhaps not always the response to fear-based campaigns, it should be noted that a well-meaning educational display, if presented in the fashion of "doom-and-gloom" environmentalism can easily cause the exact opposite reaction if those designing it are not thoughtful and well-informed.

While it is important to remember the necessity of avoiding defensive reactions induced by extreme personal relevance of threat and, and that induced by mortality salience, fear should not be entirely discounted as a motivational technique in psychology or marketing. The parallel response model posits that appraisal of the threat determines action in response to fear, therefore emotional appeal is not necessarily needed to create a desired response (Leventhal, 1970). The fear appeal has been a prevailing tactic used in health campaigns and marketing. In health-based campaigns, response levels were high when individuals were prompted with a health issue that they felt was personally relevant, and that had a solution they felt would be effective in eliminating or reducing the problem (Hovland et al., 1953). Thus, it appears that the crucial factor in presenting personally relevant information that also induces fear is that there must be a provision for agency on the part of the recipient. Other researchers have further supported the

idea that effectiveness of an action in reducing fear needed to be proven before the action would be adopted. (Rosenstock, 1974) (Rogers & Mewborn, 1983).

This presents difficulty in our research because issues of water safety, pollution, and larger environmental problems are generally beyond the scope of one recommended change to fix. Thus, the question becomes, are fear appeals effective when the problem is complex and environmental? This question deserves further investigation, but for the scope of the question addressed by the CRWD, we will later make simple recommendations that are simple for audiences to follow.

It goes without saying that as much as it is conceivable, agency should be provided and an effective solution to the problem presented to the recipient. When this is not entirely possible, or the problem extends over a long time scale with several repeating actions necessary to "fix" the issues, balancing fear and hope appeals seems the most effective method of encouraging maintenance of behavioral change and continued acceptance of recommendations in the face of a complex problem.

According the Lazarus's theory of stress and coping, perceived controllable and uncontrollable events do not necessarily render the receiver of information 'helpless' and without agency, either feeling of control or lack thereof may have either effect. In short, all responses to issues presented are context dependent. An individual finding the necessary action to control a aversive threat may actually become more agitated or stressed in gaining the knowledge that they do have agency and the ability to control the outcome. Just as a debriefing must be carried out after every psychological experiment to reduce potential stress on participants, once presented with knowledge of the environmental issue at hand, audience members must also be provided some agency and guidance as to how they may contribute to solutions to the environmental

problems they are newly or more acutely aware of. Other studies indicate the same tendency of respondents to first need to feel vulnerable to predicted climate effects, and then a need to have a sense of agency through being a part of potential climate solutions. (Zahran et al., 2006) (Leiserowitz, 2005) (Krosnick et al., 2006) (Slimak and Dietz, 2006). The value of having an impetus and method of creating change, as well as a sense of personal relevance, was emphasized by a participant in the more scientifically informed focus group "[There should be a] driving force, not just negative… she would need understanding of situation in the context of her community, as well as seriousness." (5.08 FG 1). In the same realm, it is also important to make the problem and potential solution quite clear, especially when the intended audience is young children. At the conclusion of one children's focus group, there was some ambiguity about what children could do to help alleviate the problem,

> "I might want to help a little more.
>
> E: Help a little more.
>
> G: [laughs] Help clean more."

We would posit that once this confusion is alleviated, efficacy may be increased and individuals will be more likely to commit to sustained engagement and behavioral change.

In the realm of environmental issues, it is obvious that one person will never entirely 'control' the outcome. However, this agency must be provided and assured to some extent by stressing community involvement as a means to create more significant change. Therefore, drawing heavily from the literature, we recommend that a display include information that is personally relevant, but not to such an extent that self-definitional beliefs are challenged or mortality salience induced. Of course, this is context dependent and should be reviewed carefully by the party designing the campaign. But when a need to act to assuage anxiety or fear is

provoked, an effective, believable solution must be presented, as well as the individual's ability to make an impact affirmed.

