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Watershed conservation and preservation: Environmental engagement as helping behavior ☆

Paul A. Story[a], Donelson R. Forsyth[b,*]

[a]College of William and Mary, Williamsburg, VA 23185, USA
[b]Jepson School of Leadership Studies, University of Richmond, Richmond, VA 23173, USA

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Abstract

When will a community's residents take action against urban sprawl that threatens the watershed where they live? Drawing on theoretical and empirical studies of helping behavior, we predicted that individuals will be most likely to respond to environmental challenges when they are aware of the environmental threat, believe the danger posed by the threat to be great, and feel responsible for addressing environmental problems. We tested this awareness–appraisal–responsibility (AAR) model by surveying watershed residents' awareness of watershed features, appraisal of watershed quality, sense of responsibility for protecting the watershed, and behavioral and contribution intentions. Structural equation modeling supported the model by confirming that resident's awareness and appraisal of their local watershed are related to their pro-environment behavioral and contribution intentions, but also their perception of responsibility for protecting the watershed. Mediational analyses confirmed that these relationships are likely sequentially ordered, with awareness leading to appraisal to responsibility and then behavioral and contribution intentions. The discussion considers the implications of these findings for interventions designed to increase environmental engagement.

Keywords: Watershed conservation; Environmental engagement; Behavioral intentions; Pollution

1. Introduction

The continuing spread of urban development into neighboring areas—urban sprawl—transforms not only the land in those areas but also the local hydrological systems. As growth occurs, urban land uses are imposed on what was previously forested or agricultural spaces. Along with residential housing come roads, infrastructure, commercial construction, and other forms of physical development that influence the hydrologic and biotic systems in substantial ways. Urbanization stresses natural and human-built systems, often resulting in degraded streams, increased erosion, loss of aquatic diversity, and reductions in the number of species living in the riparian zones.

The watersheds of urbanized residential and industrial areas are often substantially impaired environments, but most individuals react to this threat as bystanders do when confronted by an emergency: they do not get involved. Here we consider environmental engagement to be a form of helping behavior, and provide empirical evidence that supports this conclusion. Specifically, we draw on theoretical and empirical studies of helping and environmental behavior to suggest that individuals will be most likely to protect and sustain the environment when they are aware of the environmental threat, consider the danger of the threat to be great, and feel responsible for acting (e.g., Latané & Darley 1970; Schwartz, 1968; Stern, 2000). After elaborating the awareness–appraisal–responsibility (AAR) model and reviewing prior relevant research, we report the results of a study that tested the model by surveying individuals living in or near a degraded watershed.

1.1. Environmental engagement as helping behavior

Various forms of environmental engagement, including recycling, lobbying for environmentally friendly legislation, and conserving energy, can be considered helping behaviors. When people volunteer for community service,

☆National Science Foundation Grant 9874924 supported this research.
*Corresponding author. Tel.: +1 804 289 8461.
E-mail address: dforsyth@richmond.edu (D.R. Forsyth).

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organize a paper drive, or take part in an Adopt-A-Road program, they are helping others, the environment, and even themselves by preserving resources and making their environment cleaner (Allen & Ferrand, 1999).

When are people likely to engage in behaviors that protect, enhance, and help the environment, for example a local watershed? Schwartz (1968), in his norm-activation model (NAM) of altruism, suggests that helping becomes more likely when people are aware of the consequences of their behavior for others (AC) and they ascribe responsibility to themselves (AR) for these actions. When AC and AR are both high one's own moral norms are activated, and pro-environmental actions become more likely. These predictions have been supported in studies of littering (Heberlein, 1972), energy conservation (Black, Stern, & Elworth, 1985), the purchasing of lead-free gasoline (Heberlein & Black, 1976), environmentally responsible consumerism (Ebreo, Hershey, & Vining, 1999), recycling (Guagnano, Stern, & Dietz, 1995; Hopper & Nielsen, 1991; Vining & Ebreo, 1992), the use of alternative transportation (Hunecke, Blöbaum, Matthies, & Höger, 2001), perceptions of government and industry's obligation for environmental problems (Stern, Dietz, & Black, 1986), and even more general environmental behaviors (Gärling, Fujii, Gärling, & Jakobsson, 2003; Schultz et al., 2005; Schultz & Zelezny, 1998; Stern, Dietz, & Kalof, 1993).

Stern's (2000) value-belief-norm (VBN) model similarly stresses the importance of awareness of consequences and responsibility, but extends NAM by considering the values and motivations of the individual. For example, Steg, Dreijerink, and Abrahamse (2005), in their application of VBN, found that people who hold altruistic (concern for others) or biospheric (concern for the environment), but not egoistic (concern for oneself) values, perform more environmentally friendly behaviors. Other work, however, suggests that a mixture of altruistic and selfish concerns seemingly motivate environmental behavior (Bamberg & Möser, 2007). In other words, a desire to help the environment, others, or even yourself leads to environmental protection. Planned behavior theory, too, recognizes that awareness of consequences, one's attitudes towards those consequences, and social norms influence one's intentions to act in environmentally positive ways (Ajzen, 1985; Kaiser & Scheuthle, 2003). Planned behavior theory, more so than either NAM or VBN, assumes that intentions are better predictors of behavior than moral norms (Bamberg & Schmidt, 2003; Kaiser, Hübner, & Bogner, 2005).

Consistent with prior analyses of environmental action, we suggest that pro-environmental behavior can be considered a form of helping behavior. When, for example, will the residents of a community devote their time and personal resources to reverse a decline in the quality of the streams and rivers in their region? Just as individuals may not intervene in an emergency if they are not aware of the consequences of non-intervention and do not feel responsibility for minimizing the harm, residents who do not consider environmental problems threatening will abdicate responsibility and remain uninvolved (Dovidio, Piliavin, Gaertner, Schroeder, & Clark, 1991; Latané & Darley, 1970; Schwartz & Howard, 1981).

1.1.1. Awareness

Before bystanders will respond to an emergency, they must first become aware of that emergency. Darley and Batson (1973), in a classic study of helping behavior, discovered that many of the seminary students did not help a man slumped in a doorway because they did not see him as they hurried to their next appointment. Similarly, individuals will not take actions to address environmental problems if they never notice that the environment is threatened. They will not pick up litter they do not see, limit their use of fertilizers if they do not know the water that runs off their land dumps in to local streams, or repair their oil-leaking car if they do not know it is dripping.

Because awareness depends on the vividness, salience, and magnitude of the environmental event, people often overlook watershed degradation (Bartlett, 1995; Soliman, 1996). Watersheds are geographically specific, but they cut across existing cognitive and spatial boundaries, such as neighborhoods, towns, counties, cities, regions, and states, industrial and suburban areas, and rural and urban areas. Residents often notice sources of point pollution (contamination from a specific problem, such as a factory emitting pollutants) but then overlook non-point pollution (contamination from many unrelated sources that, taken together, generate environmental harm). In consequence, watershed problems are so perceptually subtle that few individuals notice them. For example, Kasapoğlu and Ecevit (2002) studied residents living near a seriously impaired lake and wetland. They discovered that most knew nothing about the environmental degradation of the lake, but those who were aware were more likely to report that they had taken steps to reduce the pollution of the contaminated water. Similarly, residents of Shoalhaven, Australia, who were more aware of water issues, and general environmental issues, were more likely to become personally involved in water conservation efforts in their own home (Gregory & Di Leo, 2003). An individual's general knowledge about wetlands correlates with many factors such as their assessment of the wetlands, their emotional response to its state, and self-reported wetland protective behaviors (Syme, Beven, & Sumner, 1993). Proximity of the problem is one determinant of awareness; residents are more likely to report they are aware of problems with water quality when they live near their water source (Brody, Highfield, & Alston, 2004; Brody, Highfield, & Peck, 2005). Interventions aimed at increasing awareness, even simple ones, such as showing a film about water conservation, are enough to influence residents' intentions to conserve water in the future (Kantola, Syme, & Nesdale, 1983).

