
**ENVIRONMENTAL CONCERN, RESOURCE STEWARDSHIP,
AND RECREATIONAL PARTICIPATION:
A REVIEW OF THE LITERATURE**

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Executive Summary

Objective

- The objective of this literature review is to better define the relationship between recreational participation and resource stewardship and to describe potential stewardship indicators.

Recreation-Stewardship Relationship

- There is only weak empirical support for the hypothesis that involvement in outdoor recreation increases environmental concern and pro-environmental behavior
- There is some evidence that individuals who engage in appreciative (e.g., hiking, wildlife watching) recreational activities tend to be more pro-environmental than those who engage in consumptive activities (e.g., hunting).
- Boaters and anglers tend to express levels of environmental concern more similar to appreciative activity participants than hunters.

Stewardship Definitions

- Stewardship is a widely used term that can have a variety of meanings.
- Stewardship traditionally has meant a wise use of resources held in trust for someone else.
- Stewardship can also imply an ethical obligation to care for a resource.
- While the term “stewardship” is deeply rooted in Christian tradition, it has been commonly used in recent years to refer to natural resource management and preservation.
- Little is known about what recreationists think of when they hear the term “stewardship” and how they respond to it.

Theoretical Models of Stewardship Attitudes and Behavior

- Researchers have used a variety of theoretical models to try to determine indicators or predictors of environmental concern and pro-environmental behavior.
- One of the most commonly used theoretical models is Ajzen’s (1987) Theory of Planned Behavior, which emphasizes the important influence of attitudes on behavior.
- Another common model is Schwartz’s (1970) Norm Activation Model, which focuses on an individual’s sense of personal responsibility and his or her awareness of the consequences of the behavior.

Potential Pro-environmental Indicators

- Sociodemographic variables have sometimes been shown to have an influence on environmental concern and pro-environmental behaviors, but the findings are mixed. Individuals who are female, more highly educated, and have higher incomes tend to be more pro-environmental.
- Personality traits such as a sense of personal responsibility and high internal locus of control (i.e., a feeling that one has the ability to bring about change) have been shown to be correlated with pro-environmental attitudes and behaviors.

- An individual's values have also been shown to influence pro-environmental attitudes and behaviors. Environmental values have been measured by assessing a person's level of environmental concern or sensitivity to environmental issues.
- Specific issue and situational factors have been shown to predict behavior in specific situations. Knowledge of a certain environmental problem, personal relevance, awareness of the consequences of a certain behavior, and the presence of the necessary skills to avoid environmental harm have all been shown to positively influence pro-environmental behaviors.

Environmental Measures and Behaviors

- For practical reasons, actual behavior cannot be observed in most studies, so researchers have used a variety of methods to measure behavior with a survey instrument.
- The most common way to measure behavior is to ask respondents to report what behaviors they have engaged in previously.
- Behavior can also be measured by asking individuals if they intend to engage in a certain behavior.
- Another behavioral measure is to ask respondents how much they would be willing to pay for environmental protections, or what they would be willing to give up to protect the environment.

Summary and Implications

- Many factors likely influence and individual to act in a pro-environmental way.
- We recommend for this research focusing on factors that can be influenced most easily by educational techniques and information that can be used to develop more effective educational messages:
 1. Problem awareness and awareness of consequences
 2. Knowledge to evaluate the situation
 3. Knowledge/skills to avoid environmental impacts
 4. Value orientation of recreationists/non-recreationists
 5. Psychosocial or personality traits
 6. Concept of stewardship and ethics

Introduction

Most people claim they are environmentalists, but few take significant positive action to support the environment (Scott and Willits 1994; Chase and Panagopoulos 1995). In fact, many who consider themselves environmentalists engage in outdoor recreation activities that could potentially harm the environment. Aside from the obvious polluting effects of motorized recreation, even non-consumptive activities like bird-watching or canoeing have the potential to have negative consequences for the environment. Participation in recreational activities alone does not appear to strongly increase stewardship behaviors, but it may present a valuable avenue for managers and educators to distribute educational messages that will, in turn, develop good resource stewards.

This review of the literature addresses the first objective of the project: To better define the relationship between aquatic recreational participation and aquatic resource stewardship. The specific objectives of this literature review include:

1. Review existing literature to examine whether participation in outdoor recreation positively influences pro-environmental attitudes and behaviors.
2. Describe the use of the “stewardship” concept in promoting pro-environmental attitudes and behaviors.
3. Describe indicators used in previous research to predict pro-environmental attitudes and behaviors.

While the term “stewardship” has not been directly used by many researchers, there has been a considerable effort to develop theoretical models that explain a person’s tendency to engage in pro-environmental behaviors. We will discuss the prominent theories and models used to predict environmental concern or behavior and review potential stewardship indicators. The variety of behavioral measures used in previous research also will be reviewed and the strengths and weaknesses of the various approaches will be considered. Lastly, the key findings will be summarized and the implications for the accomplishment of the remainder of the research objectives will be discussed.

Recreation-Stewardship Relationship

While intuition suggests that recreational experiences in natural settings would promote or enhance sensitivity toward the environment and pro-environmental behaviors, research conducted to date has provided little evidence to support this assertion. Dunlap and Heffernan (1975) proposed 3 hypotheses concerning the relationship between participation in outdoor recreation and environmental concern:

1. There is a positive association between involvement in outdoor recreation and environmental concern.
2. The association is stronger between appreciative activities and environmental concern than between consumptive activities and environmental concern.
3. There is a stronger association between outdoor recreation and concern with protecting aspects of the environment necessary for pursuing such activities than between outdoor recreation and other environmental issues such as air and water pollution.

The first hypothesis suggests that exposure to natural areas through direct recreational experiences (a behavior) will increase awareness of environmental issues, and thus increase environmental concern. The second hypotheses tests the concept that different types of recreational activities have different degrees of environmental impact, and that people who engage in different activities have different basic value systems. Dunlap and Heffernan (1975) suggested that hunting and fishing are consumptive activities that reflect a utilitarian value system, while appreciative activities such as hiking, camping, and photography simply allow a person to enjoy the environment without taking anything from it or altering it, which reflects a more preservationist value system or orientation. The third hypothesis reflects the idea that recreationists will be more aware of and concerned about those environmental issues that influence their ability to pursue their desired form of recreation.

Since the 3 hypotheses were proposed in 1975, numerous empirical studies have tested the propositions. Although some support for the hypotheses has been found, the various studies have produced mixed and conflicting results. Any relationships that exist appear to be weak and do not explain much of the variance in levels of environmental concern. However, it is somewhat difficult to compare survey results because different methods and indicators of environmental concern were used, as well as different recreation type categories. A summary of the research findings to date for each hypothesis is given below. Most studies focused on the first 2 hypotheses.

Hypothesis 1: There is a positive association between involvement in outdoor recreation and environmental concern.

