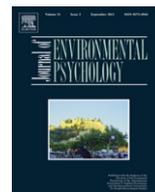




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Building a model of commitment to the natural environment to predict ecological behavior and willingness to sacrifice

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ABSTRACT

We examined the connection between individuals' relationships with the natural environment and their environmental behaviors with a focus on commitment to the environment, defined as psychological attachment and long-term orientation to the natural world. Commitment is theorized to emerge from structural interdependence with the environment and to lead to pro-environmental behaviors. Close relationships research has identified three key antecedents to commitment (satisfaction, alternatives, and investments). We developed environment-specific measures of these constructs, and factor analysis verified three distinct factors. A path analysis revealed that satisfaction with the environment and investments in the environment, but not alternatives to the environment, predicted commitment to the environment. Moreover, commitment mediated the effects of satisfaction and investments on general ecological behavior and willingness to sacrifice for the environment. In regression analyses, commitment predicted general ecological behavior and willingness to sacrifice for the environment, even when controlling for ecological worldview, inclusion of nature in the self, connectedness to nature, and environmental identity. Individuals who are satisfied with and invested in the natural world are likely to be committed to the environment and act with the well-being of the environment in mind.

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1. Introduction

"The long-term good health of populations depends on the continued stability and functioning of the biosphere's ecological and physical systems, often referred to as life-support systems. We ignore this long-established historical truth at our peril: yet it is all too easy to overlook this dependency..." (McMichael, 2003)

Human behavior is at the root of the rapid pace of global climate change (American Psychological Association, 2009) and of many environmental problems (cf. Oskamp, 2000); thus, it is critical that researchers identify motives for human behavior toward the natural environment (Clayton & Brook, 2005; Gifford, 2008; Mascia et al., 2003; Saunders, Brook, & Myers, 2006). The quote above was placed at the beginning of an American Psychological Association (2009) report on the interface between psychology and global climate change, and we share it here because our research is based on the premise that human dependence on the natural

environment should lead to pro-environmental behaviors. Environmental problems are caused by human behavior, but humans depend upon the well-being of the environment for desirable outcomes. An array of empirical research has examined human environmental behaviors, examining predictors such as attitudes (Hines, Hungerford, & Tomera, 1986–1987), values (Schultz & Zelezny, 1999; Stern, 2000), affect (Hinds & Sparks, 2008; Schultz, 2000), and normative influence (Nolan, Schultz, Cialdini, Goldstein, & Griskevicius, 2008). In addition, several models of the person–environment relationship are associated with environmental behaviors, including connectedness to nature (Leary, Tipsord, & Tate, 2008; Mayer & Frantz, 2004; Schultz, 2002), environmental identity (Clayton, 2003), and commitment to the natural environment (Davis, Green, & Reed, 2009). The present research presents evidence for an elaborated model of commitment to the natural environment.

The person–environment relationship is bidirectional: just as human behavior affects the well-being of the environment, changes in the environment affect human well-being. There is a large body of literature on the beneficial effects of nature for humans. Spending time in nature or feeling connected to nature yields benefits such as knowing the self (Clayton, 2003), mental and

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physical health (Frumkin, 2001), and greater life satisfaction (Mayer & Frantz, 2004). It is possible that such benefits are due to the restorative effects of nature on stress and attention fatigue or to an increase in vitality, a positive high-energy state (Hartig, Evans, Jamner, Davis, & Garling, 2003; Ryan et al., 2010). Recently, Mayer, Frantz, Bruehlman-Senecal, and Dolliver (2009) presented evidence that connectedness to nature is a partial mediator of the effects of exposure to nature and positive outcomes; it could be that a sense of belongingness with nature fulfills a fundamental human need to belong (cf. Baumeister & Leary, 1995). Indeed, there is some concern that as humans become further removed from nature and experience nature artificially rather than directly (e.g., via technological media or through a window), we may experience corresponding decreases in well-being (e.g., Mayer et al., 2009). Moreover, we may be oblivious to the cause of such a decrease in well-being as artificially experiencing nature becomes normative (Kahn, Severson, & Ruckert, 2009). Given that humans derive many benefits from nature, it would behoove us to treat it well.