1.1.2. Appraisal

Darley and Batson (1973), in their study of seminary students, discovered that many noticed the victim, but they did not feel that the situation qualified as an emergency. Similarly, even if residents are aware of their watershed, they may not take steps to sustain or protect it if they feel that warnings of environmental degradation are overblown or unfounded.

A number of perceptual and cognitive factors, including expectations and estimate of risk, influence this appraisal process (Gattig & Hendrickx, 2007). Shotland and Huston (1979), in a study of helping, discovered that people are more likely to respond to situations that are unexpected rather than routine, involve an imminent, escalating threat of harm, and will not be favorably resolved unless someone intervenes. Applied to environmental intervention, their work suggests that people may not consider watershed problems to be substantial enough to qualify as an emergency. Unlike acute environmental hazards, such as oil spills, which are unexpected and involve immanent harm, many consider recurrent discharge from a waste-water treatment plant during heavy rains, erosion, and litter to be a taken-for-granted aspect of modern life. The perceived susceptible of the watershed to pollution can alter behavior. If people view the quality of the watershed as dropping so low that it approaches a critical tipping point, they are much more likely to engage in behavior to protect it than those who consider its condition as unpredictable or abundant (Steg & Sievers, 2000).

Researchers have linked threat, or perception of risk, to water conservation and watershed preservation intentions in a number of studies (Lévy-Leboyer, Bonnes, Chase, Ferreira-Marques, & Pawlik, 1996; Lubell, 2002; Pahl, Harris, Todd, & Rutter, 2005; Séguin, Pelletier, & Hunsley, 1999). Residents who believed that water in their area was dirty and unclean were the ones most likely to report engaging in watershed preservation behaviors (Forsyth, Garcia, Zyzniewski, Story, & Kerr, 2004). Van Vugt and Samuelson (1999) found that only those residents who believed that a water shortage was serious were willing to conserve or restrict their water usage. In general, a sense of threat is a stronger predictor of water conservation than even individual's general environmental attitudes or political orientation (Baldassare & Katz, 1992), so long as environmental problems are not seen as so severe that they engender feelings of helplessness (Pelletier, Dion, Tuson, & Green-Demers, 1999).

1.1.3. Responsibility

Latané and Darley first highlighted the impact of responsibility on action in their studies of bystander groups. Individuals who took action felt personally responsible for helping, but once a member of a collective, individuals begin to feel that their civic duty is shared with others. The "pressures to intervene do not focus on any one of the observers; instead, the responsibility for intervention is shared among all the onlookers and is not unique to any one" (Darley & Latané, 1968, p. 378). People in groups are more likely to report having thought they were not obligated to help, and people who are alone are more likely to spontaneously think about their social obligations (Schwartz & Gottlieb, 1980). Diffusion of responsibility is minimal, however, if individuals realize that others either cannot or will not intervene and when situational factors focus responsibility on them personally (Leary & Forsyth, 1987).

How obligated people feel to respond to environmental problems depends, in part, on how much responsibility they ascribe to themselves (e.g., Gärling et al., 2003). For example, assignment of responsibility to oneself determines the likelihood that one will burn leaves in their yard (Van Liere & Dunlap, 1978). When interviewed, environmentally responsible individuals tended to credit their increased environmental knowledge and sense of responsibility as reasons for engaging in pro-environmental behaviors (Hallin, 1995). Individuals who feel more responsible for environmental problems believe that their actions make a difference. Kaiser and Shimoda (1999) found that people who claimed personal responsibility for air pollution were more likely to believe that individual action directly affected air quality.

Hines, Hungerford, and Tomera (1986/1987), in a meta-analysis of the determinants of environmental behavior, found that across six studies personal responsibility correlated with environmental behavior at .33. Personal responsibility was a stronger determinant of behavior than knowledge or several demographic variables (e.g., education level, income). Similarly, Bamberg and Möser (2007) found that across 11 studies a normative sense of moral responsibility was associated with pro-environmental behavior. Only intentions and attitudes were more strongly linked to pro-environmental action than responsibility. Schultz and his colleagues (e.g., Schultz et al., 2005; Schultz & Zelezny, 1998) find that a single item measure of responsibility can predict a variety of environmental behaviors across most countries.

The strength of the relationship between responsibility and action, although supported meta-analytically, is not beyond empirical reproach. Ascription of responsibility is the most frequently dropped component of the NAM model (e.g., Bratt, 1999; Hopper & Nielsen, 1991; Nordlund & Garvill, 2002, 2003; Stern et al., 1993) and has occasionally been found not to contribute well to predictive models of environmental response (e.g., Vining & Ebreo, 1992). Responsibility is also conceptualized as a key mediator of the relationship between personal attributes and environmental action in some models, but as a moderator of that relationship in others (e.g., Guagnano et al., 1995; Heberlein & Black, 1976; Kaiser et al., 2005; Kaiser, Ranney, Hartig, & Bowler, 1999; Schultz et al., 2005; Schwartz, 1968; Steg et al., 2005; Van Liere & Dunlap, 1978). Schwartz's NAM model, as originally proposed, suggests that responsibility is a moderator variable. Schwartz (1968) states "the correspondence

between personal norms and overt behavior is stronger among those high in the tendency to ascribe responsibility to the self than among those low in this tendency" (p. 234). Furthermore, Schwartz believes that awareness of consequences and awareness of responsibility interact such that the relationship between moral norms and behavior will be strongest with both AR and AC is high. Evidence has generally supported this assertion (e.g., Blamey, 1998; Hopper & Nielsen, 1991; Schwartz, 1968). However, others have proposed responsibility as mediator of the relationship between AC and behavior (Guagnano et al., 1995; Steg et al., 2005). For example, Steg et al. (2005), in an analysis that specifically tested for the mediation, found that responsibility fully mediated the relationship between awareness of consequences and moral norms. However, more evidence is needed about the mediation potential of responsibility, especially for other variables like awareness.

1.2. The current study

We examined the parallels between helping behavior and environmental engagement by surveying the residents of an urban watershed. The streams and brooks in this watershed area vary in size, but most are small and flow (or are piped) through developed neighborhoods and into a nearby river. These streams, however, are impaired in a number of places, due to high fecal coliform levels and low dissolved oxygen levels in the water. As with many urban watershed streams and brooks, the streams tend to be flashy during heavy rainfalls and some sections carry debris, litter, and oils. In some locations the riparian zones that surround the streams are eroded, littered, and home to invasive plants and species.

Based on studies of when people help, we predicted that resident's awareness of the watershed, appraisal of the watershed, and feelings of responsibility for intervening will predict their willingness to become involved in watershed cleanup. The awareness–appraisal–responsibility (AAR) model, shown in Fig. 1, asserts that as awareness and responsibility increase, and appraisal becomes more negative, people become more psychologically engaged with the environment. Once aware of the watershed, people are more likely to monitor this resource. However, only those residents who feel that the watershed is threatened and ascribe responsibility to themselves for helping will express pro-environment behavioral intentions. Thus, if all three conditions are high—awareness of the watershed, negative appraisal, and levels of responsibility—then residents should become psychologically engaged with their watershed and its protection. Engaged individuals should report behavioral intentions that promote environmentally responsible behaviors and discourage actions that harm the environment.

2. Method

2.1. Participants

Participants were all residents of the Greater Richmond Metropolitan area, located in the state of Virginia in the US. Residents lived in the Upham Brook Watershed (UBW), a sub-watershed of the James River watershed and the even larger Chesapeake Bay watershed. The UBW drains approximate 38 square miles of urban and suburban land. Five miles of Upham Brook, the primary stream that runs through the watershed, is identified as impaired due to fecal coliform levels that surpass full body contact standards (Virginia Department of Environmental Quality, 1998). The stream is not posted as dangerous to public health, and there are no permitted point sources in this watershed; all pollution is non-point, or non-identified, sources such as residential, commercial, industrial (railroad yards), freeway and street, park, and vacant land sources.