Surveys conducted to date provide no or weak support for the hypothesis that participation in outdoor recreation is associated with environmental concern. Dunlap and Heffernan (1975) found a positive relationship between outdoor recreation and environmental concern, but the relationship was weak and negligible. They measured environmental concern by asking respondents to indicate whether they felt the government should spend more, the same, or less on environmental issues. In a follow-up study, Geisler, Martinson, and Wilkening (1977) measured Wisconsin residents' awareness of environmental issues and willingness to spend public money on them. While a relationship between recreation and environmental concern was initially detected, it virtually disappeared when sociodemographic factors were controlled (e.g., age, gender, income), meaning that environmental concern was related more to sociodemographic factors than to recreational participation. Van Liere and Noe (1981) also found no relationship between participation in outdoor recreation and environmental concern

when using the New Environmental Paradigm (NEP) scale to measure the environmental concern of visitors to and residents of Cape Hatteras. There was some support for the hypothesis in a study of Louisiana residents when they were asked about the value of a nearby swamp (Pinhey and Grimes 1979). Recreationists were more likely to express a preservationist values than non-recreationists. However, recreational activity explained less than 1 percent of the variance in environmental concern in a multivariate model.

A few more recent studies extended Dunlap and Heffernan's (1975) original hypothesis to predict that participation in outdoor recreation activities would be associated with greater levels of pro-environmental behavior (rather than environmental concern) than non-participants. Unlike the studies that measured only environmental concern, there was some consensus that participation in outdoor recreation was correlated with various pro-environmental behaviors. Nord, Luloff, and Bridger (1998) found that respondents (Pennsylvania owners of forested and non-forested land) who participated in forest recreation activities were more likely to engage in pro-environmental behaviors (e.g., purchasing green products, watching nature shows, belonging to environmental organizations) than non-participants, but there was no difference in level of environmental concern. Another survey of Pennsylvania residents (Theodori, Luloff, and Willits 1998) found a positive relationship between outdoor recreation and pro-environmental behaviors (e.g., contributing to conservation organizations, reading conservation magazines, purchasing green products, attending a public meeting, voting for a candidate for environmental reasons). Teisl and O'Brien (2003) also found support for this relationship, but had mixed results depending on activity type and different measures of environmental behavior (i.e., membership or contribution to environmental organization, level of interest in forest management, opinions on current forest management, and likelihood of purchasing an environmentally labeled wood product).

Hypothesis 2: The association is stronger between appreciative activities and environmental concern than between consumptive activities and environmental concern.

Overall, support for the hypothesis that appreciative activity participants (e.g., wildlife watchers) would show more environmental concern than consumptive activity participants (e.g., hunters) was mixed. While differences in levels of concern among participants in different activities exist, analysis is confounded because many people engage in activities that fall into both categories (e.g., an individual may be an avid bird watcher and hunter). Researchers dealt with this issue in different ways, depending on the specific research objectives and sample characteristics. Several authors also expressed skepticism at the usefulness or validity of the appreciative-consumptive categorization, and some added an "abusive" category (Geisler *et al.* 1977; Teisl and O'Brien 2003) that included snowmobile and off-road vehicle users. One common finding was that anglers (fishing has traditionally been considered a consumptive activity) scored more similarly to respondents who engaged in appreciative activities (i.e., hiking, camping) than they did to hunters (Dunlap and Heffernan 1975; Langenau, Peyton, Wickham, Caveney, and Johnston 1984; Nord *et al.* 1998; Theodori *et al.* 1998; Teisl and O'Brien 2003). Teisl and O'Brien (2003) also found that boaters and anglers differed on some measures of environmental concern. For example, boaters were more likely than anglers to donate money, belong to an environmental organization, and purchase an environmentally

labeled wood product. Anglers tended to show more interest in forest management than boaters and tended to think forests were managed in environmentally friendly ways. Theodori *et al.* (1998) suggested that anglers may need to be further categorized depending on their level of specialization (i.e., consumptive anglers versus catch-and-release preservationists). Summary results of seven reviewed studies are given below.

Dunlap and Heffernan (1975) found that hunters showed lower levels of environmental concern than respondents who engaged in more appreciative activities (camping, hiking, visiting parks). Jackson (1986) also found a moderately strong difference in level of environmental concern between respondents who engaged in appreciative activities and those who engaged in consumptive or motorized activities. However, several other studies showed little or no distinction between appreciative and consumptive users. Geisler *et al.* (1977) found some difference, depending on the specific measure of environmental concern considered, but sociodemographic characteristics explained more of the variance than did type of activity. Van Liere and Noe (1981) reported differences in environmental concern, but the correlations were low. Pinhey and Grimes (1979) found no differences in Louisiana residents' views about a local marsh. Theodori *et al.* (1998) and Teisl and O'Brien (2003) found mixed support for this hypothesis. While Teisl and O'Brien (2003) found that participants in different activities differed in their levels of environmental concern, the trends were not always as would be predicted based upon the appreciative-consumptive continuum. For example, they found that participants in activities typically categorized together (e.g., hiking and wildlife watching) differed greatly on some measures of environmental concern and behavior. Langenau *et al.* (1984) also found that some activities typically categorized as consumptive or motorized scored similarly to appreciative activities in their survey of recreationists utilizing a state forest in Michigan. Boaters and anglers (generally categorized as consumptive users) had similar negative attitudes toward oil and gas development in the forest as wildlife watchers, those out for a scenic drive, hikers, and campers, while snowmobilers and trailbike users were more in favor of development. These mixed findings cast doubt on the usefulness or accuracy of the traditional appreciative-consumptive categorization of recreation activities.

Hypothesis 3: There is a stronger association between outdoor recreation and concern with protecting aspects of the environment necessary for pursuing such activities than between outdoor recreation and other environmental issues such as air and water pollution.

Only two studies addressed the hypothesis that outdoor recreation participants would be more concerned about those environmental issues pertaining to their chosen recreation activities than more general concerns like air and water pollution. The results of both studies strongly supported this hypothesis (Dunlap and Heffernan 1975; Jackson 1986). This is not surprising given that people tend to care more about issues they perceive to be personally relevant.

Summary

While these findings cast significant doubt on the proposed relationships between the positive influence of outdoor recreation activities and environmental concern, some issues should

be considered before completely discarding these hypotheses. First, these hypotheses predict an influence of behavior on attitudes, as opposed to the reverse pathway hypothesized in the Theory of Planned Behavior (Ajzen 1987) that attitudes influence behavior. There is, however, considerable evidence that behaviors do influence attitudes through cognitive dissonance (Cooper and Fazio 1984) and direct experience with an attitude object tends to strengthen attitudes (Fazio and Zanna 1981; Petty and Cacioppo 1986). Cognitive dissonance is a theory that suggests individuals experience psychological discomfort when they behave differently from their attitudes; they may then change their attitudes to conform to the behavior they engaged in to reduce that tension. Direct experience with an attitude object means that a person has had personal experience with an issue or behavior such as boating, fishing, or cleaning up litter along a stream. This direct involvement through a behavior (i.e., participation in an activity) provides an individual with personal experiences which tend to strengthen attitudes, improve motivation to process information, and increase attitude accessibility (or saliency), thus strengthening the attitude-behavior relationship (Tarrant and Green 1999). The strengthening of the attitude-behavior relationship is critical because most people have very pro-environmental attitudes, but do not always behave pro-environmentally (Scott and Willits 1994; Chase and Panagopoulos 1995). Stronger pro-environmental attitudes that are more accessible (or salient) are more likely to positively influence behavioral choices.