1.1. Connectedness to nature and environmental identity

There has been a long history of theorizing about the person–environment relationship (e.g., Leopold, 1949), but over the last decade there has been an increasing amount of empirical work on this important topic. There are several lines of research on environmental identity and the person–environment relationship that share a global approach to understanding the broad underlying structure of relational motives for environmental behaviors (as opposed to place-specific attachment; Scannell & Gifford, 2010). Clayton (2003) introduced the concept of environmental identity as a type of collective identity and offered a scale designed to measure environmental ideology and positive emotions about the environment, among other things. Individuals with stronger environmental identities reported performing more environmentally sustainable actions. Mayer and Frantz (2004) and Schultz (2002) have examined the implications of connectedness to nature. Mayer and Frantz developed a measure of connectedness to nature and provided evidence in five studies that those who feel more at one with nature report greater concern for nature, ecological behavior, and identity as environmentalists. Schultz (2002) adapted the Aron, Aron, and Smollan (1992) inclusion of other in the self scale (designed for interpersonal relationships) to assess inclusion of nature in the self using a single item to measure the degree to which individuals include nature in their self-concept (also see Davis et al., 2009). Relatedly, Leary et al. (2008) introduced the concept of *allo-inclusive identity*, which they defined as self-construals that go beyond intra- and interpersonal. They used an 8-item adapted version of the Aron et al. (1992) inclusion of other in the self scale to assess inclusion of the natural world in the self (e.g., for one item, the “other” was a tree). Individuals who scored higher on *allo-inclusive identity* for the natural world reported greater social/ecological concern. In a similar vein, Arnocky, Stroink, and DeCicco (2007) found that individuals engaged in greater conservation behavior to the extent that they included all living things in their self-construal.

1.2. Commitment to the environment

Commitment to the environment is a person–environment relationship construct that is theoretically distinct from these other approaches. It is a concept rooted in theory developed to examine the structure of interpersonal relationships – interdependence theory (Kelley & Thibaut, 1978; Thibaut & Kelley, 1959) and Rusbult's (1980, 1983) model of commitment. From the perspective of interdependence theory, individuals are more committed to the

extent that they are dependent on the other (e.g., a particular location, the natural environment) to uniquely gratify their needs. As such, the premise of our approach is that structural interdependence leads to the subjective experience of commitment. Davis et al. (2009) provided evidence that commitment to the environment predicts individuals' past environmental behaviors as well as their environmental behavioral intentions. They used an experimental manipulation of dependence on the natural world to increase the likelihood that participants would volunteer (or learn about volunteer opportunities) for a local river clean-up.

In close relationships theory and research, commitment has been identified as a central process that includes a long-term orientation towards a relationship, the intent to persist in a relationship, and psychological attachment to a partner (Arriaga & Agnew, 2001; Rusbult, Olsen, Davis, & Hannon, 2001). Based on interdependence theory (Thibaut & Kelley, 1959), Rusbult's (1980) commitment model is a commonly employed framework for understanding the factors that predict commitment. From this perspective, satisfaction with, investments in, and alternatives to a relationship independently predict individuals' commitment to the relationship; the present research applies this model to individuals' commitment to the natural environment. Satisfaction refers to the subjective evaluation of the relative positivity or negativity experienced in a relationship (e.g., the benefits individuals receive from the natural environment) and is positively associated with commitment. Investments refer to tangible or intangible resources tied to a relationship that would be lost if the relationship were to dissolve (e.g., the time and effort individuals have put into the natural environment) and are positively associated with commitment. Alternatives refer to the extent to which individuals' needs could be met without the current relationship partner (e.g., the availability of alternative ways individuals could receive the benefits imparted by the natural environment) and are negatively associated with commitment. A wealth of research has supported this commitment model, and collectively satisfaction, investments, and alternatives account for two-thirds of the variability in commitment (Le & Agnew, 2003). Although scholars have successfully employed this model to explain phenomena as far-flung as adherence to medical regimens (Putnam, Finney, Barkley, & Bonner, 1994), participation in musical activities (Koslowsky & Kluger, 1986), and even the “war on terror” (Agnew, Hoffman, Lehmler, & Duncan, 2007), no previous work has sought to harness the power of this commitment model to understand individuals' commitment to the natural environment or their willingness to make sacrifices to benefit it.

1.3. Willingness to sacrifice

Within the literature on interpersonal relationships, commitment emerging from relational dependence is theorized to be accompanied by a cognitive shift as individuals become partner- and dyad-focused rather than solely concerned with their own outcomes. This process, known as *transformation of motivation* (Rusbult, Arriaga, & Agnew, 2001), represents a fundamental adjustment to how individuals view themselves, yielding revised motivations and behavioral choices. Therefore, it is not surprising that commitment predicts a number of pro-relational outcomes such as relationship maintenance (Le, Korn, Crockett, & Loving, 2011), accommodating a partner in times of conflict (Rusbult, Yovetich, & Verette, 1996), missing one's partner when geographically separated (Le et al., 2008), forgiving a partner's betrayal (Finkel, Rusbult, Kumashiro, & Hannon, 2002), and remaining faithful to one's partner (Drigotas, Safstrom, & Gentilia, 1999). Commitment also is positively associated with *willingness to sacrifice*, which refers to “foregoing one's own immediate self-

interests to promote the well-being of the partner or relationship" (Van Lange, Agnew, Harinck, & Steemers, 1997, p. 1331). Thus, sacrificing one's own preferences for the sake of the partner's preferred outcome (or the best outcome for the relationship) benefits and demonstrates dedication to the relationship.