Respondents included 51 men and 67 women. They ranged in age from 17 to 89, with an average age of 39. Specifically, 42.2% were in the 17–20 age range, 20.7% were 30–44, 20.7% were 45–64, and 17.2% reported being 65 or older. The majority (72.8%) were white, 15.8% African American, 8.5% Asian, and the remainder named another category or did not respond. Only 2.5% reported themselves of Hispanic origin. Over half of the respondents reported having some college education (51.7%), 20.3% finished college, 12.7% obtained a graduate degree, and 4.2% did not have a high school diploma.

2.2. Procedure

Six neighborhoods that bordered a stream or brook in the UBW were selected to represent the larger residential area. All neighborhoods were notified by an informational flyer delivered through the mail 1 week in advance about the study. The information sheet also informed residents of possible risks, costs of their involvement, confidentiality of their records, and their rights as participants. Finally, the information sheet provided residents with contact information if they had any additional questions about the study.

Researchers went door-to-door asking residents to participate in a study "on resident's perceptions of lakes, streams and brooks in their area." If residents agreed, we provided them with a questionnaire and a self-addressed

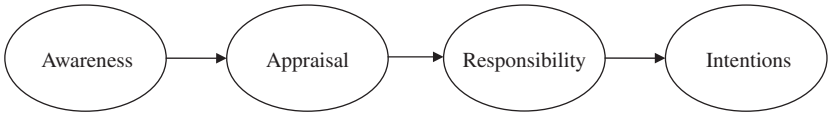

Fig. 1. The awareness–appraisal–responsibility–intentions model.

stamped envelope to return the questionnaire. If the resident did not answer, the researcher left the materials at the door. Of the 450 questionnaires distributed at residents' households, 26.2% (118) were returned.

2.3. Measures

The survey instrument was a printed booklet that included a consent form, a very brief overview of the concept of a watershed, and a series of opinion statements. The instructional materials were included because, in a prior survey conducted via the telephone, we discovered that many residents were not familiar with the concept of a watershed (Forsyth et al., 2004). The booklet therefore explained the nature of a watershed, and informed participants that they lived in the UBW. The survey noted that in the UBW wastewater goes into the sewer line (or septic system), but most rainwater is carried by natural waterways (streams, brooks) and man-made waterways (drainage ditches, gutters, and underground pipes) to the Upham Brook. The survey explained, "We want to know your opinion of the natural and man-made waterways that make up the watershed where you live." (For the sake of clarity, we used the word "man-made" rather than a gender-fair wording.)

This introductory material was followed by a series of items that, when combined, would form four scales: knowledge of the watershed's features (awareness), evaluation of the physical condition of the watershed (appraisal), sense of responsibility for maintaining and enhancing the watershed's ecological integrity (responsibility), and anticipated involvement in pro-watershed conservation efforts (behavioral intentions). We developed the scales by first writing items for each domain, and then asking experts from a variety of fields and specializations (including ecology, environmental policy, hydrology, aquatic biology, political science, sociology, social psychology, and decision and risk analysis) to review them for clarity and relevance (Merrick, Parnell, Barnett, & Garcia, 2005). We then pretested the items on a group of 101 adults who resided in the watershed. Using both exploratory factor analysis (EFA) and traditional scaling analysis, we deleted items that (a) did not load significantly on the first factor extracted for each scale; (b) reduced the overall internal consistency of the scale created by summing the items; and (c) respondents consistently identified as vague or misleading.

The final survey included these pre-tested items, interspersed with items pertaining to other community matters. Respondents indicated agreement with each item using a Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree). Participants, if unsure, could also indicate "don't know." Negatively worded items were scored in reverse, so that when the items were averaged together higher scores indicated greater awareness, a more positive appraisal, higher levels of responsibility, and stronger behavioral intentions. If a participant did not respond to an item in a scale, we calculated the score with the mean of the remaining items. Factor loadings from the CFA using principal components analysis are listed after each item in parentheses.

2.3.1. Awareness

We measured residents' general knowledge of, familiarity with, and attentiveness to the UBW with the following five items: "I do not know very much about the UBW" (.82), "Parts of the UBW (streams, creeks, drainage ditches) are noticeable where I live/work" (.54), "I don't pay much attention to the UBW" (.84), "I am not sure where the UBW begins and where it ends" (.58), and "I am aware of the environmental condition of the UBW" (.74). Confirmatory factor analysis (CFA) verified that the *Awareness* scale was unidimensional: χ^2 (5, $N = 118$) = 8.93, CFI = .97, and the Cronbach alpha of the scale based on these items was .74.

2.3.2. Appraisal

Participants' beliefs about the degree to which the watershed was polluted, in terms of litter, water quality, and erosion, were assessed using the following six items: "I am satisfied with the quality of the water in the UBW" (.78),"The water in the waterways of the UBW is free of disease-carrying organisms" (.67), "The waterways in the UBW are clean (unpolluted)" (.82), "Portions of the UBW are polluted" (.69), "Waterways in the watershed contain litter" (.77), and "Erosion is a problem in the UBW" (.48). CFA supported a one-factor measurement model: χ^2 (9, $N = 118$) = 14.33, CFI = .98, and the Cronbach alpha of the *Appraisal* scale was .80.

2.3.3. Responsibility

The *Responsibility* scale measured residents' feelings of personal responsibility for maintaining and protecting the watershed, as well as their feelings of efficacy in dealing with pollution. It included these five items: "I feel personally responsible for protecting the UBW" (.60), "It isn't my responsibility to protect the UBW" (.73), "There is very little I can do to combat pollution in the UBW" (.78), "My efforts to clean up the UBW would not make much of a difference" (.61) and "No one person can do much to prevent pollution in the UBW" (.73). Despite the content heterogeneity of the items in this scale, CFA confirmed a single-factor measurement model: χ^2 (5, $N = 118$) = 3.63, CFI = 1.00, and the scale's internal consistency was adequate ($\alpha = .72$).

2.3.4. Behavioral intentions

The behavioral intention scale sampled a number of behaviors that residents could perform to promote, or not promote, the overall quality of the watershed where they lived. We developed the items to tap a single set of behavioral intentions, and then pretested the items with a sample of University students. Results indicated they formed a single-factor measure of intentions. Exploratory

factor analysis of the items with the residential sample, however, suggested a 2-factor solution. Except for one item that we removed because of dual loadings, no factor loaded higher than .19 on the other factor. We further tested the measurement model with the residential sample, using structural modeling, and found that a single-factor model did not fit the data: χ^2 (20, $N = 118$) = 149.73, CFI = .88. We confirmed the 2-factor model through CFA: χ^2 (26, $N = 100$) = 38.15, CFI = .97. Five of the 8 original items pertained to intended behaviors that would sustain or enhance the watershed, such as "I plan to monitor the quality of the UBW" (.67), "I plan to talk about the UBW with members of local groups (such as church groups, work groups, community groups) I belong to" (.87), "I plan to take steps to improve the quality of the UBW" (.70), "I plan to clean up portions of the UBW (pick up litter, trim brush, and so on)" (.73), and "I plan to take part in a community-based UBW clean-up program" (.83). The remaining items pertained to donating money or time: "I would donate money or my time to organizations that promote positive environmental action" (.95), "I would be willing to get involved in preserving the UBW" (.78), and "I would NOT be willing to donate my time or money to improve the UBW" (.92). We labeled these two scales *behavioral intentions* and *contribution intentions*. These two scales had α's of .84 and .90, respectively.