It is likely that the people who engage in outdoor recreation activities already have a relatively positive concept or interest in the environment, and their specific experiences while recreating reinforce or change these views. Thus, a positive experience where the participant engages in ethical (pro-environmental) behavior, or a negative experience from an unexpected degradation to a favorite recreational location (Chawla 1998, 1999) is likely to increase pro-environmental attitudes. However, an experience with friends or family who engage in unethical (anti-environmental) behavior may lead one to decrease his or her level of environmental concern to reduced internal dissonance (i.e., "I or my group kept more than the legal limit of fish; the rules say that is wrong, but we are good ethical people, therefore it must be OK to take over the limit.") The potential impact of recreational experiences on shaping future attitudes and behavior highlights the importance of educational efforts to promote stewardship ethics.

A second issue to consider is that it is hard to differentiate between recreationists based upon the concept of environmental concern because most people report high levels of concern and consider themselves to be environmentalists, regardless of recreational involvement. An encouraging finding by Nord *et al.* (1998) was that while no differences were found among participants in different types of activities based upon environmental concern, there were differences in actual reported levels of pro-environmental behavior. Because fewer people engage in pro-environmental behavior than claim they are environmentalists, it is possible that recreationists can be better categorized and targeted based on level of environmental behavior.

While recreational activity may be somewhat predictive of pro-environmental attitudes or behavior, the relationships found were relatively weak in most cases. In fact several studies found that other measured factors were more predictive of environmental concern and behavior than recreation participation. For example, Nord *et al.* (1998) found that sociodemographic factors were more predictive of behavior than concern level. Geisler *et al.* (1977) also found that sociodemographic factors (age, education level, and income) were more correlated with two

environmental concern measures than recreational activities. Pinhey and Grimes (1979) found that among several variables, recreational activity was the least predictive of environmental concern among the factors measured. Langenau *et al.* (1984) found that property ownership, age, and values were more predictive of environmental attitudes than recreational activity type. These findings suggest that while there may be a relationship between activity type and pro-environmental attitudes and behaviors, it is possible that a person's social status, values, and beliefs influence them to engage in particular types of outdoor recreation (Langenau *et al.* 1984; Jackson 1986), thereby creating an indirect relationship to environmental concern. This is the relationship (i.e., attitudes and values influence behavior) proposed by the Theory of Planned Behavior and it is opposite to Dunlap and Heffernan's hypotheses (behavior influences attitudes and values).

Stewardship Definitions

The RBFF's Stewardship Team has formally defined aquatic stewardship as "taking personal responsibility to sustain and enhance freshwater and marine resources, while accepting an obligation to the environment" (RBFF 2003). This definition of stewardship suggests each individual has an ethical responsibility to act in a way that does not detract from the quality of natural resources.

Stewardship is a frequently used term. An internet search of the term "environmental stewardship" returned about 187,000 results. The corresponding websites included governmental agencies, religious organizations, chemical companies (and other corporate sites), recreational organizations (e.g., 4-H), and universities. While the common use of the word could be a positive factor in increasing recognition of and influencing reaction to an educational campaign, there is, unfortunately, no real consensus about the meaning of "stewardship." Table 1 lists stewardship definitions and descriptions taken from a variety of sources. While all contain language that suggests sustainable use or wise use, most definitions, but not all, include an ethical or moral component. Even among the definitions that include an ethical component, there are differing opinions about the reason for the moral obligation. Some state the moral or ethical obligation is to God, others imply a personal obligation to future generations and not abusing the commons. Still others, while mentioning ethics, focus more on management actions that consider long-term economic, as well as moral, benefits. Many definitions also convey the concept that a steward is caring for a resource for someone else. That someone else is often cited as society, future generations, nature itself, or God.

Table 1. Stewardship definition examples.

Source	Definition
Dixon <i>et al.</i> 1995 In Fedler 2001	Stewardship is the moral obligation to care for the environment and the actions undertaken to provide that care. Stewardship implies the existence of an ethic of personal responsibility, an ethic of behavior based on reverence for the earth and a sense of obligation to future generations. To effectively care for the environment, individuals must use resources wisely and efficiently, in part by placing self-imposed limits on personal consumption and altering personal expectations, habits, and values. Appropriate use of natural resources within the stewardship ethic involves taking actions that respect the integrity of natural systems.
Holsman 2000	<u>Personal Stewardship</u> : A moral norm with altruistic motivations that necessitates personal action by individuals. <u>Agency or Institutional Stewardship</u> : refers to the institutional mission to conserve and sustain wildlife and ecosystems in the public trust. A cultural value whereby agencies take on the moral and legal obligation of maintaining the resource on behalf of the public trust.
Pennsylvania Forest Stewardship (Finley, Jones, and Chunko 1996)	<u>Forest stewardship</u> involves applying forest management within the context of a land ethic.
Worrell and Appleby 2000	Stewardship is the responsible use (including conservation) of natural resources in a way that takes full and balanced account of the interests of society, future generations, and other species, as well as of private needs, and accepts significant answerability to society (and ultimately to God).
University of Michigan 2004	Stewardship is the concept of responsibly managing all of our resources for the benefit of present and future generations of people, plants, and animals.
Webster's Dictionary 2004	1 : the office, duties, and obligations of a steward 2 : the conducting, supervising, or managing of something; <i>especially</i> : the careful and responsible management of something entrusted to one's care < <i>stewardship</i> of our natural resources>
Interfaith Council for Environmental Stewardship 2004	Men and women were created in the image of God, given a privileged place among creatures, and commanded to exercise stewardship over the earth. Human persons are moral agents for whom freedom is an essential condition of responsible action. Sound environmental stewardship must attend both to the demands of human well being and to a divine call for human beings to exercise caring dominion over the earth. It affirms that human well being and the integrity of creation are not only compatible but also dynamically interdependent realities.
4-H 2004	Environmental Stewardship is the concept of teaching young people how to proactively serve their communities as conservators and protectors of the environment. The specific goals of the Environmental Stewardship program include: understanding ecological concepts, building an awareness of environmental issues and values, developing scientific investigatory and critical thinking skills, and learning skills needed for effective action.

These different stewardship definitions are grounded in very different value systems (e.g., religious, economic, anthropocentric, biocentric). These differences potentially pose some difficulties to educators seeking to use the stewardship concept in promoting pro-environmental behavior in outdoor recreation settings and encouraging environmental activism on a broader scale. Many questions remain concerning the use of and interpretation of stewardship, including:

1. What meanings do people (i.e., message receivers) attach to the term “stewardship”?
2. Are meanings of the word “stewardship” similar across populations (e.g., ethnic groups, regional groups, age groups)?
3. Assuming that individuals associate different meanings with stewardship, how does an individual’s personal interpretation of “stewardship” influence how he or she responds to educational messages using the concept?
4. If meanings of stewardship derive from different basic value structures, do those different values result in different outcomes (attitude or behavior change) from educational messages depending on how they are framed?
5. If different value structures lead to different conceptions of “stewardship,” do different stewardship indicators need to be considered?

