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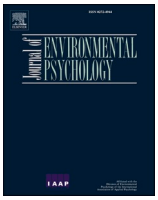

Nature as community: An overlooked predictor of pro-environmental intentions☆

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ABSTRACT

Environmental psychologists have dedicated considerable attention to how anthropocentric (e.g., egoistic) and biocentric (e.g., biospheric) reasons for valuing the environment might differentially predict pro-environmental outcomes. Yet, there has been little attention to other reasons for valuing nature. However, work outside psychology suggests that people also value nature for community or relational reasons. Here, we create a measure of valuing nature as community (NAC) as well as complementary measures of valuing nature for people (N4P) and valuing nature for nature (N4N). In Study 1, using an undergraduate sample, we found that NAC (a) represents a distinct psychological factor from N4P and N4N, (b) does not easily map onto the anthropocentric-biocentric dichotomy, and (c) predicts unique variance in pro-environmental behavioral intentions above and beyond N4P and N4N. In Study 2, using a more general US sample, we replicate the factor structure and tests of predictive utility reported in Study 1. In Study 3, we further replicate these findings using a measure of actual behavior and differentiate NAC from connectedness to nature. Together, the results from these studies suggest that NAC is an important and distinct basis for environmental values that has been, until now, overlooked by environmental psychology. Broader implications and future directions are discussed.

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Historically, environmentalists have long debated whether anthropocentrism-based or biocentrism-based values are most likely to promote pro-environmental outcomes (e.g., Batavia & Nelson, 2017; Neuteleers, 2020; O'Connor & Kenter, 2019). For instance, the ongoing discourse around ecosystem-services rhetoric is a modern example of such debates (see Schröter et al., 2014). In brief, *ecosystem-services rhetoric* conveys that we should protect nature *because* it provides services upon which human society's functioning and success depend. Some defend ecosystem services rhetoric because of the ostensible importance of recognizing nature's instrumental value for human health, wellbeing, and even existence (Batavia & Nelson, 2017; see; Schröter et al., 2014). Yet, others argue that such rhetoric neglects the inherent value of nature, undermining the prioritization of the environment by emphasizing anthropocentrism (Batavia & Nelson, 2017; see; Schröter et al., 2014). This example highlights, first, a longstanding interest in the pro-environmental implications of different bases for valuing nature and, second, a need for an empirical answer to the question of which basis for environmental values best predicts pro-environmental outcomes. However, it also highlights that these debates often neglect another essential basis for valuing nature: its role as a member of the planetary *community*.

Indeed, a third type of value-basis focuses on nature's role as an irreplicable member of the broader collective (see Neuteleers, 2020; O'Connor & Kenter, 2019; Pascual et al., 2017). In this class of value-bases, there is neither a sole focus on nature's instrumental value nor its inherent value. Instead, the emphasis is better characterized as focusing on nature as a member of the same community as humanity (Neuteleers, 2020; O'Connor & Kenter, 2019; Pascual et al., 2017). For example, within the Land Ethic (Leopold, 1949), nature is given the same status and consideration as any other community member, resulting in greater consideration of nature's wellbeing and the influence that nature and the land have on other community members. In other words, nature is viewed as both important and as a co-creator of the community.

Paralleling philosophical debates, environmental psychology has

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dedicated much research to measuring and testing differential effects of different environmental value-bases (e.g., Schultz, 2001; Schultz et al., 2005) and has historically distinguished between two types of environmental values: those that are based upon anthropocentrism (i.e., valuing nature for its utility to people) versus those that are based upon biocentrism (i.e., valuing nature for its own sake; De Groot & Steg, 2008; Schultz & Zelezny, 1999). However, environmental psychology has yet to turn its focus to environmental values that are based upon valuing nature as part of the community, despite the appearance of such value-bases in philosophical discussions regarding valuing nature (e.g., The Land Ethic, Leopold, 1949) and as part of lived practices in many cultures across the globe (Coscieme et al., 2020; Diaz et al., 2015; Pascual et al., 2017). Therefore, there is a need for environmental psychology to broaden its focus to include valuing nature as community in its investigations regarding which value-basis most effectively promotes pro-environmental outcomes.

Ultimately, our understanding of the pro-environmental consequences associated with different value-bases remains incomplete due to environmental psychology's neglect of nature as community. Thus, the primary purpose of the present research was to remedy the neglect of nature as community and to test whether this perspective contributes to our understanding of different motives for pro-environmental actions. Additionally, our understanding of the pro-environmental consequences of the value-bases that *have* been studied remains unclear; despite longstanding investigations into the effects of anthropocentrism versus biocentrism, there remains uncertainty about whether all value-bases predict pro-environmental outcomes equally well and in the direction of the associations (e.g., Schultz, 2001 vs. Joireman et al., 2001). Thus, we also sought to clarify our understanding of the associations between prominent value-bases and pro-environmental outcomes. More specifically, this study sought to (1) create scales that adequately measure endorsements of all three prominent environmental value-bases and (2) subsequently test whether these value-bases are differentially associated with environmentally (un)desirable outcomes.