When confronted with day-to-day environmental dilemmas, *willingness to sacrifice for the environment* represents the extent to which individuals' decisions will take into account the well-being of the environment, even at the expense of immediate self-interest, effort, or costs. (Note that this construct is distinct from willingness to sacrifice for the sake of other individuals or the greater good of a community of people [e.g., tragedy of the commons; Hardin, 1968].) Iwata (2002) reported that individuals with greater willingness to sacrifice for the environment reported greater environmentally-responsible behavior. What leads people to experience willingness to sacrifice for the environment? Willingness to sacrifice financially for the environment has been associated with demographic variables such as income and education (Gelissen, 2007). Our approach – conceptualizing willingness to sacrifice from an interdependence theoretic perspective, motivated by relational dependence – is comparatively less altruism-centered, and therefore may better motivate pro-environmental behavior (cf., Kaplan, 2000). Further understanding of the conditions under which individuals make decisions taking into account the greater needs of the natural world, rather than acting in immediate self-interest is of great importance for promoting pro-environmental behavior.

1.4. Overview and hypotheses

Our first aim was to build a model of commitment to the natural environment, including predictors of commitment to the environment (i.e., satisfaction, investments, and alternatives) and outcomes of commitment to the environment (i.e., ecological behavior and a new measure, willingness to sacrifice for the environment). Hypothesis 1 was that satisfaction with the environment, investments in the environment, and alternatives to the environment would predict commitment to the environment. We predicted that commitment to the environment would mediate the effects of the three predictors of commitment (satisfaction, investments, and alternatives) on ecological behavior (Hypothesis 2) and willingness to sacrifice for the environment (Hypothesis 3).

In recent years, researchers have developed several measures of the person–environment relationship, all of which are related to environmental attitudes and behavior: inclusion of nature in the self (Schultz, 2001), environmental identity (Clayton, 2003), connectedness to nature (Mayer & Frantz, 2004), and commitment to the environment (Davis et al., 2009). These measures have not yet all been included in the same study. Our second aim in this project was to broadly examine predictors of ecological behavior and willingness to sacrifice for the environment. We predicted that commitment to the environment would predict a well-established measure of ecological behavior (Hypothesis 4) as well as our new measure of willingness to sacrifice for the environment (Hypothesis 5) above and beyond other related measures.

2. Method

2.1. Participants

Participants included 248 undergraduate students (106 men, 142 women) from Virginia Commonwealth University who participated in partial fulfillment of a requirement for their introductory psychology course. Participants were 22 years old on average ($SD = 3.07$, ages ranged from 17 to 38); 53% were freshman,

27% were sophomores, 13% were juniors, 5% were seniors (2% listed other). Sixty-one percent of participants self-identified as Caucasian (16% African American, 9% Asian American, 4% Latino, and 10% other).

2.2. Commitment to the environment measures

The commitment to the environment measures are adapted versions of Rusbult, Martz, and Agnew's (1998) close relationships scales. Participants responded to each item using a 9-point scale (0 = *do not agree at all*; 8 = *agree completely*). Within each scale, we averaged responses to create a composite index. We used the Davis et al. (2009) 11-item measure of commitment to the environment to assess long-term orientation and psychological attachment to the natural world (e.g., "When I make plans for myself, I take into account how my decisions may affect the environment"; $\alpha = .87$; $M = 4.89$, range = 0.00–8.00).

We developed three new 5-item measures using factor analysis (described in the Results section; alphas and descriptives for the 5-item measures are reported here). To measure satisfaction with the environment, participants responded to 12 potential items (e.g., "Spending time in the natural environment is rewarding"; $\alpha = .95$; $M = 5.91$, range = 1.40–8.00). To measure investments in the environment, participants responded to 14 potential items (e.g., "I have put a lot of time, energy, and effort into the well-being of the natural environment"; $\alpha = .92$; $M = 3.84$, range = 0.00–8.00). To measure alternatives to the environment, participants responded to 17 potential items (e.g., "My needs for activity, relaxation, and adventure could easily be fulfilled somewhere other than the natural environment"; $\alpha = .85$; $M = 4.77$, range = 0.80–8.00).

2.3. Additional person–environment relationship measures

We included several other measures of the person–environment relationship in order to distinguish our commitment to the environment model from related approaches.

2.3.1. Inclusion of nature in the self

The inclusion of nature in the self (INS) measure (Davis et al., 2009; Schultz, 2002) is an adapted version of Aron et al.'s (1992) inclusion of other in the self (IOS) scale. It is a closeness measure that describes the interconnectedness of individuals with the natural world using Venn-like pictorial diagrams, with two circles of varying degree of overlap representing the self and nature. Participants selected from seven diagrams which degree of overlap of circles best described their relationship with nature (1 = least overlap, 7 = greatest overlap; $M = 4.19$, range = 1–7).