To date, it appears that there has been no formal research that attempts to answer the question of what meanings people attach to the term “stewardship.” While current use of the word stewardship is common among natural resource professionals, it is a term that is deeply rooted in Christianity (Peterson 2000; Worrell and Appleby 2000). In a nationwide survey, supported by in-depth interviews, Kempton, Boster, and Hartley (1995) found extensive evidence of a significant relationship between religion and environmental values. Surprisingly, even 69% of the respondents who did not belong to an organized religion agreed with the statement that “Because God created the natural world, it is wrong to abuse it.” In an open-ended question, God was listed a major source of environmental values. Even among those who claimed not to believe in God, many said they felt or believed there was a spiritual force in nature. Negra and Manning (1997) also found that religion or spirituality played a large role in influencing the environmental values and ethics of visitors to Vermont state parks. Based on responses to survey questions, visitors were grouped into four different categories. The spiritually-based stewardship subgroup was the largest (42%), followed by religiously-based anthropocentrism (25%), secular ethical extensionism (16%), and spiritually-based biocentrism (16%). These findings suggest that religious or spiritual values may play a significant role in the perceptions of environmental stewardship and ethics.

Another common traditional use of stewardship reflects Webster’s dictionary definition that implies stewardship involves the careful and responsible management of something entrusted to one’s care. Simply stated, stewardship implies that something is looked after for another (Worrell and Appleby 2000). For example, the term could be used for a manager of a trust fund, Congressional spending of tax dollars (as implied in the President’s most recent State of the Union address), a Christian behaving environmentally to protect Creation for God, or a grandfather practicing conservation strategies to preserve his farm for future generations. As in these examples, stewardship has traditionally been used to describe agricultural practices, monetary issues, and religious obligation. Only more modern definitions have included the

concept that the steward has an ethical obligation to look after the environmental resource for society, future generations, or nature itself (Worrell and Appleby 2000).

While it seems likely that different individuals perceive stewardship differently, it is not clear that different meanings of the word would lead to different environmental attitudes or behaviors. For example, when stewardship is mentioned, one may think of forestry or ecosystem management, and another may think of responsibility to God to take care of Creation, but they both may decide to manage their forest in the same environmentally friendly way. There is some empirical evidence to support the idea that different values may lead to similar pro-environmental attitudes and behaviors. For example, Kempton *et al.* (1995) reported that groups from vastly different backgrounds (Sierra Club members vs. sawmill workers) and with different concepts of the environment (e.g., spiritual vs. utilitarian values) responded very similarly to a variety of attitude questions about the environment. In another study, the majority of respondents exhibited some level of environmental concern, even though their basic reasons for concern were in some cases vastly different (Negra and Manning 1997). For example, one person may want to preserve the environment because God created it, another may want to preserve it so it can be used by humans, and another may think it has intrinsic value. Scott and Willits (1994) also concluded that stewardship could still be practiced by individuals who feel dominion over nature, if they feel that dominion implies they have a moral or ethical responsibility to preserve nature.

Although people may behave pro-environmentally for different reasons, understanding the basis for behaviors would benefit educators and managers who are trying to develop interpretive or educational messages to promote ethical behavior. It seems important to be as inclusive as possible when attempting to persuade people to behave pro-environmentally in the outdoors so that messages are seen to be personally relevant. Negra and Manning (1997) suggested that environmental education efforts should focus on identifying and presenting common values and reasons for preservation, while avoiding arguments that could be viewed as offensive to some groups.

In addition to the lack of information about stewardship perceptions, research to date has also failed to reach a consensus about key indicators of ethical attitudes or behaviors. While many different variables (e.g., sociodemographic characteristics, personality traits, values, knowledge) and environmental sensitivity scales have been considered and tested, none of the variables were found to consistently and strongly predict pro-environmental attitudes and behaviors.

Theoretical Models of Stewardship Attitudes and Behavior

Researchers have used several different theoretical models, primarily developed in the social psychological literature, in an attempt to understand what factors most influence pro-environmental behaviors. Some have also developed their own models that consist of factors suspected of influencing behavior, often combining key concepts from the various well-established models. Multi-item attitude scales to operationalize key concepts such as

environmental concern have also been developed and tested. A brief review of the major theories and ideas follows.

One of the major theories proposed to explain or predict behavior is Ajzen's (1987) Theory of Planned Behavior. The theory, based upon the assumption that behavior is a conscious, rational activity, proposes that attitudes toward the behavior, subjective norms, and perceived behavioral control interact to form a person's behavioral intentions, which lead to the performance of a specific behavior. This theory has been used to predict behavior in leisure settings (e.g., Ajzen and Driver 1992) and pro-environmental behaviors, such as water conservation (Trumbo and O'Keefe 2001), use of green electricity (Bamberg 2003), and general ecological behavior (Kaiser, Wölfing, and Fuhrer 1999)

Another major theory used to explain moral or ethical behavior is Schwartz's Norm Activation Model (1970), which was originally developed to explain altruism and helping behavior. This model predicts that in order for a person to engage in an altruistic act, he or she must first be aware of the consequences of action (or inaction), and feel a personal responsibility to act. This theory has been used in outdoor settings to evaluate intentions to obey rules and regulations (e.g., Gramann, Bonifield, and Kim 1995). It also has been used to predict or explain pro-environmental behaviors (Van Liere and Dunlap 1978; Noe, Hull, and Willman 1982; Stern, Dietz, and Kalof 1993) and pro-environmental behavioral intentions (Gärling, Fujii, Gärling, and Jakobsson 2003).

Kohlberg's moral development theory (Kohlberg, Levine, and Hewer 1983) describes 6 stages of moral development that range from pre-conventional morality (in which people behave simply to avoid punishment), to conventional morality (in which an individual becomes concerned about what others think), to post-conventional morality (in which people do what they believe is right, regardless of what others think). This theoretical model has been used in recreational settings to develop messages directed at the different stages of moral reasoning to reduce depreciative behaviors (e.g., Gramann and Vander Stoep 1987; Christensen and Dustin 1989; Widner and Roggenbuck 2000).

In addition to these theoretical models, many researchers have hypothesized their own predictors and models of pro-environmental attitudes and behavior. Some have simply tested the statistical correlation between various variables and behaviors, while others have proposed and tested new models. For example, Hines, Hungerford, and Tomera (1987) proposed a model to predict Responsible Environmental Behavior (REB) that was based largely on key components of the theories of planned behavior and norm activation. Other researchers focused on developing scales that could measure concepts such as environmental concern (e.g., the New Environmental Paradigm (NEP) scale proposed by Dunlap and Van Liere (1978)) and value orientation (e.g., Vaske, Donnelly, Williams, and Jonker (2001)).

The result of over two decades of research on the predictors or determinants of pro-environmental behavior is a somewhat confusing picture of what factors are dominant in influencing a person to behave environmentally. While a few individual studies or models have been successful in predicting pro-environmental behavior moderately well, most studies have found only weak relationships between tested variables and behavior. A summary of the

potential indicators of pro-environmental behavior is given in the next section. A discussion of the implications of the findings for predicting or influencing stewardship behavior follows.

Potential Pro-environmental Behavior (Stewardship) Indicators

Numerous indicators of pro-environmental behavior have been proposed and tested. For this literature review, they have been grouped into the following major categories: 1.) sociodemographic characteristics, 2.) personality traits, 3.) personal values and ideology, and 4.) issue and situational factors. Findings related to each potential indicator from the research reviewed to date are summarized below, and specific results for each indicator are given by category type in Tables 2 to 5. The relative strength of correlation coefficients is given, when provided by the study. When multiple regression techniques were used, bivariate correlation coefficients were given if provided, if not, the regression coefficient (i.e., β -weight) is given, with values closer to -1 or 1 representing stronger relationships. P-values indicate a different type of test (e.g., Chi-square or ANOVA) was conducted, or the correlation coefficients were not given. It is important to note that significance (i.e., $p < 0.05$) does not necessarily mean that the indicator is a strong predictor of behavior or environmental concern because a relationship can be statistically significant, but relatively weak in practicality. Also, the reported studies used a range of methods to measure or operationalize environmental concern and behavior, which makes direct comparison difficult.