2. Conceptual perspectives on valuing nature

Recent qualitative scholarly work has highlighted several meaningfully distinct value-bases for valuing nature (e.g., Pascual et al., 2017; Diaz et al., 2015; see also O'Connor & Kenter, 2019; Neuteleers, 2020). Specifically, three underlying reasons for valuing nature stand out (Pascual et al., 2017): (1) Valuing nature for anthropocentric or instrumental reasons (e.g., Enlightened self-interest, Leopold; 1949; Egoistic, Schultz, 2001), (2) valuing nature for biocentric or intrinsic reasons (e.g., Rights of Nature, Global Alliance for the Rights of Nature [GARN], 2017; Biospheric, Schultz, 2001), and (3) valuing nature for relational or community-oriented reasons (e.g., The Land Ethic, Leopold, 1949; see also O'Connor & Kenter, 2019; Neuteleers, 2020).

These three value-bases differ in the underlying reasons serving as the *basis* for valuing the environment (see Pascual et al., 2017; Diaz et al., 2015), hence our use of the phrase environmental value-basis. Many conceptual writings touch upon these three values-bases (e.g., Pascual et al., 2017; Diaz et al., 2015; see O'Connor & Kenter, 2019, or Neuteleers, 2020). Each scholarly perspective has its points of nuance, and each draws slightly different boundaries among value-bases. Our goal here is neither to definitively demarcate which *specific* reason for valuing nature belongs in which category nor to deliberate which of the many conceptual perspectives is most sound. Instead, our goal is to give due attention to the three broad categories of value-bases that have emerged from these perspectives and to specifically incorporate nature-*as*-community into psychological research.

Nature for People (N4P). One of the most intuitive underlying reasons individuals value the natural environment is because nature benefits oneself and, by extension, humans (e.g., food, energy, and materials provided by nature). Put more plainly, these are *self-* or *human-focused* value-bases, where nature is valued based on the benefits of nature *for people* (N4P hereafter). The notion of human-centered or self-centered concern for nature has featured prominently in philosophical writings (e.g., Leopold, 1949). N4P-based ethics drove the utilitarian conservation movement, which emerged in the late 19th and early 20th centuries. Forebears of this movement valued the resources that nature provided and advocated conserving them so that humans could continue using them for centuries to come (see Merchant, 2004). Additionally, Aldo Leopold (1949) referred to value-bases focusing on people as 'enlightened self-interest'; that is, caring about nature for reasons that can be traced back to self-interest. More broadly, enlightened self-interest, egoistic concern, and other related perspectives are consistent with valuing N4P. Ultimately, N4P is essentially anthropocentric, placing an almost sole emphasis on nature's instrumental value for people.

The utility of such a perspective has been long debated. For example, Leopold (1949) argued that contemporary conservation efforts relied solely upon a framework of *enlightened self-interest.* He argued that such reliance would not result in the changes in humans' treatment of the environment necessary to live in harmony with nature. More recently, environmental philosophers have questioned the efficacy of "enlightened anthropocentrism" and conservation through nature commodification (Keulartz, 2012). Additionally, as noted at the outset of this paper, many critiques of ecosystem services-based rhetoric stem from its apparent sole emphasis on nature's instrumental value to people (see Schröter et al., 2014; see also O'Connor & Kenter, 2019). Finally, environmental psychologists have theorized that concern for nature rooted in concern for the impacts of environmental problems on oneself—egoistic concern—would only ever lead to protecting oneself and not nature (Schultz, 2002). Thus, the wisdom of years of philosophizing on the subject suggests that N4P might not be an environmentally desirable value-basis.

Despite this longstanding wisdom, it is worth noting that many strongly defend ecosystem-services rhetoric on the more pragmatic grounds that it is essential to appeal to instrumental sensibilities (Batavia & Nelson, 2017). Such support suggests a prevailing belief that recognizing the instrumental value of nature, as represented by N4P, has utility. The evident conflict between the philosophical and pragmatic perspectives makes a strong case for the necessity of *thorough* empirical investigations of the effects of N4P value-bases on pro-environmental outcomes.