2.3.2. Environmental identity

The environmental identity (EID) scale (Clayton, 2003) is a 24-item measure designed to assess the degree to which individuals include the environment as a part of who they are as a person (e.g., "I think of myself as a part of nature, not separate from it"). Participants responded to each item using a 7-point scale (1 = *not at all true of me*; 7 = *completely true of me*; $\alpha = .95$). We averaged responses to create a composite index for the EID ($M = 4.55$, range = 1.00–7.00).

2.3.3. Connectedness to nature

The connectedness to nature scale (Mayer & Frantz, 2004) is a 14-item measure designed to assess the degree to which individuals feel emotionally attached to the environment (e.g., "I often feel a kinship with animals and plants"). Participants responded to each item using a 5-point scale (1 = *not at all true of me*; 5 = *completely true of me*; $\alpha = .85$). We averaged responses to create

a composite index for the connectedness scale ($M = 3.06$, range = 0.18–4.69).

2.4. New ecological paradigm

The new ecological paradigm (NEP) scale (Dunlap, Van Liere, Mertig, & Jones, 2000) is a widely used scale that measures individuals' endorsement of an ecological worldview. The NEP scale consists of 15 items designed to measure beliefs about nature and humans relationship with it (e.g., "The balance of nature is very delicate and easily upset"). Participants responded to each item using a 5-point scale (1 = *strongly disagree*; 5 = *strongly agree*; $\alpha = .80$). We averaged responses to create a composite index for the NEP ($M = 3.42$, range = 2.07–4.79). We included the NEP scale in our analyses as a control variable.

2.5. General ecological behavior

The general ecological behavior (GEB) scale is a well-established self-report measure developed by Kaiser, Doka, Hofstetter, and Ranney (2003). Items on the scale are ecological behaviors as well as their counterpart (non-ecological) behaviors. We used the Davis et al. (2009) version of the scale, in which items that were not relevant to the student context were adjusted or omitted. This adapted version of the GEB includes 28 items (e.g., "In nearby areas, I will use public transportation, ride a bike, or walk"). Participants responded to each ecological item using a 5-point scale (1 = *never/no*; 5 = *always/yes*; $\alpha = .75$). We averaged responses to create a composite index for GEB ($M = 3.31$, range = 2.07–4.46).

2.6. Willingness to sacrifice for the environment

Based on items used in past relationship research (Etcheverry & Le, 2005), we developed a 5-item measure of willingness to sacrifice (WTS) to assess whether individuals were willing to sacrifice their own needs for the sake of the environment (e.g., "I am willing to give things up that I like doing if they harm the natural environment"; see Appendix). Participants responded to each item using a 9-point scale (0 = *do not agree at all*; 8 = *agree completely*; $\alpha = .88$). We averaged responses to create a composite index for WTS ($M = 4.83$, range = 1.20–8.00).¹

3. Results

3.1. Factor analysis

First, we constructed scales to measure satisfaction with the environment, investments in the environment, and alternatives to the environment. We developed 43 possible items to measure the three constructs, and performed an exploratory factor analysis on all 43 items. Given that these three factors have been correlated in relationship research (Le & Agnew, 2003), we used the maximum likelihood method with a promax (oblique) rotation. Six factors with eigenvalues above 1.0 emerged ($\chi^2(660) = 1151.63$, $p < .001$). Factor 1 (eigenvalue = 15.65; 36.39% of the variance) included all of the items intended to assess satisfaction, and Factor 2 (eigenvalue = 4.97;

11.56% of the variance) included 12 items intended to assess investments. The items written to assess alternatives were divided among the remaining four factors; we retained only items from Factor 3 (Factor 3: six items, eigenvalue = 4.50 and 10.47% of the variance; Factor 4: three items, eigenvalue = 2.10 and 4.89% of the variance; Factor 5: three items, eigenvalue = 1.43 and 3.33% of the variance; Factor 6: three items, eigenvalue = 1.17 and 2.17% of the variance).

An examination of the scree plot suggested a structure consisting of three factors (Cattell, 1966). Paralleling the scales developed by Rusbult et al. (1998) for assessing satisfaction, investments, and alternatives in close relationships, we selected the five items from each of the first three factors with (1) the highest loadings (2) that did not cross-load on other factors to form our measures of satisfaction with, investments in, and alternatives to the natural environment (see Table 1 for the final items, factor loadings, and reliabilities). Interfactor correlations were of moderate strength and varied from $-.28$ to $.42$.

3.2. Path analysis

Second, we performed a path analyses using LISREL software (Jöreskog & Sörbom, 2006) to examine the direct and indirect (mediated by commitment) effects of commitment model measures (satisfaction, investments, and alternatives) on general ecological behavior (GEB) and willingness to sacrifice (WTS). We used the maximum likelihood method of parameter estimation and the variance–covariance matrix as inputs. In addition, we allowed satisfaction, investments, and alternatives to correlate, and we allowed GEB and WTS to correlate.