Sociodemographic Characteristics

Many studies considered sociodemographic characteristics as potential indicators or factors that might influence environmental concern or pro-environmental behavior. The most common variables considered were age (n=19 studies), gender (n=14), education (n=17), and income (n=14). Age was significantly correlated with environmental concern and/or behavior in most studies, but the relationship tended to be relatively weak. Younger individuals tended to express more environmental concern and behave more pro-environmentally than older people. Gender also tended to be a relatively weak predictive indicator of environmental concern (i.e., women were more likely to express strong concern than men), however two studies found a strong relationship (Stern *et al.* 1993; Kellert 1996). Stern *et al.* (1993) found that the strong relationship between behavioral intention and gender was controlled largely by the stronger female tendency to believe that environmental quality was tied to human health and well-being. Education and household income were also relatively weak predictors of environmental concern and behavior, however a meta-analysis by Hines *et al.* (1987) found they were stronger predictors than age and gender. More highly educated individuals, and those with greater incomes tended to behave more pro-environmentally. Other sociodemographic indicators tested include community type (i.e., urban vs. rural), race/ethnicity, marital status, number of children, and home or property ownership. None of these indicators was strongly correlated with environmental concern or behavior. Community type and race/ethnicity were found to be statistically significant, but only weakly correlated with environmental concern or behavior.

Marital status, number of children, home ownership, length of residence, and occupation were sometimes found to be significantly correlated with pro-environmental behavior.

Table 2. The relationship between sociodemographic characteristics and environmental concern or behavior.

Indicator	Study	Findings
Age	Arcury, Johnson, and Scollay 1986	Moderately strong ¹
	Buttel and Flinn 1978	Moderate
	Cottrell and Graefe 1997	Weak
	Ellen, Wiener, and Cobb-Walgren 1991	P<0.03
	Geisler, Martinson, and Wilkening 1977	Most influential variable
	Gifford, Hay, and Boros 1982/83	Not significant
	Granzin and Olsen 1991 ²	P=0.014
	Hines, Hungerford, and Tomera 1987 ³	Weak
	Jacobsen, Close, Anderson, and Kelly 1999	Not significant
	Kellert 1996	Important variable
	Langenau, Peyton, Wickham, Caveney, and Johnston 1984	Weak
	Nord, Luloff, and Bridger 1998	P<0.05
	Pickett, Kangun and Grove 1993	$\beta = -0.47$
	Pinhey and Grimes 1979	$\beta = 0.001$
	Samdahl and Robertson 1989	$\beta = 0.28$
	Scott and Willits 1994	Very weak
	Theodori, Luloff, and Willits 1998	Not significant
	Van Liere and Dunlap 1981	Very weak to moderate
	Wall 1995	Very weak
	Gender	Gifford, Hay, and Boros 1982/83
Granzin and Olsen 1991		P=0.049
Hines, Hungerford, and Tomera 1987		Very weak
Jacobsen, Close, Anderson, and Kelly 1999		P=0.005
Kellert 1996		Important variable
Langenau, Peyton, Wickham, Caveney, and Johnston 1984		Not significant
Nord, Luloff, and Bridger 1998		Not significant
Pickett, Kangun, and Grove 1993		$\beta = -0.16$
Pinhey and Grimes 1979		$\beta = 0.0002$
Scott and Willits 1994		Very weak
Stern, Dietz, and Kalof 1993		$\beta = 0.42$ to 0.74^4
Theodori, Luloff, and Willits 1998	Not significant	
Van Liere and Dunlap 1981	Very weak to weak	
Vaske, Donnelly, Williams, and Jonker 2001	P<0.001	
Education	Arcury, Johnson, and Scollay 1986	Strong

	Buttel and Flinn 1978	Moderate
	Cottrell and Graefe 1997	Weak
	Geisler, Martinson, and Wilkening 1977	Predictive
	Granzin and Olsen 1991	Not significant
	Hines, Hungerford, and Tomera 1987	Weak
	Jacobsen, Close, Anderson, and Kelly 1999	Not significant
	Kellert 1996	Important variable
	Nord, Luloff, and Bridger 1998	P<0.05
	Pickett, Kangun, and Grove 1993	$\beta=0.08$
	Pinhey and Grimes 1979	$\beta=0.008$
	Samdahl and Robertson 1989	Not significant
	Scott and Willits 1994	Weak to moderate
	Theodori, Luloff, and Willits 1998	P<0.001
	Van Liere and Dunlap 1981	Very weak to weak
	Vaske, Donnelly, Williams, and Jonker 2001	P<0.001
	Wall 1995	Very weak to weak
Income	Arcury, Johnson, and Scollay 1986	Moderate
	Cottrell and Graefe 1997	Weak
	Geisler, Martinson, and Wilkening 1977	Predictive
	Granzin and Olsen 1991	Not significant
	Hines, Hungerford, and Tomera 1987	Weak
	Jacobsen, Close, Anderson, and Kelly 1999	Not significant
	Kellert 1996	Important variable
	Nord, Luloff, and Bridger 1998	P<0.05, behavior Not significant, concern
	Pickett, Kangun, and Grove 1993	$\beta=-0.29$
	Pinhey and Grimes 1979	$\beta=0.007$
	Samdahl and Robertson 1989	$\beta =-0.16$
	Scott and Willits 1994	Weak to moderate
	Theodori, Luloff, and Willits 1998	Not significant
	Vaske, Donnelly, Williams, and Jonker 2001	Not significant
	Wall 1995	Very weak
Community Type	Arcury, Johnson, and Scollay 1986	Weak
	Buttel and Flinn 1978	Weak
	Kellert 1996	Few differences
	Nord, Luloff, and Bridger 1998	Not significant
	Pinhey and Grimes 1979	$\beta=0.005$
	Samdahl and Robertson 1989	Not significant
	Van Liere and Dunlap 1981	Very weak to weak
Race/ethnicity	Ellen, Wiener, and Cobb-Walgren 1991	P<0.05
	Kellert 1996	Differences detected
Marital status	Granzin and Olsen 1991	Not significant
	Pickett, Kangun, and Grove 1993	$\beta =0.83$
Number of	Granzin and Olsen 1991	Not significant

children		
	Pickett, Kangun and Grove 1993	$\beta = 0.31$
Home/property ownership	Granzin and Olsen 1991	Not significant
	Langenau, Peyton, Wickham, Caveney, and Johnston 1984	$P < 0.01$
	Pickett, Kangun, and Grove 1993	$\beta = 0.31$
Occupation	Granzin and Olsen 1991	Not significant
	Pinhey and Grimes 1979	$\beta = 0.012$
Length of Residence	Pickett, Kangun and Grove 1993	$\beta = -0.08$
	Vaske, Donnelly, Williams, and Jonker 2001	$P < 0.011$

¹Correlation coefficient coding if a significant relationship was found: very weak=0.0-0.1; weak=0.1-0.2; moderate=0.2-0.3; moderately-strong=0.3-0.4; strong>0.4. When multiple measures of environmental concern or behavior were evaluated in a given study, the range of correlation coefficient values is given (e.g., very weak to moderate).