3. Results

The primary goal of this study was to test a model of environmental engagement that describes how awareness, appraisal, and a sense of responsibility are related to intentions to act in ways that sustain and enhance the environment. The secondary goal was to determine if appraisal and responsibility mediate the relationship between awareness and environmental engagement. After describing the distribution of responses to the measures, and their interrelationships, we make use of structural equation modeling to test the fit of the proposed AAR model to the survey data.

3.1. Appraisal and engagement

The means, standard deviations, skewnesses, kurtosises, intercorrelations, and intercorrelations corrected for attenuation of the five variables we examined—awareness of the watershed, appraisal of the condition of the watershed, sense of responsibility, pro-watershed behavioral intentions, and contribution intentions with regards to conservation efforts—are shown in Table 1.

3.2. Model testing

Table 1 presents the zero-order correlations among the five key measures: awareness, appraisal, responsibility, behavioral intentions, and contribution intentions. All correlations, except for appraisal and behavioral intentions, were significant at the .05 level or lower. Four of the five variables—awareness, responsibility, intentions, and contributions—were positively correlated with one another; appraisal was the negative correlate. This pattern is consistent with the hypothesized model: awareness is related to appraisal, which is related to responsibility, which is in turn related to pro-environment behavioral intentions. We therefore tested both the direct and indirect effects of awareness, appraisal, and responsibility on behavioral intentions and contributions using structural equation modeling with LISREL 8.54 (Jöreskog & Sörbom, 2003).

In this analysis we used a parsimony-adjusted index (root mean square error of approximation [RMSEA]), an incremental index (comparative fix index [CFI]), an index based on covariances (standardized root mean square residual [SRMR]), a non-normed fit index [NNFI], and the following cutoffs as indicating acceptable fit levels: RMSEA $\leqslant$ .10, CFI $>$ .90, SRMR $<$ .10, and NNFI $>$ .90 (Hu & Bentler, 1999). We applied common parceling procedures when the items from each scale (shown in Table 2) measured the same underlying construct. Additionally parceling provided the added benefit of alleviating problems associated with skewness and kurtosis (Little, Cunningham, Shahar, & Widaman,

Table 1
Intercorrelations (raw and corrected for attenuation), reliabilities (along the diagonal), means, SDs, skewness, and kurtosis indices for awareness, appraisal, responsibility, and intentions

Measure	Awareness	Appraisal	Responsibility	Behavioral	Contribution
Awareness	.74	−.26**	.24**	.40**	.23*
Appraisal	−.33	.80	−.24*	−.15	−.25**
Responsibility	.33	−.31	.72	.41**	.45**
Behavioral	.51	−.18	.53	.84	.61**
Contribution	.28	−.30	.55	.71	.90
Mean	2.56	2.44	3.58	2.86	3.41
SD	.71	.52	.63	.64	.86
Skewness	2.66	−1.03	−.60	−.99	−2.97
Kurtosis	.13	−.48	−1.40	.09	−.09

Note: $N = 118$; *$p < .05$, **$p < .01$; skewness and kurtosis indexes are standardized. Correlations corrected for attenuation are tabled below the diagonal. Behavioral = behavioral intentions; Contribution = contribution intentions.

Table 2
Correlation and residual matrix of parceled indicators of model in Fig. 2

Indicator	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	M	SD
1. Aware 1	–	.49	.50	−.25	−.22	−.22	.41	.10	.24	.41	.25	.30	.27	.19	.26	3.08	.94
2. Aware 2	.02	–	.42	−.12	−.10	−.08	.24	−.09	.03	.34	.09	.15	.10	−.00	.08	1.88	.76
3. Aware 3	.02	.01	–	−.30	−.19	−.09	.27	.05	.12	.43	.29	.29	.20	.22	.19	2.89	.93
4. Apprsl 1	.00	.04	−.05	–	.59	.57	−.26	−.17	−.35	−.20	−.18	−.12	−.35	−.28	−.31	2.48	.59
5. Apprsl 2	−.01	.03	−.01	−.01	–	.53	−.08	−.10	−.25	−.13	−.06	−.01	−.17	−.15	−.13	2.64	.70
6. Apprsl 3	.02	.03	.04	.00	.02	–	−.18	−.00	−.21	−.13	−.06	−.05	−.07	−.17	−.12	2.21	.54
7. Rsblty 1	.09	.01	.02	.00	.07	.01	–	.50	.47	.38	.35	.40	.40	.47	.43	3.45	.72
8. Rsblty 2	−.07	−.14	−.09	.01	.03	.06	.02	–	.45	.17	.26	.21	.21	.22	.19	3.55	.76
9. Rsblty 3	.01	−.10	−.06	−.08	−.05	−.02	−.03	.05	–	.30	.29	.31	.41	.40	.32	3.89	.88
10. BI 1	.02	.03	.07	−.02	.00	.00	.00	−.06	.00	–	.71	.59	.50	.44	.61	2.73	.73
11. BI 2	−.06	−.09	−.01	−.01	.03	.02	.00	.00	.01	.00	–	.59	.46	.48	.52	2.84	.67
12. BI 3	.00	−.06	.02	.00	.06	.02	.05	−.01	.04	−.02	.02	–	.39	.47	.50	3.17	.83
13. CI 1	.05	−.05	.01	−.05	.03	.07	−.02	−.07	.06.	−.03	−.02	−.04	–	.78	.77	3.38	.93
14. CI 2	−.02	−.12	.04	−.02	.04	.02	.05	−.06	.07	−.06	.01	.05	.02	–	.70	3.48	1.02
15. CI 3	.05	−.05	.00	−.03	.05	.04	.01	−.07	.00	.06	.03	.06	.00	−.02	–	3.37	.89

Note: $N = 118$, Aware = awareness, Apprsl = appraisal, Rsblty = responsibility, BI = behavioral intentions, CI = contribution intentions; correlations are entered on the upper right of the matrix, standardized residuals on the bottom left; for $rs > .17$, $p < .05$; for $rs > .24$, $p < .01$.

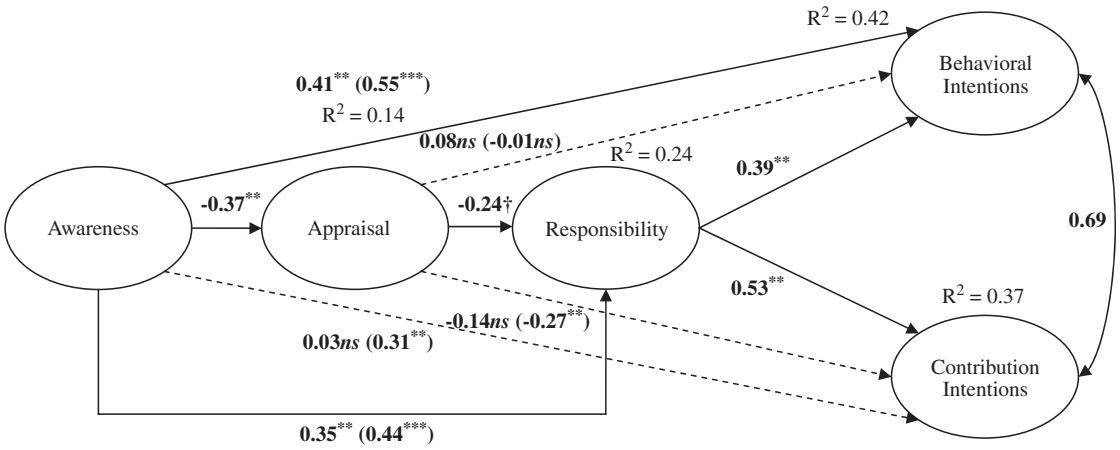

Fig. 2. Model of watershed preservation with standardized parameter estimates. Dotted lines indicate paths specified in the model that were not significant. Betas inside the parentheses indicate the relationship between variables when the mediator(s) are not controlled. (*Note*: $^{\dagger}p < .06$. $^{**}p < .01$. $^{***}p < .001$).