To test our hypotheses, we performed a path analysis testing fully-mediated and partially-mediated models of the effect of commitment model measures on GEB and WTS. First, we tested the fully-mediated model, which provided a poor fit to the data: $\chi^2(6) = 53.21$, $p < .001$; comparative fit index (CFI) = .93; and root mean square error of approximation (RMSEA) = .17. Next, we tested a partially-mediated model; we proceeded by testing each direct effect independently of the others. The greatest direct effect was between satisfaction and WTS, so we included that path in the model. A test of the change in the chi-square statistic ($\Delta\chi^2$) indicated that this partially-mediated model provided a significantly improved fit to the data, $\Delta\chi^2(1) = 23.69$, $p < .001$; however, model fit was still poor: $\chi^2(2) = 29.52$, $p < .001$; CFI = .96; and RMSEA = .14. Next, we added the direct effect of investments on WTS, which significantly improved the model, $\Delta\chi^2(1) = 11.43$, $p < .001$; however, model fit remained poor: $\chi^2(4) = 18.09$, $p < .001$; CFI = .98; and RMSEA = .12. Next, we added the direct effect of satisfaction on GEB, which significantly improved the model, $\Delta\chi^2(1) = 16.93$, $p < .001$. Moreover, this model provided an excellent fit to the data: $\chi^2(3) = 1.16$, $p < .76$; CFI = 1.00; and RMSEA = .00 (see Fig. 1).²

Consistent with Hypothesis 1, individuals with greater satisfaction with the environment and investments in the environment reported greater commitment to the environment. Alternatives to the environment were not associated with commitment to the environment; however, we chose to retain the measure in the model because our theoretical framework (i.e., Rusbult's commitment model) includes all three constructs. Consistent with

¹ In order to explore our expectation that items on the willingness to sacrifice scale would load on a single factor, we performed a factor analysis using maximum likelihood extraction and an oblique promax rotation. The first factor had an eigenvalue of 3.41 and explained 68% of the variance; a second factor had an eigenvalue of 0.67 and explained only 13% of the variance. The pattern of factor loadings on the second factor was not theoretically interpretable; no items loaded higher on the second factor than on the first. These results are consistent with a single-factor interpretation of the scale.

² When we tested the model in Fig. 1 after adding the direct effect of investments, the model was still an excellent fit to the data: $\chi^2(2) = 1.14$, $p < .57$; CFI = 1.00; and RMSEA = .00. Given that our theory is consistent with partial or full mediation of the effect of investments on GEB, we felt that the most appropriate interpretation of the path analyses was partial mediation.

Table 1

Rotated factor loadings of items assessing satisfaction with, investments in, and alternatives to the environment.

	Factor 1 Satisfaction $\alpha = .95$	Factor 2 Investments $\alpha = .92$	Factor 3 Alternatives $\alpha = .85$
The natural environment is an ideal place to spend time.	.86	-.10	.18
Spending time in the natural environment is rewarding.	.88	-.01	.14
Spending time in the natural environment makes me very happy.	.88	-.16	.15
The natural environment does a good job meeting my needs for activity, relaxation, and adventure.	.86	-.11	.17
I am satisfied when I spend time in the natural environment.	.88	-.07	.14
I have put a lot of time, energy, and effort into the well-being of the natural environment.	.16	.78	-.13
Compared to other people I know, I have invested a great deal in the environment.	.15	.83	-.04
I feel very involved with the natural environment; like I have put a great deal into it.	.06	.90	-.04
Overall I have a lot invested in the natural environment.	.16	.82	-.06
I have put a lot of effort into the well-being of the natural environment.	.13	.85	-.14
Compared to the natural environment, there are other places where I could spend time that would be more enjoyable.	-.23	-.15	.56
When I'm not in the natural environment I find other appealing places to spend my time.	.11	-.11	.79
My needs for activity, relaxation, and adventure could easily be fulfilled somewhere other than the natural environment.	-.20	-.17	.66
I have other ways of occupying my time besides spending time in the natural environment.	.08	-.12	.85
Generally speaking, my alternatives to spending time in the natural environment are appealing.	-.07	-.04	.77

Note. Factor loadings above .50 are in bold.

Hypothesis 2, individuals' commitment to the environment partially mediated the effects of their satisfaction with the environment and investments in the environment on their ecological behavior. Consistent with Hypothesis 3, individuals' commitment to the environment partially mediated the effects of their satisfaction with the environment and investments in the environment on their WTS for the environment.

3.3. Hierarchical regression analyses

Third, we performed two sets of regression analyses to examine the association between commitment to the environment and GEB and WTS while controlling for other measures of the person–environment relationship. Intercorrelations among all measures are reported in Table 2.