²Results from recycling behavior were reported. The study also looked at walking and product reuse activities.

³Based on averages from a meta-analysis.

⁴Strong relationship to behavioral intentions, but relationship disappears when controlling for beliefs on how environmental quality affects health and well-being, which women hold more strongly than men.

Personality Traits

Personality traits are measures of general tendencies of individuals, and it has been hypothesized that they influence behavior. While not as commonly considered by researchers as predictors or determinants of pro-environmental behavior as sociodemographic characteristics, some traits have been found to be moderately correlated with pro-environmental behavior. Locus of control, self-efficacy, personal responsibility, and psychological sex role classification (i.e., traits traditionally associated with each gender) have all been found to be significantly correlated with behavior, although the relationships were not always strong (Table 3).

Personal responsibility is a concept that describes a person's feelings of duty or obligation to engage in helping behavior. People who internalize responsibility are more likely to engage in helping behavior, either toward others or to the environment (Granzin and Olsen 1991). People who externalize responsibility are less likely to act to help the environment because they feel it is the responsibility of other more powerful forces (e.g., the government or God) to protect it. Hines *et al.* (1987) found an average correlation coefficient of 0.33 (moderately strong) between those with a strong sense of personal responsibility and pro-environmental behavior.

Locus of control and self-efficacy are two related personality traits (Kaiser *et al.* 1999) that have been tested to evaluate their role in influencing pro-environmental behavior. Locus of

control has been defined as an individual's perception of whether or not he or she has the ability to bring about change through his or her behavior (Hines *et al.* 1987). As with personal responsibility, those with an internal locus of control are more likely to behave environmentally, than those who tend to have a more external locus of control (i.e., believe an individual cannot make much of a difference, because events happen by chance or only larger entities such as the government can bring about change). Self-efficacy refers to the perception by an individual that he or she has the knowledge and skills needed to conform to his or her attitudes or beliefs (Axlerod and Lehman 1993). Hines *et al.* (1987) reviewed 15 studies that considered locus of control or efficacy and they found a moderately strong correlation (mean coefficient, $r=0.365$) between locus of control and pro-environmental behavior. Hwang, Kim, and Jeng (2000) found locus of control was the most important predictor of behavioral intention in their model, and also that it had a moderately strong influence on attitudes.

Psychological sex role classification was considered by only two studies, and it was found to be a moderately strong predictor of behavior in one study and non-significant in the other. Sex role refers to personality traits traditionally associated with males and females. Androgynous individuals (i.e., those who do not conform to the traditional sex role) tended to engage in more pro-environmental behavior (Sia, Hungerford, and Tomera 1985/86; Hungerford and Volk 1990).

Table 3. The relationship between personality traits and environmental concern or behavior.

Indicator	Study	Findings
Personal Responsibility	Granzin and Olsen 1991	$P=0.009$
	Hines, Hungerford, and Tomera 1987	Moderately strong
	Hwang, Kim, and Jeng 2000	Weak
Locus of Control	Hines, Hungerford, and Tomera 1987	Moderately strong ¹
	Hwang, Kim, and Jeng 2000	Moderate
	Sia, Hungerford, and Tomera 1985/86	Moderately strong
	Sivek and Hungerford 1989 ²	Not significant to $\beta=0.05$
Efficacy	Axelrod and Lehman 1993	Moderately strong
Psychological Sex Role Classification	Sia, Hungerford, and Tomera 1985/86	Moderately strong
	Sivek and Hungerford 1989	Not significant

¹ Based on a meta-analysis of 15 studies (6 measured locus of control, 9 measured efficacy).

² Four different groups were studied.

Personal Values and Ideology

Values are the guiding principles that a person uses to decide what is moral, desirable, or just (Kempton *et al.* 1995). They are more basic in nature than attitudes or beliefs, which are

directed toward more specific issues or objects, and values likely influence both. Values are related to morals and ideas about what is ethical behavior. Values have been measured in many different ways by researchers. Some researchers have used membership to certain organizations (i.e., conservation groups) as indicators of values or affiliation with a certain political ideology (i.e., liberal vs. conservative). Others have considered values specific to the environment on an anthropomorphic-biocentric continuum or adherence to the New Environmental Paradigm (NEP). A few have considered basic religious or spiritual convictions. A detailed review of the correlation between values and behavior is given below in Table 4.

Many authors expressed the belief that environmental attitudes and behaviors are deeply rooted in basic values and that value orientations should be considered when trying to predict behavior (Burningham 1995; Clark 1995; Stern *et al.* 1993). In a review of predictors of environmental behavior, Granzin and Olsen (1991) found that people who placed a high value on preserving the environment and being close to nature were more likely to have pro-environmental attitudes and engage in pro-environmental behavior than those who valued living a prosperous, comfortable life. Kellert (1996) described a classification system of nine human values toward nature and animals: utilitarian, naturalistic, ecologicistic-scientific, aesthetic, symbolic, dominionistic, humanistic, moralistic, and negativistic. His book describes the frequency of these different values in American society and explains how these different values manifest themselves in different levels of pro-environmental attitudes and behaviors. Kempton *et al.* (1995) summarized major values behind environmental attitudes of Americans into three major categories that are not necessarily mutually exclusive: religious, anthropocentric, and biocentric. Negra and Manning (1997) classified park visitors based upon 14 different potential park values and 17 possible environmental ethics according to the anthropocentric-biocentric continuum, ethical extensionism and egalitarian ethics (i.e., the extension of human rights to nonhumans), and secular, religious, and spiritual beliefs. While not measured directly by many researchers, some mentioned that a majority of respondents stated that religious or spiritual ideas influenced their values toward the environment (Kempton *et al.* 1995). Negra and Manning (1997) also found that only 16% of park visitors did not have strong religious or spiritual values related to the environment.

Political ideology was used by a number of researchers as a surrogate for values related to social concerns and to the environment. There were few differences detected between Democrats and Republicans, but studies that distinguished between pro-regulatory (anti-laissez faire) liberalism and social welfare (welfare-state) liberalism found correlations between political ideology and environmental behavior. For example, Samdahl and Robertson (1989) found the strongest relationship was between pro-regulatory liberalism and support for environmental regulations. However, pro-regulatory liberalism had only a slightly positive effect on perceptions of environmental problems and ecological behaviors.

Another surrogate measure of values used was membership to an environmental organization (a behavior). Across all studies, individuals who belonged to environmental organizations were found to have higher levels of environmental concern (Maloney, Ward, and Braucht 1975; Dunlap and Van Liere 1978; Weigel and Weigel 1978; La Trobe and Acott 2000) or were more likely to engage in pro-environmental behavior (Sia *et al.* 1985/86).