As an aside, we would also recommend stressing the importance of, and individual benefits from, community engagement. Humans are intrinsically social creatures and highly driven by other's perceptions of them, therefore the prosocial aspect of environmentalism should be emphasized to thoroughly motivate behavioral change.

Prosocial behavior has been proven a great contributing factor in environmental protection. 'Conspicuous Environmentalism' is also a growing trend in modern society, as people who are seen as stewards of their environment may be driven by personal attachment, but also by the perceived individual benefits of being seen by society as prosocial and a responsible community member. Therefore, a display that eludes to, directly or indirectly, the personal and esteem benefits of acting as a steward of the environment may further motivate audiences toward behavioral change. Leading into our recommendations section, we would also add that a display might provide some indication that committing the environmental behavior will be viewed favorably by peers, family members, or neighbors (e.g., Griskevicius et al, 2010).

3. Recommendations

Based on a synthesis of focus group findings and the research literature, we propose the following recommendations for future CRWD display design:

1) Create displays targeting either children or adults to minimize the potential to psychologically distance both groups. Children in the focus groups, for instance, wanted more pictures of children.

2) Tailor displays according to audience's feelings of personal relevance. For example, our focus groups suggest that children equate personal relevance with personal hygiene, whereas adults tend to equate personal relevance with place attachment.

3) Maximize audience understanding of scientific information by emphasizing about three “main points” to be taken away from the display. By limiting the amount of scientific information, individuals will be less likely to feel overwhelmed and more likely to incorporate these new ideas into their daily behavior.

4) Provide additional education resources for those interested, perhaps in the form of a brochure.

5) Offer tangible feasible solutions to environmental problems to encourage agency. Suggest specific actions that individuals can take to engage in solutions; however, these actions should not only (or primarily) be personal actions but should also include community-based opportunities for collective action.

6) Balance positive and negative information to reduce audience anxiety and defensiveness.

7) Anticipate different learning styles by including kinesthetic elements in the display. These tactile displays could supplement factual information to sustain engagement, leading to a greater likelihood of later learning and behavioral change.

4. References

Chen, S., & Chaiken, S. (1999). The heuristic-systematic model in its broader context. Dual-process theories in social psychology, 73-96.

De Hoog, N., Stroebe, W., & de Wit, J. B. (2007). The impact of vulnerability to and severity of a health risk on processing and acceptance of fear-arousing communications: A meta-analysis. Review of General Psychology, 11(3), 258.

Feinberg, M., & Willer, R. (2011). Apocalypse Soon? Dire Messages Reduce Belief in Global Warming by Contradicting Just World Beliefs. *Psychological Science*, *22*, 34–38.

Griskevicius, V. , Tybur, J., Van den Bergh, J. (2010). Going Green to be Seen: Status, Reputation, and Conspicuous Conservation. Journal of Personality and Social Psychology, 98(3), 392-404. DOI: 10.1037/a0017346

Hovland, C. I., Janis, I. L., & Kelley, H. H. (1953). Communication and persuasion; psychological studies of opinion change.

Jensen, B. B., & Schnack, K. (1997). The Action Competence Approach in Environmental Education. *Environmental Education Research, 3*(2), 163-178

Krosnick, JAHA, Lowe, L., Visser P.S. (2006). The origins and consequences of democratic citizens' policy agendas: A study of popular concern about global warming. *Climatic Change* 7-43.

Leiserowitz, A. A. (2005). American risk perceptions: Is climate change dangerous? *Risk Analysis 25:* 1433-1442.

Leventhal, H. (1970). Findings and theory in the study of fear communications. Advances in experimental social psychology, 5, 119-186.

Lorenzoni, I., Leiserowitz, A., de Franca Doria, M., Poortinga, W., & Pidgeon, N. F. (2006). Cross-national comparisons of image associations with 'global warming' and 'climate change' among laypeople in the United States of America and Great Britain. *Journal of Risk Research 9*(3): 265-281.

Louv, R. (1991). *Childhood's Future.*

Machlis, G. & Field, D. (1992). "Children in social groups." *On Interpretation.* 69-71.