2002). Residual variances of the parceled indicators are included in the bottom left portion of the matrix in Table 2 (McDonald & Ho, 2002.[1]

Results of the overall model analysis suggested a reasonable overall model fit for the proposed model of watershed protection shown in Fig. 1: χ^2 (80, $N = 118$) = 130.82, CFI = .96, SRMR = .066, RMSEA = .066 (90% CIs: .040, .089), NNFI = .95. To determine if awareness and appraisal are sufficient conditions for watershed protection, we tested an alternative model (presented in Fig. 2), which allowed for direct links between the independent variables (AAR) and the dependent variables (Behavioral Intentions and Contribution Intentions). Results find that this model provides an even better fit to the data; $\Delta\chi^2$ (5) = 24.24, $p < .001$. First, in the revised AAR model, the path from awareness to appraisal was significant ($\beta = -.37$, SE = .12, $t = -3.17$, $p < .01$), as predicted, but so were the paths from awareness to responsibility and behavioral intentions (β's = .35 and .41, SE's = .13 and .12, t's = 2.73 and 3.34, p's < .01). Second, the path between appraisal and responsibility, although not significant, was in the predicted direction and approached significance ($\beta = -.24$, SE = .12, $t = -1.92$, $p = .058$). The direct paths from appraisal to the intention measures were not significant. Third, in some cases paths between variables that were correlated at the bivariate level were not significant. For example, the path from awareness to contribution intentions ($\beta = .03$, SE = .12, $t = .21$, $p > .10$) was not significant, even though these two variables were correlated in the bivariate analyses (see Table 1). Similarly, the paths from appraisal to intentions were not significant, despite the significant bivariate correlations in Table 1. Overall, awareness accounts for 14% of the

[1]We thank an anonymous reviewer for these suggestions.

variance in appraisal. Awareness and appraisal account for 24% of the variance in responsibility. Awareness, appraisal, and responsibility account for 42% of the variance in behavioral intentions and 37% of the variance in contribution intentions.

3.3. Mediation

Given the general support for the mediational model shown in Fig. 2, and the differences between the path coefficients and the bivariate correlations among the variables, we conducted mediational analysis to explore the strength of the mediational paths, relative to the direct, unmediated, paths. We first examined the awareness–responsibility relationship to determine if appraisal fully or partly mediated that relationship. We also examined the awareness–intentions relationship to determine if appraisal and/or responsibility mediated the awareness–intentions relationship. We conducted these second tests twice: once for behavioral intentions, and again for contribution intentions. We followed the methodological steps recommended by Baron and Kenny (1986) and used LISREL to calculate the strength of the proposed mediational paths (Brown, 1997).

Does appraisal mediate the relationship between awareness and responsibility? As shown in Fig. 2, the basic requirements for mediation as specified by Baron and Kenny (1986) were met: awareness was related to appraisal, awareness was related to responsibility, and appraisal was related to responsibility. Moreover, when we introduced appraisal into the model, the coefficient for the path from awareness to responsibility decreased from .44 to .35, but nonetheless remained significantly different from zero. This decrease in magnitude only approached statistical significance ($\Delta\beta = .09$, SE = .05, $t = 1.74$, $p = .086$), so the claim of mediation was not supported..

Do appraisal and responsibility mediate the relationship between awareness and behavioral intentions? We examined the mediational effects of appraisal, responsibility, and the joint effects of appraisal and responsibility, to determine if these variables account for a substantial portion of the relationship between awareness and behavioral intentions. Note that we could not examine the mediational effects of appraisal by itself, because this variable does not meet the first requirement of a mediational model: as Fig. 2 indicates, appraisal was not significantly related to the dependent variable, behavioral intentions. However, appraisal did significantly predict responsibility and could work with responsibility as a combined mediator.

As Fig. 2 again indicates, the basic components of a mediational model were significant. First, awareness was related to both possible mediators and to the outcome variable, behavioral intentions. Second, responsibility was related to behavioral intensions; appraisal was not, however. Third, when we introduced awareness and responsibility into the model, the coefficient for the path from awareness to behavioral intentions significantly decreased from .55 to .41 ($\Delta\beta = .14$, SE = .07, $t = 2.01$, $p < .05$). The relationship remained significant, suggesting that awareness and responsibility only partially mediate the awareness–behavioral intentions relation.

Do appraisal and responsibility mediate the relationship between awareness and contribution intentions? We examined the joint mediational effects of appraisal and responsibility, to determine if these variables account for a substantial portion of the relationship between awareness and contribution intention. As Fig. 2 indicates, the basic components of a mediational model were significant. First, awareness was related to both possible mediators and to the outcome variable, contribution intentions. Second, responsibility was a strong predictor of contribution intensions, whereas appraisal was a weaker one. Third, when we introduced appraisal and responsibility into the model, the coefficient for the path from awareness to contribution intentions significantly decreased from .31 to .03 ($\Delta\beta = .28$ SE = .09, $t = 3.13$, $p < .01$), and was no longer significant. The relationship between awareness and contribution intentions is fully mediated by responsibility and possibly by the combination of appraisal and responsibility as appraisal significantly predicts responsibility.

Does responsibility mediate the relationship between appraisal and contribution intentions? The preconditions needed for possible mediation were established for the appraisal–responsibility–contribution intentions relation: appraisal was related both to responsibility and to intentions, and responsibility was related to intentions. When we introduced responsibility into the model, the coefficient for the path of appraisal to contribution intentions changed from significant (−.27) to non-significant (−.14). This change, however, was not statistically significant ($\Delta\beta = -.13$ SE = .07, $t = -1.79$, $p = .077$).

4. Discussion

Pro-environmental attitudes, at least for residents of the US, stand in stark contrast to actual environmental engagement. Even though people generally express very positive attitudes about the environment, very few are highly engaged in activities that protect and sustain the environment; they act as if environmental threats will not influence them personally (Fridgen, 1994).

Why? We suggest that people's lack of involvement in protecting and enhancing the environment—what we call environmental engagement—is not due to disinterest, lethargy, or thoughtlessness, but is instead the result of a series of decisions that prompts them to remain uninvolved rather than engaged. Just as Latané and Darley's (1970) model of emergency intervention suggests individuals must notice the event, interpret it to be an emergency, and take responsibility for helping, we theorized that individuals will be most likely to protect and sustain the environment when they are aware of the environmental threat, consider the danger of the threat to be great, and feel responsible for

acting. If any link in this cognitive chain is broken, then the individual will not be environmentally engaged. But if awareness leads to a negative appraisal which in turn engenders a feeling of responsibility for minimizing the harm, then the individual will engage in pro-environmental actions.

Our results support the sequential decision-making model. First, the variables identified by Latané and Darley (1970)—awareness, appraisal, and responsibility—were all significantly related to environmental engagement. Second, structural equation modeling confirmed the basic model, for we found that all of the links among the measured variables were significant. Third, our mediational analysis provided some support for the assumption that these variables are sequentially linked steps in the decision process: appraisal and responsibility, combined, substantially mediated the relationship between awareness and engagement. In some cases, the predicted mediational effects did not reach statistical significance, but the overall patterns of changes in the strength of the relationships when mediators were considered were suggestive. In particular, including appraisal in the model weakened the link between awareness and responsibility; responsibility altered the relationship between appraisal and contribution intentions.

Structural equation modeling also revealed, however, unanticipated patterns of relationships within the data. Specifically, our analyses suggested that awareness was more influential, in terms of variance accounted for, than the other variables of interest. Awareness was directly linked to appraisal, responsibility, and behavioral intentions, rather than just appraisal as the sequential model suggests. Although originally correlated with contribution intentions, once appraisal and responsibility were included in the model, the link was no longer significant. Contrary to predictions, the relationship between awareness and behavioral intentions remained significant even once controlling for appraisal and responsibility. Hence, individuals who were simply aware of the watershed where they lived reported intentions to act in environmentally positive ways.