Nature for Nature (N4N). At the other end of the environmental-value-bases spectrum lies one alternative to N4P. Instead of caring about the environment because of its impact on humans, other reasons for valuing nature involve caring about nature for nature's own sake (e.g., Animal welfare/rights; Pascual et al., 2017; Diaz et al., 2015). In other words, *nature-focused* value-bases where nature's wellbeing is valued *for nature* (N4N hereafter). This perspective is at the core of the "rights of nature" movements (GARN, 2017). Under the rights of nature—and other nature-for-nature's-sake value-bases—nature's wellbeing is seen as deserving of consideration purely because nature has the right to be protected (GARN, 2017). The general logic is, much in the same way humans have inherent value—and, therefore, should not be harmed nor treated as a means to an end (Kant, 2002)—nature too should not be harmed nor treated as a means to an end because *it* has inherent value independent of the instrumental value it has for humans (Batavia & Nelson, 2017).

Further, this inherent-value-based reason for valuing nature is the foundation of the preservation movement of the late 19th and early 20th centuries, where naturalists such as Muir, Thoreau, and Emerson sought to preserve wild nature for its *inherent* value (see Merchant, 2004 for a history of the movement). Echoing these beliefs, early psychological theories (e.g., Schultz, 2002) also posited that concern about environmental problems for nature's sake—biospheric concern—should be the more environmentally desirable perspective. Ultimately, the rights of nature and biospheric concern reflect forms of N4N in that they are biocentric, placing an almost sole emphasis on the inherent value of

nature.

Notably, such N4N perspectives are not without critique. On a philosophical level, sole reliance on N4N may lead to the exclusion of humans from nature to preserve an idealized 'pure' nature or wilderness (Cronon, 1998; Taylor, 2017). The ideal of pristine wilderness and nature protected from humans reifies divisions between humans and nature, which can invalidate and erase the experiences of those who live in harmony with nature (Taylor, 2017; Langton, 1996). On a practical level, some scholars critique a N4N perspective due to a belief that messages relying on the intrinsic value of nature have been largely ineffective (although some have challenged the moral validity of such critiques; see Batavia & Nelson, 2017).

These the arguments for and against N4N and N4P currently pit a noble but ostensibly ineffective value-basis (i.e., N4N) against an ignoble but ostensibly effective value-basis (i.e., N4P; see Batavia & Nelson, 2017). In other words, N4N versus N4P is presented as a trade-off between moral high ground at the cost of efficacy. However, as highlighted in the next section, this may be a false dichotomy. Nature as community (NAC) might not suffer from the ostensible unpalatability of a value-basis that ignores the pragmatic reality of nature's utility to people (i.e., N4N) and might not be plagued with the moral qualms that accompany a *solely* anthropocentric perspective (i.e., N4P).

Nature as Community (NAC). NAC explicitly recognizes the relationship between humans and nature (Diaz et al., 2015; Neuteleers, 2020; O'Connor & Kenter, 2019; Pascual et al., 2017) and the relative irreplaceability of the products of these relationships (see O'Connor & Kenter, 2019). In the case of NAC, the focus is on interdependence and community, for example, living in harmony or balance with nature and valuing cultural identity and sense of place (Pascual et al., 2017; Diaz et al., 2015). Here the emphasis is on how our relationship and interdependence with nature impacts—and is a part of—the broader planetary collective (see Diaz et al., 2015; see also O'Connor & Kenter, 2019; Neuteleers, 2020); these are *collective-focused* value-bases where nature is valued because nature is valued *as community* (NAC hereafter).[1]

NAC is often directly raised as an alternative to N4N and N4P (see Neuteleers, 2020). For example, in his critiques of the utility of enlightened self-interest, Leopold (1949) pushed for a transition toward an ethical framework, which he called the Land Ethic. Within this ethic, nature is viewed as a community member, not solely as a means to the end of self-interest. This perspective considers the consequences of human decisions on nature (e.g., the land), just as one would consider the consequences of one's behavior on their neighbor. It is worth noting that Leopold did not suggest that a Land Ethic precludes considerations of enlightened self-interest, a sentiment echoed in modern conceptual writings (e.g., Batavia & Nelson, 2017). In Leopold's eyes, the land ethic was not necessarily incompatible or diametrically opposed to N4P value-bases. Still, he asserted that relying on self-interest alone would not provide sufficient nor robust motivation to protect the environment and, therefore, urged the adoption of the Land Ethic. Carolyn Merchant's Partnership Ethic is another related ethic (Merchant, 2000, 2004). This ethic argues that the "greatest good for the human and nonhuman communities is in their mutual living interdependence" (Merchant, 2004, p. 223). Merchant suggests that integrating human and nonhuman communities through partnership will lead humans to make decisions that fulfill the needs of both humans and nature (Merchant, 2004). In essence, the Land Ethic, Partnership Ethic, and other community-oriented perspectives center upon the idea of NAC.