The closely related concepts of environmental concern and environmental sensitivity have typically been measured with multi-item scales. A comparison of 6 different measures of environmental concern revealed that various commonly used measures of environmental concern are not necessarily interchangeable, and likely reflect different dimensions of the environmental concern construct (Van Liere and Dunlap 1981). One of the most commonly used scales to measure environmental concern is the New Environmental Paradigm (NEP) scale developed by Dunlap and Van Liere (1978). Twelve items were proposed to represent the 5 key parts of the NEP: limits to growth, balance of nature, "spaceship earth" metaphor, steady state economy, and anti-anthropocentrism. At first, research was focused on using recreation activity (i.e., Dunlap and Heffernan hypotheses), sociodemographic characteristics, and group membership to predict different levels of environmental concern based upon NEP scores. Early studies also focused on the validity, reliability, and dimensionality of the scale (i.e., does it measure only one concept). Although the scale was initially thought of as unidimensional (Van Liere and Dunlap (1978), most studies have found the scale to reflect two or more dimensions (Albrecht, Bultena, Hoiberg, and Nowak 1982; Geller and Lasley 1989; Scott and Willits 1994). This means that the scale likely measures attitudes to several distinctly different concepts about the environment (e.g., attitudes about limits to population growth, balance of nature, and man over nature), instead of simply measuring one general environmental concern attitude. The different dimensions have been shown to vary in predictive power of environmental attitudes and behavior (e.g., Jackson 1986, Scott and Willits 1994). Several studies (e.g., Gigliotti 1992, Jackson 1986, Kuhn and Jackson 1989; La Trobe and Acott 2000) have also modified the NEP scale. Overall, the various measures of environmental concern tested (including the NEP) appear to be relatively moderately to strongly correlated with pro-environmental behavior. However, environmental concern only appears to explain 10% or less of the variance in specific pro-environmental behaviors (Bamberg 2003). One possible weakness in the environmental concern measures is that they often fail to clearly differentiate between people because the vast majority of people respond to the items in very pro-environmental ways.

Table 4. Relationship between values and ideology and pro-environmental behaviors.

Indicator	Study	Findings
Values	Axlerod and Lehman 1993	Moderate to strong
	Granzin and Olsen 1991 ¹	P<0.05
	Kaiser, Wölfing, and Fuhrer 1999 ²	$\beta=0.22$
	Nordlund and Garvill 2002	Not significant to moderately strong ³
	Smith, Gilden, Cone, and Steel 1997	Strong ⁴
Morals	Corraliza 2001	P<0.05 ⁵
Political ideology	Buttel and Flinn 1978	Moderate
	Cottrell and Graefe 1997	Not significant
	Gigliotti 1992	Weak
	Samdahl and Robertson 1989	$\beta=0.097$
	Scott and Willits 1994	Very weak to weak
	Theodori, Luloff, and Willits 1998	P<0.0001

	Van Liere and Dunlap 1981	Weak to moderate
	Wall 1995	Very weak to weak ⁶
Environmental sensitivity	Sia, Hungerford, and Tomera 1985/86	Strong
	Sivek and Hungerford 1989	Not significant to R ² =0.19
Environmental concern	Bamberg 2003	Moderate
	Cottrell and Graefe 1997	Weak
	Weigel and Weigel 1978	Strong
NEP	Gigliotti 1992	Moderately strong
	Kuhn and Jackson 1989	P<0.0001
	Scott and Willits 1994	Weak

¹ Considered values associated with altruism, religion, and closeness to nature.

² Measured with a 7 item scale that included religious, biocentric, and anthropocentric statements.

³ Four types of values were considered: self transcendence (r=0.29), self-enhancement (r=-0.09), ecocentric (r=0.33), and anthropocentric (r=0.01)

⁴ Economic vs. environmental considerations.

⁵ Correspondence between morals and behavior was highest when situational factors (ease or difficulty of doing) were consistent with morals (i.e., believed moral to recycle and thought easy to do).

⁶ Canadian political party identification.

Issue and Situational Factors

Values and basic ideological thought may be important predictors of pro-environmental behavior, but they are general measures or tendencies that may not be the only influence on behavior when a person is faced with a specific situation. In fact, situational factors have also been recognized to strongly influence behavior (Cottrell and Graefe 1997; Corraliza 2000). While some situational factors are out of the control of outreach/education professionals (e.g., reduction of physical barriers or constraints, sense of place, experience level in setting), other issue-related factors that can influence behavior, such as knowledge, awareness of problem or consequences of behavior, presences of action skills, attitudes, and beliefs, can be influenced by environmental education (Hungerford and Volk 1990; Newhouse 1990; Fedler, Siemer, Knuth, and Matthews 2001). By providing information that could help someone evaluate a situation, and by providing knowledge of the skills necessary to prevent environmental harm, managers and educators can provide recreationsists with a sense of empowerment (or internal locus of control), which might then motivate them to behave pro-environmentally. Education can also provide people with the knowledge necessary to be aware of an issue, evaluate issue importance, and make the connections so that the issue becomes personally relevant.

Knowledge and attitudes, two commonly measured concepts that are hypothesized to strongly influence behavior, actually showed mixed results in the studies looked at here. The relationship between knowledge and pro-environmental behavior ranged from non-significant to strong (Table 5), although specific knowledge related to the consequences of a particular behavior or skill tended to be more consistently and moderately related to behavior. Attitudes

are thought of as a positive or negative feeling about some person, object or issue (Newhouse 1990), and are considered one of the most important influences on behavior. However, the reviewed studies showed attitudes had a large range of influences on behavior, depending on the specific study and measures. Beliefs (i.e., the information that an individual has about a person, object or issue) are thought to influence attitudes and thus behavior. Kempton *et al.* (1995) investigated the beliefs Americans have about the environment. They found several widely held models or beliefs of nature, including beliefs that nature is a limited resource that humans depend on, nature is balanced, interdependent, and fairly unpredictable, and nature is complex. One study that looked specifically at beliefs, found that negative attitudes toward development were correlated with beliefs that development would harm the local elk herd, increase backcountry access, and increase off-road vehicle use (Langenau *et al.* 1984).

Other possible situational factors include issue salience (Chase and Panagopoulos 1995), norms (i.e., what an individual perceives that significant others (or society) believe about the rightness or wrongness of a certain behavior), issue importance, and issue relevance. Previous direct experience with the issue or resource, perceived behavioral control in the specific situation (concept related to locus of control, but in a specific situation context), commitment to a specific issue, and perceived threat from action or inaction have also been hypothesized to influence behavior. It is difficult to judge how important these variables are in influencing pro-environmental behavior because they have been evaluated in relatively few studies, however, behavioral control, issue importance, issue salience, and direct experience were all found to be moderate to strong predictors of behavior.

Table 5. Relationship between specific issue or situational factors and environmental behavior.

Indicator	Study	Findings
Knowledge	Cottrell and Graefe 1997	Weak
	Granzin and Olsen	Not significant
	Hines, Hungerford, and Tomera 1987	Moderate
	Hwang, Kim, and Jeng 2000	Very weak
	Kaiser, Wölfing, and Fuhrer 1999	$\beta=0.47$
	Pickett, Kangun, and Grove 1993	$\beta=0.28$
	Cottrell and Graefe 1997	Moderate
Awareness of problem or consequences	Stern, Dietz, and Kalof 1993	Moderate to strong ¹
	Nordlund and Garvill 2002	Moderately strong
	Sia, Hungerford, and Tomera 1985/86	Strong
Skill knowledge	Sivek and Hungerford 1989	$R^2=0.11$ to 0.30
	Axelrod and Lehman 1993	Strong (general)
Attitudes	Bamberg 2003	Strong (specific)
	Hines, Hungerford, and Tomera 1987	Moderately strong
	Hwang, Kim, and Jeng 2000	Weak (specific)
	Sia, Hungerford, and Tomera 1985/86	Not significant to moderate

Norms	Bamberg 2003	Strong
	Granzin and Olsen 1991	P<0.0001
	Nordlund and Garvill 2002	Strong
	Pickett, Kangun, and Grove 1993	$\beta=0.23$
Perceived behavioral control	Bamberg 2003	Moderate ²
Issue Importance	Axelrod and Lehman 1993	Strong
Saliency of issue	Granzin and Olsen 1991	P<0.0001
Commitment	Cottrell and Graefe 1997	Very weak
Direct Experience	Kals, Schumacher, and Montada 1999	$\beta=0.27^3$
Threat perception	Axelrod and Lehman 1993	Moderately strong

¹ Three different measures of awareness of consequences (to self, society, or environment) were compared with three measures of behavior (political action, income tax, and gasoline tax).