This direct link between awareness and behavioral intentions is consistent, in some respects, with the findings of Brody et al. (2004, 2005). People who live near streams or rivers in the watershed are likely more aware of its condition and they are also more likely to act to protect the watershed—no matter what their appraisal of the watershed's quality or their sense of responsibility for it. These residents, because these features are on their property or in their neighborhoods, may still plan to monitor its quality, but for pragmatic reasons rather than a sense of civic responsibility. This analysis, although speculative, explains why appraisal only partial mediates the link between awareness and responsibility. People who do not consider the water dirty still may take responsibility for its condition, considering themselves stewards of their portion of the watershed. Note, however, that people indicating high awareness would not be willing to donate time or money, a more involving behavior, unless they considered it dirty and took responsibility for its condition.

Appraisal, in contrast to awareness, was not directly associated with our measures of environmental engagement. This finding may be due, in part, to the restriction in scale, for many of the residents we surveyed regarded the watershed's condition as degraded and polluted. Conceivably residents may have become indifferent to water pollution through consistent exposure to the unsightly water just as those who are constantly exposed to crime and constant harm to others are less likely to help (Milgram, 1970). Additionally this constant exposure could explain why awareness accounted for such a small portion of the variance in appraisal. Nevertheless, statistical modeling suggests that appraisal is related to engagement, but that responsibility alters this relationship. Hence, individuals who consider the watershed to be degraded are more likely to feel they are personally responsible for protecting their residential environment, and this sense of responsibility prompts them to become environmentally engaged.

Similar to Steg et al. (2005), we found that responsibility fully mediates the link between appraisal and both measures of intentions. Our findings underscore the importance of responsibility, which was a central theoretical concept in Latané and Darley (1970) analysis of bystander intervention. Responsibility was a strong to moderate predictor of both intentional measures and fits well with past literature. Once included in the model, the links between awareness, appraisal and intentions change significantly. Therefore, the current study extends and strengthens the awareness-appraisal model (Forsyth et al., 2004) by suggesting awareness and a negative appraisal prompt residents to feel responsible for intervening, and that this felt responsibility is the proximate cause of engagement.

Limitations in the current work must be considered when interpreting these findings. In terms of measurement, all of the scales we developed were psychometrically adequate, except for measure of behavioral intentions. Pretesting suggested that all the behavioral intention items measured the same underlying construct, but in the study itself one cluster of items pertained primarily to pro-environment action plans, such as monitoring the streams and brooks and cleaning them as necessary and a second scale pertained primarily to contributions of time and effort to pro-environment causes and organizations. This bifurcation of the behavioral items was unexpected, and may reflect variance in the way the items were worded and hence is of little theoretical interest. However, these two clusters may indicate that different psychological processes influence intentions to undertake direct forms of pro-environmental action and indirect forms of pro-environmental action. The behavioral intentions items all focused on relatively simple behaviors that could be performed individually, whereas the contribution items emphasized

working with others to achieve change. In any case, the behavioral intentions were more closely linked to awareness and to responsibility, whereas the behavioral contributions were linked primarily to responsibility.

The results, although contrary to expectations, are not surprising. Increasingly environmental researchers are proposing that measures, once considered one-dimensional, as more complex multidimensional measures. For example, Frick, Kaiser, and Wilson (2004) suggest three different types of knowledge: system (general knowledge about ecosystems), action-related (what can be done to solve environmental problems), and effectiveness knowledge (how well each solution works). Gärling et al. (2003) finds that Schwartz's AC measure can be broken into three components: consequences for oneself, others, and the environment. Similarly, Stern (2000) when proposing VBN theory uses different values (biospheric, altruistic, and egoistic) to explain ecological worldviews and suggest that moral norms should predict different types of environmental behaviors. Kaiser and Shimoda (1999) separate responsibility feelings from responsibility judgment. Thus, the split of our behavioral items adds to the growing body of literature that suggests splitting measures provides a more complete picture of the antecedents of environmental engagement.

The patterns of relationships among our three key predictor variables—awareness, appraisal, and responsibility—may have been due to the specific watershed we studied, as well as the items we used to measure these constructs. We studied residents living in one watershed in the US, and aspects of that watershed and their experience with it may have uniquely conditioned their awareness, appraisals, and responsibility for that environment. In particular, the watershed we investigated has been judged to be severely degraded for a number of years, possibly raising residents' overall level of awareness and lowering their appraisals. At the same time, the long history of problems with local water conditions may have prompted residents to abdicate their responsibility towards involvement. A lack of a significant change in the water's condition may have allowed residents to become accustomed to its current condition. Their consistent inaction and apathy towards the watershed may have become habitual (Bamberg & Schmidt, 2003; Fujii, Gärling, & Kitamura, 2001). Therefore, the model may only apply to long-standing environmental problems instead of new, rapidly occurring ones.

We should also note the limitations of the data-analytic strategy we used to test our theoretical model. We avoided using modification indices to identify ways to strengthen the fit of our theoretical model to the data (e.g., MacCallum, Roznowski, & Necowitz, 1992), but we did modify the measure of intentions (as noted above). In consequence, the measurement model may not generalize to other samples and care should be taken when interpreting the model until it can be tested with independent samples. We made use of parceling methods in our structural equations modeling rather than item-level modeling. As Little et al. (2002) suggest, parceling is appropriate when sample sizes are small and when the data are skewed. Although parceling is particularly useful when the number of indicators is large, it can be used with only a small number of indicators, since it offers a means of dealing with problems of "lower reliability, lower communality, a smaller ratio of common-to-unique factor variance, and a greater likelihood of distributional violations" (Little et al., p. 154) encountered when using item-level methods. The possibility remains, however, that somewhat different conclusions may have been supported by an alternative data-analytic method. Our findings also account for only a portion of the variance in people's behavioral intentions with regards to pro-environmental interventions. Our survey focused the specific variables described in the AAR model, and even though the model successfully explained variations in the key-dependent measures, other influential variables that we did not investigate may be important to consider when explaining pro-conservation actions.

An additional limitation is that we studied individual, not collective, intentions to protect the watershed. A group of individuals may perceive an environmental problem in a different manner than even those exposed to the same problem (Axelrod & Lehman, 1993). Social psychological analyses, such as the theory of planned behavior (Ajzen, 1985), suggest that how people react depends on the behavior of others, particularly when they are unsure of social norms and values (e.g., Gärling, Biel, & Gustafsson, 2002). Including a social component may directly affect variables in the model like responsibility, with individuals attributing more or less responsibility to their behavior when considering how others react to environmental problems. Applied to environmental problems, if individuals do not see others recycling cans or bottles, carefully disposing of used motor oil, or making efforts to clean up polluted water, then they are unlikely to undertake these actions. Future work should include a social component to determine how other's behavior motivates our own behaviors toward watershed protection and conservation.

These limitations are substantial enough to urge great caution in using the results to make suggestions about how to intervene in a community to increase pro-environmental action. However, assuming that AAR model correctly identifies and sequences the cognitive decisions that lead individuals from environmental apathy to environmental engagement, the model suggests that interventions should begin by raising awareness of the watershed itself. Particularly in urban communities, residents may mistakenly believe that rainwater is piped into the city water treatment system, and they may not even know the source of their drinking water. If individuals do not know the boundaries of their watershed or its hydrological features, then they are not likely to get involved in correcting its deficiencies.

Second, educational interventions should teach residents to gauge accurately the overall health of watershed as an ecosystem. Although residents recognize that a trash-filled creek is impaired, they may not realize that piping the stream will remove the habitat for a number of plant and animal species. Residents tend to prefer manicured, well-maintained vegetation in urban green spaces, even though riparian zones with rich biodiversity are more sustainable than those that are landscaped (Bonnes, Uzzell, Carrus, & Kelay, 2007). Awareness, by itself however, will not necessarily lead to action. For example, a qualitative review on interventions aimed at energy conservation suggests that simply making people more aware is not enough for energy reduction. Nevertheless, in use with other strategies, such as increasing self-efficacy through modeling behaviors, increasing awareness may also increase pro-environmental action (see Abrahamse, Steg, Vlek, & Rothengatter, 2005).