Maibach, E. W., Nisbet, M., Baldwin, P., Akerlof, K., & Diao, G. (2010). Reframing climate change as a public health issue: an exploratory study of public reactions. *BioMed Central Public Health 10:* 229.

Maio, G. R. & Haddock, G. (2007). Attitude change. In A. W. Kruglanski & E. T. Higgins (Eds.), *Social psychology: Handbook of basic principles* (2nd ed., pp. 565-586). New York, NY: Guilford.

McCright, A. M., & Dunlap, R. E. (2011). Cole dudes: The denial of climate change among conservative white males in the United States. *Global Environmental Change, 21,* 1163–1172.

Minnesota Department of Natural Resoures. (2013). Minnesota Facts and Figures. http://www.dnr.state.mn.us/faq/mnfacts/water.html

Minnesota Pollution Control Agency. (2013). Minnesota's Impaired Waters and TMDLs. http://www.pca.state.mn.us/index.php/water/water-types-and-programs/minnesotas-impaired-waters-and-tmdls/impaired-waters-list.html

Ojala, Maria. (2012). Regulating worry, promoting hope: How do children, adolescents, and young adults cope with climate change? *International Journal of Environmental & Science Education 7*(4): 537-561.

Persson, L., Lundegård, I., & Wickman, P-O. (2011). Worry becomes hope in education for sustainable development. An action research study at secondary school. *Utbildning & Demokrati, 20*(1), 123–144.

Rosenstock, I. M. (1974). The health belief model and preventive health behavior. Health Education & Behavior, 2(4), 354-386.

Maddux, J. E., & Rogers, R. W. (1983). Protection motivation and self-efficacy: A revised theory of fear appeals and attitude change. Journal of Experimental Social Psychology, 19(5), 469-479.

Scannell, L. & Gifford, R. (2013). Personally relevant climate change: The role of place attachment and local versus global message framing in engagement. *Environment and Behavior 45*(1): 60-85.

Semenza, J. C., Ploubidis, G. B., & George, L. A. (2011). Climate change and climate variability: personal motivation for adaptation and mitigation. *Environmental Health 10*(46): 1-12.

Slimak, MWDT. (2006). Personal values, beliefs, and ecological risk perception. *Risk Analysis 26*: 1689-1705.

Slusher, M. P., & Anderson, C. A. (1996). Using causal persuasive arguments to change beliefs and teach new information: The mediating role of explanation availability and evaluation bias in the acceptance of knowledge. *Journal of Educational Psychology, 88*(1), 110.

Solomon, S., Greenberg, J., & Pyszczynski, T. (1991). A terror management theory of social behavior: The psychological functions of self-esteem and cultural worldviews. Advances in experimental social psychology, 24(93), 159.

Tilden, Freeman. (1957). *Interpreting Our Heritage.*

Zahran S., Brody, S. D., Grover H., & Vedlitz, A. (2006). Climate change vulnerability and policy support. *Society and Natural Resources 19*: 771-789.

Other possible sources not referenced in the paper:

Bartlett, Sheridan. 2011. "Children and the Culture of Climate Change". *The Journal of the History of Childhood and Youth.* 4 (3): 497-505.

"The big picture - Children and the fight against climate change; press release 'misrepresented' organic food study; the lowdown on geo-engineering; more dirt on coal-fired electricity; Al Gore's 'hockey-stick' vindicated". 2008. *The Ecologist.* 38 (8): 6.

"Climate Change inaction puts Children at risk.(In Brief)("Legacy of Disasters: The Impact of Climate Change on Children" by Save the Children)(Report)". 2010. *Alternatives Journal.* 36 (2).

Clode, Rachel. 2008. "Climate change for beginners - Rachel Clode talks to children's environmental author Rebecca Morch". *The Ecologist.* 38 (5): 67.

Hicks, M. A, , Berger, J. G., and Generett, G. G. (2005). From hope to action: Creating spaces to sustain transformative habits of mind and heart. *Journal of Transformative Education 3*:57.