3.3.1. General ecological behavior

To test Hypothesis 4, we performed hierarchical multiple regression to examine predictors of GEB (see Table 3). For Model 1, we regressed GEB onto environmental identity, connectedness to nature, and inclusion of nature in the self (INS), and included the new ecological paradigm (NEP) scale as a control variable. Environmental identity and NEP were the only significant predictors of GEB (β 's were .20 and .37, respectively).³ For Model 2, we added commitment to the environment to the model. Consistent with Hypothesis 4, commitment to the environment (and NEP) significantly predicted GEB (β 's were .19 and .34, respectively). That is, even after taking other person–environment measures and scores on the NEP into account, individuals with greater commitment to the environment were more likely to report greater ecological behavior.

3.3.2. Willingness to sacrifice

To test Hypothesis 5, we performed hierarchical multiple regression to examine predictors of WTS (see Table 4). For Model 1, we regressed WTS onto environmental identity, connectedness to nature, and inclusion of nature in the self (INS), and included the new ecological paradigm (NEP) scale as a control variable.

³ We tested whether person–environment measures predicted general ecological behavior (GEB) when included as single predictors in separate regression models. In this manner, we found that connectedness to nature ($\beta = .46, t[245] = 8.15, p < .001$) and inclusion of nature in the self ($\beta = .33, t[225] = 5.25, p < .001$) also predicted GEB.

Environmental identity, connectedness to nature, INS, and NEP all significantly predicted WTS (β 's ranged from .12 to .32). For Model 2, we added commitment to the environment to the model. Commitment to the environment, inclusion of nature in the self, and environmental identity were the only significant predictors of WTS (β 's ranged from .12 to .35). Consistent with Hypothesis 5, individuals with greater commitment to the environment reported greater willingness to sacrifice for the environment.

4. Discussion

In previous work, Davis et al. (2009) employed interdependence theory to introduce commitment to the natural environment as a new theoretical approach to understanding the person–environment relationship. They defined commitment to the environment as psychological attachment and long-term orientation to the natural world. In the current work, we present evidence for a model of commitment to the environment that includes two predictors (satisfaction with the environment and investments in the environment) and two outcomes (general ecological behavior [GEB] and willingness to sacrifice [WTS] for the environment). We examined three potential predictors of commitment to the environment: satisfaction with the environment, investments in the environment, and alternatives to the environment. We developed scales to assess each predictor of commitment, and a factor analysis revealed a theoretically consistent three-factor structure.

Rusbult's (1980) commitment model posits that commitment is a function of three key antecedents: satisfaction, investments, and alternatives. In a great deal of research across many contexts (e.g., romantic relationships, jobs), these three antecedents reliably predict commitment. In our research, individuals' reports of their satisfaction with the environment and their investments in the environment predicted their level of commitment to the environment; however, their perception of their quality of alternatives to the environment did not. The findings for satisfaction and investments are in-line with much commitment research. Although we predicted a significant association between quality of alternatives and commitment to the environment, past work on non-romantic relationships has not consistently revealed a significant association between alternatives and commitment. For example, Le and Agnew (2003) reported that in non-interpersonal domains (e.g., commitment to sports or other activities), individuals' perception of their quality of alternatives did not significantly predict their level of commitment. It is possible that alternatives and commitment are most strongly linked when the relationship is implicitly or

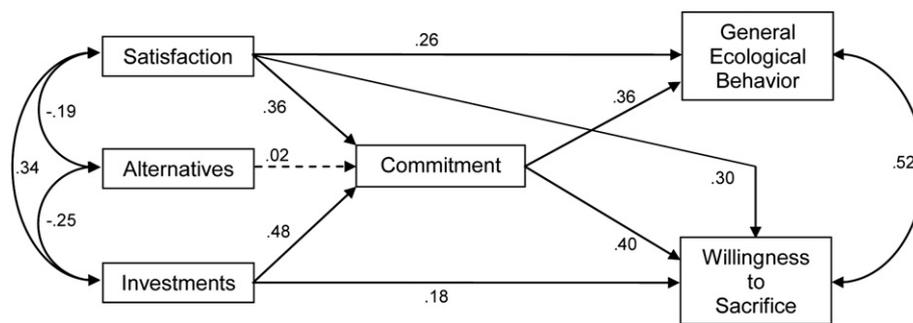


Fig. 1. Path model predicting general ecological behavior and willingness to sacrifice for the environment: $\chi^2(3) = 1.16, p < .76$; CFI = 1.00; and RMSEA = .00. Curved lines represent correlations. Solid lines represent significant standardized path coefficients.

explicitly exclusive (e.g., a romantic partner). Commitment to the natural environment does not preclude attachments to other physical environments in the same way that romantic commitment does, thus alternatives may not be important in predicting commitment in the environmental domain. For example, the association between alternatives and commitment was substantially diminished in studies of friendships (which are assumed to be non-exclusive; one can have multiple friends; Branje, Frijns, Finkenauer, Engels, & Meeus, 2007; Lin & Rusbult, 1995).