Last, after awareness and appraisal increase, interventions should target resident's perception of responsibility by presenting the problem as controllable and preventable via individual involvement. People are uncertain about how their individual behavior affects the environment (see Gärling et al., 2002). Quantifying the turning point at which a large resource, such as watershed, cannot recover is near impossible for the average watershed resident. Therefore, those who see the environmental problem as too large will be intimidated and overwhelmed by such a monumental task leading to lower levels of perceived responsibility. For large environmental issues, Weick (1984) presents the idea of small wins, which can help build confidence while simultaneously getting residents involved. By breaking down a problem into smaller pieces, the issue seems less intimidating, as each component is addressed and fixed, residents feel a sense of accomplishment—a small win—and the win serves to increase their feelings of self-efficacy. Additionally, educating residents about an environmental threat—besides simply drawing attention to the problem—can have unintended, but beneficial, results by altering their ecological worldview of other environmental problems (Arcury & Christianson, 1990; Marshall, Picou, & Bevc, 2005). Once residents engage in protecting their local environment this commitment to protect the environment can serve as a foot-in-the-door leading to increases in other environmentally responsible behaviors over time (Hallin, 1995).

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References

Abrahamse, W., Steg, L., Vlek, C., & Rothengatter, T. (2005). A review of intervention studies aimed at household energy conservation. *Journal of Environmental Psychology*, *25*, 273–291.

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In J. Kuhl, & J. Beckman (Eds.), *Action control: From cognition to behavior* (pp. 11–39). New York: Springer.

Allen, J. B., & Ferrand, J. L. (1999). Environmental locus of control, sympathy, and proenvironmental behavior: A test of Geller's actively caring hypothesis. *Environment and Behavior*, *31*, 338–353.

Arcury, T. A., & Christianson, E. H. (1990). Environmental worldview in response to environmental problems: Kentucky 1984 and 1988 compared. *Environment and Behavior*, *22*, 23–39.

Axelrod, L. J., & Lehman, D. R. (1993). Responding to environmental concerns: What factors guide individual actions? *Journal of Environmental Psychology*, *13*, 149–159.

Baldassare, M., & Katz, C. (1992). The personal threat of environmental problems as predictor of environmental practices. *Environment and Behavior*, *24*, 602–616.

Bamberg, S., & Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behavior. *Journal of Environmental Psychology*, *27*, 14–25.

Bamberg, S., & Schmidt, P. (2003). Incentives, morality, or habit? Predicting students' car use for university routes with models of Ajzen, Schwartz, and Triandis. *Environment and Behavior*, *35*, 264–285.

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173–1182.

Bartlett, R. A. (1995). *Troubled waters: Champion International and the Pigeon River controversy*. Knoxville: University of Tennessee Press.

Black, J. S., Stern, P. C., & Elworth, J. T. (1985). Personal and contextual influences on household energy adoptions. *Journal of Applied Psychology*, *70*, 3–21.

Blamey, R. (1998). The activation of environmental norms: Extending Schwartz's model. *Environment and Behavior*, *30*, 676–708.

Bonnes, M., Uzzell, D., Carrus, G., & Kelay, T. (2007). Inhabitants' and experts' assessments of environmental quality for urban sustainability. *Journal of Social Issues*, *63*, 59–78.

Bratt, C. (1999). The impact of norms and assumed consequences on recycling behavior. *Environment and Behavior*, *31*, 630–656.

Brody, S. D., Highfield, W., & Alston, L. (2004). Does location matter? Measuring environmental perceptions of creeks in two San Antonio watersheds. *Environment and Behavior*, *36*, 229–250.

Brody, S. D., Highfield, W., & Peck, B. P. (2005). Exploring the mosaic of perceptions for water quality across watersheds in San Antonio, Texas. *Landscape and Urban Planning*, *73*, 200–214.

Brown, R. L. (1997). Assessing specific mediational effects in complex theoretical models. *Structural Equation Modeling*, *4*, 142–156.

Darley, J. M., & Batson, C. D. (1973). 'From Jerusalem to Jericho': A study of situational and dispositional variables in helping behavior. *Journal of Personality and Social Psychology*, *27*, 100–108.

Darley, J. M., & Latané, B. (1968). Bystander intervention in emergencies: Diffusion of responsibility. *Journal of Personality and Social Psychology*, *8*, 377–383.

Dovidio, J. F., Piliavin, J. A., Gaertner, S. L., Schroeder, D. A., & Clark, R. D., III (1991). The arousal: Cost-reward model and the process of intervention: A review of the evidence. In M. S. Clark (Ed.), *Prosocial behavior* (pp. 86–118). Thousand Oaks, CA: Sage.

Ebreo, A., Hershey, J., & Vining, J. (1999). Reducing solid waste: Linking recycling to environmentally responsible consumerism. *Environment and Behavior*, *31*, 107–135.

Forsyth, D. R., Garcia, M., Zyzniewski, L. E., Story, P. A., & Kerr, N. A. (2004). Watershed pollution and preservation: The awareness-appraisal model of environmentally positive intentions and behaviors. *Analyses of Social Issues and Public Policy*, *4*, 115–128.

Frick, J., Kaiser, F. G., & Wilson, M. (2004). Environmental knowledge and conservation behavior: Exploring prevalence and structure in a representative sample. *Personality and Individual Differences*, *37*, 1597–1613.

Fridgen, C. (1994). Human disposition toward hazards: Testing the environmental appraisal inventory. *Journal of Environmental Psychology*, *14*, 101–111.

Fujii, S., Gärling, T., & Kitamura, R. (2001). Changes in drivers' perceptions and use of public transport during a freeway closure. *Environment and Behavior*, *33*, 768–808.

Gärling, T., Biel, A., & Gustafsson, M. (2002). The new environmental psychology: The human interdependence paradigm. In R. B. Bechtel, & A. Churchman (Eds.), *Handbook of environmental psychology* (pp. 85–94). Hoboken, NJ: Wiley.

Gärling, T., Fujii, S., Gärling, A., & Jakobsson, C. (2003). Moderating effects of social value orientation on determinants of proenvironmental behavior intention. *Journal of Environmental Psychology*, *23*, 1–9.

Gattig, A., & Hendrickx, L. (2007). Judgmental discounting and environmental risk perception: Dimensional similarities, domain differences, and implications for sustainability. *Journal of Social Issues*, *63*, 21–39.

Gregory, G. D., & Di Leo, M. (2003). Repeated behavior and environmental psychology: The role of personal involvement and habit formation in explaining water consumption. *Journal of Applied Social Psychology*, *33*, 1261–1296.

Guagnano, G. A., Stern, P. C., & Dietz, T. (1995). Influences on attitude–behavior relationships: A natural experiment with curbside recycling. *Environment and Behavior*, *27*, 699–718.

Hallin, P. O. (1995). Environmental concern and environmental behavior in Foley, a small town in Minnesota. *Environment and Behavior*, *27*, 558–578.

Heberlein, T. A. (1972). The land ethic realized: Some social psychological explanations for changing environmental attitudes. *Journal of Social Issues*, *28*(4), 79–87.

Heberlein, T. A., & Black, J. S. (1976). Attitudinal specificity and the prediction of behavior in a field setting. *Journal of Personality and Social Psychology*, *33*, 474–479.

Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1986/1987). Analysis and synthesis of research on responsible environmental behavior. *Journal of Environmental Education*, *18*(2), 1–18.