² Moderate predictor of intention, very weak predictor of behavior.

³ Moderate predictor of emotional affinity to nature, which was moderately predictive of behavior.

Environmental Behavior Measures and Methods

The most common method of evaluating the level of pro-environmental behavior among studies reviewed (15 of 20 studies) was to ask respondents to give self-reports of behaviors they have engaged in, typically during the previous year. Some studies asked for respondents to estimate the frequency with which they engaged in the behavior, others simply asked for a yes/no response. Four studies asked respondents to indicate their intention to engage in a particular behavior. Behavioral intention was measured by asking a person about how likely it was they would perform a certain behavior, how willing they were to pay to protect the environment (e.g., increased tax dollars), or how willing they were to give up activities or possessions that hurt the environment. Behavioral intention is generally thought to be highly correlated with actual behavior. In fact, Kaiser *et al.* (1999) found that behavioral intention explained 75% of the variance in a general ecological behavioral scale. While difficult to do, a few studies (n=4) also measured actual behavior. One measured interest in using a green electricity source by having interested respondents mail in a postcard attached to an informational brochure (Bamberg 2003). Another study verified students' stated pro-environmental behaviors by asking their parents about any pro-environmental behavior their children engaged in during the time period of the course (Ramsey, Hungerford, and Tomera 1981). A third study measured actual behavior several months after the respondents completed a survey by having a confederate (research assistant) invite them to sign a petition, participate in a local recycling program, and help out in a roadside litter pick-up (Weigel and Weigel 1978).

The behaviors respondents were asked about in the reviewed studies ranged widely. Some studies asked about behaviors related to politics, such as participation in public meetings, voting for candidates based upon environmental issues, signing petitions, or writing their government representatives. Recycling was a common activity asked about, as was turning down the thermostat in winter, turning out lights that are not used at home, and driving less. Respondents also were often asked about their purchase of environmentally friendly products

(e.g., phosphate free soap or recycled products), or their reduction in use of harmful products (e.g., lawn chemicals). Membership in environmental organizations, monetary contributions to conservation organizations, watching nature specials on television, or reading conservation magazines also were considered to be pro-environmental behaviors. Most studies asked a variety of behaviors meant to represent different types of pro-environmental behavior. The responses to each item were then generally combined into a scale or rating (e.g., high or low behavior groups). Only one study reviewed focused on behavior engaged in while recreating; Cottrell and Graefe (1997) asked boaters to indicate how much raw sewage they pumped into the water versus in designated pump-out stations.

The validity of general behavior scales has been debated, as well as their usefulness as a predictor of pro-environmental behaviors. The general nature of both attitude and behavior scales could partially account for the relatively low variance explained by the various models tested. Another concern related to the measurement of behavior is that some commonly asked actions could be the result of motivations other than environmental ones. For example, an individual may turn down the thermostat in winter in order to save money without considering possible environmental advantages of the behavior. Therefore, non-environmental motivations may weaken correlations between environmental concern and pro-environmental behavior.

Summary and Implications

Overall, few of the studies or models reviewed were successful in explaining significant percentages of the variance in pro-environmental behaviors, much less the effect of recreational activity on those behaviors. Unfortunately, there is also no consensus about what variables most strongly influence behavior. While many variables have been found to be significantly correlated with behavior, the predictive power of the models remains low. While discouraging, this is not uncommon in the social psychology literature where many factors interact in a complex way to influence human behavior.

A possible weakness that has limited predictive power to date is the focus on general measures of concern and behavior. It is widely accepted that attitudes are only weakly predictive of behavior when measured at a general level (Kraus 1995; Petty 1995). Bamberg (2003) felt that environmental concern was only weakly predictive of specific environmental behaviors because it was a general measure and only an indirect determinant of behavior. For example, a specific attitude on recycling is more likely to be predictive of recycling behavior than is a score on the NEP scale. He hypothesized that environmental concern was a basic value orientation that simply guides a person in framing an environmental issue. Environmental behavior also has often been measured in a general manner by converting responses to a variety of different specific behaviors (i.e., multiple items) into a single numerical value or category of behavior (e.g., high or low behavior). This simplification of attitudinal and behavioral responses reduces the predictive power of potential indicators (predictors) of behavior because factors are more likely to be predictive when they are referring to a specific behavior.

While many factors may influence behavior in a given situation, it seems that the most productive strategy to take for this research is to focus on influences of behavior that can be affected through environmental education and interpretation. Several researchers have concluded that problem awareness and perceived skill in avoiding environmental harm are important factors that encourage pro-environmental behavior. Hines *et al.* (1987) suggested that environmental education should focus on the knowledge and skill components, while cultivating more positive environmental attitudes, and encouraging the development of an internal locus of control and a sense of personal responsibility. Newhouse (1990) also recommended that programs educate participants about how to evaluate an issue, and provide information about appropriate action skills to behave pro-environmentally. Sivek and Hungerford (1989) found that the strongest predictor of environmental behavior from hunters and conservation club members was perceived skill in using environmental action strategies. While there is some discussion over the significance of affect or emotion in decision making, Pooley and O'Connor (2000) found that cognition (i.e., knowledge of the issues) explained more of the variance in behavior than emotion.

The following key variables seem likely to influence behavior and are important for developing educational messages:

1. Awareness of potential problem or consequences
Are people aware of a particular problem and that the consequences of their actions may positively or negatively impact the environment? What specific beliefs about outcomes do people have about a given behavior? For example, do boaters believe outboard motors pollute the lake and hurt fish populations?
2. Knowledge to evaluate the situation
Do people have enough knowledge of the environment to make educated evaluations of a situation?
3. Value orientation
What values do people use to frame situations? Do they value the environment for religious, biocentric, or anthropocentric reasons? Value orientation will influence how people perceive a situation and receive educational messages.
4. Knowledge to avoid environmental impacts
Do recreational anglers and boaters know how to avoid environmental impacts while they are recreating? While boaters and anglers may know their activities are causing harm, they may not know alternative behaviors to avoid damage.
5. Skills/equipment to avoid impact
If anglers or boaters know they should avoid a specific impact, do they possess the skills and or equipment necessary to act in a pro-environmental manner?
6. Psychosocial or Personality Traits
Do recreational boaters and anglers believe their individual action will make a difference? Do individuals view their personal actions as significant? These questions involve the concepts of locus of control, efficacy, and personal responsibility
7. Concept of Stewardship and Ethics
How do the concepts of stewardship and ethics influence behavior, and what are the best educational methods to encourage pro-environmental behavior?

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