We examined two potential outcomes of commitment to the environment: an established measure of ecological behavior (GEB) and our new measure of WTS for the environment. In an important test of our model of commitment to the environment, and consistent with a great deal of work on commitment in various domains (cf. Le & Agnew, 2003), a path analysis revealed that commitment to the environment partially mediated the effects of individuals' satisfaction with the environment and their investments in the environment on their reports of past ecological behavior (GEB) and their WTS for the environment. In addition to the mediated effects, there were direct effects of satisfaction (on GEB and WTS) and investments (on WTS). These direct effects are consistent with past research. For example, students who were in classes that included ecological field work (which could be viewed as an investment) reported greater ecological behavior compared to students who were in classes that included only in-class instruction with limited fieldwork (Bowler, Kaiser, & Hartig, 1999).

Researchers are interested in general measures of pro-environmental behavior, and many rely on the GEB scale (Kaiser et al., 2003), which includes a series of items that are specific examples of ecological behaviors (e.g., procedure for laundering clothing). We introduced a brief but valid measure, WTS for the environment, which is general rather than context-specific, thus providing researchers with an instrument that can be used with differing

populations in diverse settings. All of the measures we included in the present research predicted WTS for the environment (i.e., ecological worldview, inclusion of nature in the self, connectedness to nature, and environmental identity). WTS and GEB both reflect individuals' underlying tendencies to engage in ecological behavior, and thus it is not surprising that they yield similar patterns of results (cf. Kaiser, Schultz, & Scheuthle, 2007); as would be expected, there is a moderately strong correlation between the two measures (see Table 2). The new WTS measure is a parsimonious option for researchers interested in assessing pro-environmental behavioral tendencies. We designed the measure to get at the heart of day-to-day dilemmas that individuals face in their environmental behaviors: whether to do what is best for themselves or whether to do what is best for the environment. Importantly, commitment model constructs predicted WTS in a manner consistent with interdependence theorizing.

In an important extension of Davis et al. (2009), individuals' commitment to the environment predicted their reports of ecological behavior and their WTS for the environment, even when controlling for related measures such as ecological worldview, connectedness to nature, inclusion of nature in the self, and environmental identity. The present research is the first to report effects together for all of these measures. In future work it would be interesting to explore how commitment to the environment relates to the nature relatedness scale (Nisbet, Zelenski, & Murphy, 2009), a new measure that assesses the thoughts, feelings, and experiences that people have with nature.

4.1. Strengths, limitations, and future research

Given that commitment to the environment is a powerful predictor of environmental behavior, a strength of the present work is that it highlights the underpinnings of commitment. According to

Table 2
Intercorrelations among measures.

	NEP	EID	CON	INS	COM	ALT	SAT	INV	GEB	WTS
M	3.42	4.55	3.06	4.19	4.89	4.77	5.91	3.84	3.31	4.83
SD	.51	1.08	0.78	1.48	1.28	1.38	1.61	1.57	0.40	1.34
NEP	—	.41***	.34***	.16*	.38***	-.13*	.42***	.05	.52***	.35***
EID		—	.80***	.57***	.68***	-.26***	.69***	.61***	.51***	.66***
CON			—	.49***	.63***	-.13*	.66***	.51***	.46***	.60***
INS				—	.57***	-.32***	.40***	.47***	.33***	.51***
COM					—	-.19**	.52***	.60***	.50***	.67***
ALT						—	-.19**	-.25***	-.08	-.13*
SAT							—	.34***	.45***	.57***
INV								—	.31***	.52***
GEB									—	.52***
WTS										—

Note. * $p < .05$; $N = 248$; ** $p < .01$; *** $p < .001$. Variable names are new ecological paradigm (NEP), environmental identity (EID), connectedness with nature (CON), inclusion of nature in the self (INS), commitment to the environment (COM), alternatives to the environment (ALT), satisfaction with the environment (SAT), investments in the environment (INV), general ecological behavior (GEB), and willingness to sacrifice for the environment (WTS).

Table 3
Summary of regression analyses predicting general ecological behavior (GEB).

	β	t	$p <$	R^2
Model 1				.39
New ecological paradigm	.37	6.18	.001	
Environmental identity	.20	2.08	.04	
Connectedness to nature	.12	1.42	.16	
Inclusion of nature in the self	.09	1.36	.18	
Model 2				.40
New ecological paradigm	.34	5.63	.001	
Environmental identity	.14	1.43	.15	
Connectedness to nature	.09	1.02	.31	
Inclusion of nature in the self	.04	0.55	.58	
Commitment to the environment	.19	2.44	.02	

Note. $N = 225$. Standardized betas are reported.

the Davis et al. (2009) research, it is possible to directly affect individuals' momentary perceptions of dependence on the environment, thereby increasing their pro-environmental behavior. In the present study, we learned that satisfaction with the environment and investments in the environment are associated with greater commitment. Theoretically, interventions designed to enhance individuals' experiences or perceptions of satisfaction (e.g., experiences in the natural environment that yield benefits to individuals) or investments (e.g., actions individuals take that expend effort to benefit the natural environment) should lead to greater felt commitment to the environment, and therefore greater pro-environmental behavior.