Hopper, J. R., & Nielsen, J. M. (1991). Recycling as altruistic behavior: Normative and behavioral strategies to expand participation in a community recycling program. *Environment and Behavior*, *23*, 195–220.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*, 1–55.

Hunecke, M., Blöbaum, A., Matthies, E., & Höger, R. (2001). Responsibility and environment: Ecological norm orientation and external factors in the domain of travel mode choice behavior. *Environment and Behavior*, *33*, 830–852.

Jöreskog, K., & Sörbom, D. (2003). *LISREL 8.54*. Chicago: Scientific Software International.

Kaiser, F. G., Hübner, G., & Bogner, F. X. (2005). Contrasting the theory of planned behavior with the value-belief-norm model in explaining conservation behavior. *Journal of Applied Social Psychology*, *35*, 2150–2170.

Kaiser, F. G., Ranney, M., Hartig, T., & Bowler, P. A. (1999). Ecological behavior, environmental attitude, and feelings of responsibility for the environment. *European Psychologist*, *4*(2), 59–74.

Kaiser, F. G., & Scheuthle, H. (2003). Two challenges to a moral extension of the theory of planned behavior: Moral norms and just world beliefs in conservationism. *Personality and Individual Differences*, *35*, 1033–1048.

Kaiser, F. G., & Shimoda, T. A. (1999). Responsibility as predictor of ecological behavior. *Journal of Environmental Psychology*, *19*, 243–253.

Kantola, S. J., Syme, G. J., & Nesdale, A. R. (1983). The effects of appraised severity and efficacy in promoting water conservation: An informational analysis. *Journal of Applied Social Psychology*, *13*, 164–182.

Kasapoğlu, M. A., & Ecevit, M. C. (2002). Attitudes and behavior toward the environment: The case of Lake Burdur in Turkey. *Environment and Behavior*, *34*, 363–377.

Latané, B., & Darley, J. M. (1970). *The unresponsive bystander: Why doesn't he help?* New York: Appleton.

Leary, M. R., & Forsyth, D. R. (1987). Attributions of responsibility for collective endeavors. *Review of Personality and Social Psychology*, *8*, 167–188.

Lévy-Leboyer, C., Bonnes, M., Chase, J., Ferreira-Marques, J., & Pawlik, K. (1996). Determinants of pro-environmental behaviors: A five-countries comparison. *European Psychologist*, *1*, 123–129.

Little, T. D., Cunningham, W. A., Shahar, G., & Widaman, K. F. (2002). To parcel or not to parcel: Exploring the question, weighing the merits. *Structural Equation Modeling*, *9*, 151–173.

Lubell, M. (2002). Environmental activism as collective action. *Environment and Behavior*, *34*, 431–454.

MacCallum, R. C., Roznowski, M., & Necowitz, L. B. (1992). Model modifications in covariance structure analysis: The problem of capitalization on chance. *Psychological Bulletin*, *111*, 490–504.

Marshall, B. K., Picou, J. S., & Bevc, C. A. (2005). Ecological disaster as contextual transformation: Environmental values in a renewable resource community. *Environment and Behavior*, *37*, 706–728.

Merrick, J. R. W., Parnell, G. S., Barnett, J., & Garcia, M. (2005). A multiple-objective decision analysis of stakeholder values to identify watershed improvement needs. *Decision Analysis*, *2*, 44–57.

McDonald, R. P., & Ho, M. R. (2002). Principles and practice in reporting structural equation analyses. *Psychological Methods*, *7*, 64–82.

Milgram, S. (1970). The experience of living in cities. *Science*, *167*, 1461–1468.

Nordlund, A. M., & Garvill, J. (2002). Value structures behind proenvironmental behavior. *Environment and Behavior*, *34*, 740–756.

Nordlund, A. M., & Garvill, J. (2003). Effects of values, problem awareness, and personal norm on willingness to reduce personal car use. *Journal of Environmental Psychology*, *23*, 339–347.

Pahl, S., Harris, P. R., Todd, H. A., & Rutter, D. R. (2005). Comparative optimism for environmental risks. *Journal of Environmental Psychology*, *25*, 1–11.

Pelletier, L. G., Dion, S., Tuson, K., & Green-Demers, I. G. (1999). Why do people fail to adopt environmental protective behaviors? Toward a taxonomy of environmental amotivation. *Journal of Applied Social Psychology*, *29*, 2481–2504.

Schultz, P. W., Gouveia, V. G., Cameron, L. D., Tankha, G., Schmuck, P., & Franěk, M. (2005). Values and their relationship to environmental concern and conservation behavior. *Journal of Cross-Cultural Psychology*, *36*, 457–475.

Schultz, P. W., & Zelezny, L. C. (1998). Values and proenvironmental behavior: A five-country survey. *Journal of Cross-Cultural Psychology*, *29*, 430–558.

Schwartz, S. H. (1968). Words, deeds, and the perceptions of consequences and responsibility in actions situations. *Journal of Personality and Social Psychology*, *10*, 232–242.

Schwartz, S. H., & Gottlieb, A. (1980). Explanations for the moderating effect of responsibility denial on the personal norms–behavior relationship. *Social Psychology Quarterly*, *43*, 441–446.

Schwartz, S. H., & Howard, J. A. (1981). A normative decision-making model of altruism. In J. P. Rushton, & R. M. Sorrentino (Eds.), *Altruism and helping behavior: Social personality, and developmental perspectives* (pp. 189–211). Hillsdale, NJ: Erlbaum.

Séguin, C., Pelletier, L. G., & Hunsley, J. (1999). Predicting environmental behaviors: The influence of self-determined motivation and information about perceived environmental health risks. *Journal of Applied Social Psychology*, *29*, 1582–1604.

Shotland, R. L., & Huston, T. L. (1979). Emergencies: What are they and do they influence bystanders to intervene? *Journal of Personality and Social Psychology*, *37*, 1822–1834.

Soliman, H. H. (1996). Community responses to chronic technological disaster: The case of the Pigeon River. *Journal of Social Service Research*, *22*, 89–108.

Steg, L., Dreijerink, L., & Abrahamse, W. (2005). Factors influencing the acceptability of energy policies: A test of VBN theory. *Journal of Environmental Psychology*, *25*, 415–425.

Steg, L., & Sievers, I. (2000). Cultural theory and individual perceptions of environmental risks. *Environment and Behavior*, *30*, 250–269.

Stern, P. C. (2000). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, *56*, 407–424.

Stern, P. C., Dietz, T., & Black, J. S. (1986). Support for environmental protection: The role of moral norms. *Population and Environment*, *8*, 204–222.

Stern, P. C., Dietz, T., & Kalof, L. (1993). Value orientations, gender, and environmental concern. *Environment and Behavior*, *25*, 322–348.

Syme, G. J., Beven, C. E., & Sumner, N. R. (1993). Motivation for reported involvement in local wetland preservation: The roles of knowledge, disposition, problem assessment, and arousal. *Environment and Behavior*, *25*, 586–606.

Van Liere, K. D., & Dunlap, R. E. (1978). Moral norms and environmental behavior: An application of Schwartz's norm-activation model to yard burning. *Journal of Applied Social Psychology*, *8*, 174–188.

Van Vugt, M., & Samuelson, C. D. (1999). The impact of personal metering in the management of a natural resource crisis: A social dilemma analysis. *Personality and Social Psychology Bulletin*, *25*, 731–745.

Vining, J., & Ebreo, A. (1992). Predicting recycling behavior from global and specific environmental attitudes and changes in recycling opportunities. *Journal of Applied Social Psychology*, *22*, 1580–1607.

Virginia Department of Environmental Quality (1998). *Virginia water quality assessment, 305b report to the EPA Administrator and Congress for the period July 1, 1992 to June 30, 1997*. Richmond, VA: VDEQ.

Weick, K. E. (1984). Small wins: Redefining the scale of social problems. *American Psychologist*, *39*, 40–49.