Although our results were largely consistent with hypotheses, they should be interpreted with care given the correlational and cross-sectional design of this study. Similarly, there is a degree of method variance (i.e., similarity between content and structure of items) that should be acknowledged in our new measures of satisfaction with, investments in, and alternatives to the natural environment; however, the results of the factor analysis lessen such a concern given the lack of cross-loadings of items across factors. Furthermore, this work did not investigate the causal pathways between satisfaction, alternatives, investments, and commitment. However, previous research has supported this directionality within the model (Rusbult, 1980). Similarly, recent experimental work (Davis et al., 2009) demonstrated that manipulating commitment affects intentions to engage in pro-environmental behaviors.

An important extension of the current work will be to examine the generalizability of these findings in a community (non-student) sample in the context of a specific location (e.g., a national park). In addition, it would be interesting to explore the relationship of the environmental attitudes inventory (Milfont & Duckitt, 2010) with commitment to the environment as well as WTS for the environment. The environmental attitudes inventory is a multidimensional

Table 4
Summary of regression analyses predicting willingness to sacrifice (WTS) for the environment.

	β	t	$p <$	R^2
Model 1				.48
New ecological paradigm	.12	2.22	.03	
Environmental identity	.32	3.58	.001	
Connectedness to nature	.19	2.34	.02	
Inclusion of nature in the self	.22	3.63	.001	
Model 2				.53
New ecological paradigm	.07	1.29	.20	
Environmental identity	.21	2.42	.02	
Connectedness to nature	.13	1.62	.11	
Inclusion of nature in the self	.12	2.03	.04	
Commitment to the environment	.35	5.01	.001	

Note. $N = 226$. Standardized betas are reported.

measure that includes twelve subscales designed to capture the overall structure of environmental attitudes by synthesizing findings from other related measures. Future research could also explore the utility of applying alternative interpersonal commitment models to commitment to the environment (e.g., Johnson, Caughlin, & Huston's [1999] moral component) or supplement the model with additional factors such as social network influence (e.g., Etcheverry & Agnew, 2004). Similarly, investigating the cognitive underpinnings of environmental commitment (cf. Etcheverry & Le, 2005) might yield insight into the conditions under which the effects of commitment are maximized. Finally, future research can examine whether WTS for the environment predicts specific pro-environmental behaviors (in addition to our reported association of WTS with GEB).

5. Conclusion

The person–environment relationship is a burgeoning area of research in the field of conservation psychology (cf. Clayton & Brook, 2005). Over the last several years, researchers have introduced a variety of relevant measures; the growing collection of measures reflects the utility of the relational approach to predicting ecological behavior. An important step in the theoretical development of this approach is to examine the relationships among existing measures and their combined utility in predicting ecological behavior. Our work centers around the premise that individuals are more likely to engage in pro-environmental behavior to the degree that they experience greater felt commitment to the environment. In the present work, satisfaction with the environment and investments in the environment were associated with greater commitment to the environment, which emerged as a powerful predictor of self-reported ecological behavior and willingness to sacrifice for the environment.

A great deal of research has highlighted the generalizability of Rusbult's (1980) commitment model to commitment targets beyond romantic partners (Le & Agnew, 2003), and following from Davis et al.'s (2009) work on commitment to the environment, the current study demonstrates the utility of this approach for understanding willingness to sacrifice for the environment. Individuals with greater satisfaction with and investment in the environment are likely to feel committed to the environment, which in turn is associated with greater willingness to sacrifice for the environment. From an interdependence theoretic perspective, willingness to sacrifice for the environment may be especially important in decisions regarding environmental action because it encompasses the psychological tension of acting in one's immediate best interests versus considering one's future orientation towards the greater good of the environment (and, via dependence on the environment, the future well-being of oneself). Insight into the processes of individuals making decisions based upon short-term and long-term considerations is paramount to understanding how to motivate citizens' pro-environmental actions.

Appendix. Willingness to sacrifice for the environment

To what extent does each statement describe your current attitudes? Please use the following scale to record your answers.

0	1	2	3	4	5	6	7	8
Do not agree at all			Agree somewhat			Agree completely		

1. I am willing to give things up that I like doing if they harm the natural environment.
2. I am willing to take on responsibilities that will help conserve the natural environment.
3. I am willing to do things for the environment, even if I'm not thanked for my efforts.
4. Even when it is inconvenient to me, I am willing to do what I think is best for the environment.
5. I am willing to go out of my way to do what is best for the environment.

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