Most importantly, NAC has largely been neglected by the psychological literature, and no known studies have attempted to measure individuals' endorsements of NAC. However, two other constructs may *appear* to already capture NAC: Altruistic environmental concern and Connectedness to Nature (CtN). Yet, we argue, these constructs reflect related but distinct constructs that do not capture the essential elements of NAC as a measure of community and relational oriented reasons for valuing nature.

NAC Versus Altruistic Environmental Concern. Some constructs, such as altruistic concern from the Environmental Concern scale (Schultz, 2000), share the collective-orientation that is part of NAC but fail to capture important dimensions of NAC, such as the relational value of nature (e.g., Pascual et al., 2017). While altruistic concern is not purely self-focused, it still has an undeniable focus on people; altruistic environmental concern is still about concern *for people* and not *for nature as a member of the community*. Thus, it seems inaccurate to treat altruistic concern as capturing endorsements of NAC and might be most appropriately treated as a measure of N4P.

NAC Versus CtN. NAC might also seem to overlap with constructs assessing people's relationship with nature, such as CtN—defined as including nature in one's sense of self and the accompanying sense of oneness or unity with nature (Lengieza & Swim, 2021). Indeed, CtN shares a focus on the relationship between humans and nature (Mayer & Frantz, 2004; Nisbet & Zelenski, 2009; Schultz, 2002). Yet, only one conceptualization of CtN explicitly evokes the notion of the natural community (i.e., Mayer & Frantz, 2004).[2] Moreover, many of the items focusing on community in Mayer & Frantz's corresponding measure reflect only a basic sense that one is a part of nature but ultimately lack a focus on whether that is the reason an individual finds nature important or valuable. Thus, all major conceptualizations of CtN (e.g., Schultz, 2002; Nisbet & Zelenski, 2009) lack the focus on *valuing* nature's role in forming our culture and community that *is* found within NAC, making them poor conceptualization of values. Instead, these conceptualizations, and their corresponding measures, are focused on the inclusion of nature in one's self-concept rather than the *reasons* for *valuing* nature.

Additionally, while Mayer & Frantz's conceptualization of CtN discusses ideas of community, it is still framed squarely as a phenomenon that involves expanding one's self-concept. This framing is consistent with the other major conceptualizations of CtN (i.e., Schultz, 2002; Nisbet & Zelenski, 2009). From this, it is clear that the core emphasis consistently found across conceptualizations of CtN is the self. Additionally, it is worth noting the plausibility that one could value some target *because* it is a member of a community *without* experiencing it as a part of their sense of self. Thus, NAC fails to adequately capture an important part of CtN because it lacks a focus on nature being included in an individual's sense of self.

In sum, it is for these reasons we argue NAC and CtN are distinct. Whereas NAC focuses on *valuing* nature because it is part of our community, CtN does not. Conversely, whereas CtN focuses on nature's influence on our self-concepts, NAC does not. Thus, we contend that NAC and CtN are two distinct, if similar, constructs (this distinction is addressed empirically in Study 3).

These points regarding altruistic concern and CtN are important because they mean NAC is, indeed, missing from the psychological literature, implying that psychologists' understanding of the effects of environmental value-bases is incomplete. Thus, there is a need to incorporate NAC into psychological investigations.

NAC And The Anthropocentric-Biocentric Dichotomy. Long-standing debates about which value-basis is preferable have largely

[1] Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) identifies these three views as Nature for Society, Nature for Nature, and Nature as Culture, that align with the three ways of valuing nature that we identify (ref = https://ipbes.net/scenarios-models). However, we use nature for *people* instead of nature for *society* because it is more descriptive of the focus (i.e., people) within this value-basis. We use the term Nature as Community rather than Nature as Culture because we believe it better captures a third relational alternative to human and nature centered reasons for valuing nature. For example, nature for culture implies a benefit that nature gives to humans and aligns it with anthropocentric, N4P, reasons for valuing nature.

[2] It seems worth pointing out that community's emphasis in only one of the major conceptualizations suggests this may not be an essential part of CtN.

taken an approach that emphasizes an anthropocentrism–biocentrism dichotomy (Neuteleers, 2020). However, it is unclear how NAC maps onto this dichotomy. On the one hand, NAC might map onto the anthropocentrism–biocentrism dichotomy closer to the side of anthropocentrism. Collective-focused value-bases—especially those that emphasize the relational value of nature (see Pascual et al., 2017)—can be seen as still emphasizing anthropocentrism. That is, even if collective-focused value-bases are not strictly based upon instrumental values, they are still partially about benefits to people (making them technically anthropocentric; see O'Connor & Kenter, 2019, for elaboration on the distinction). On the other hand, NAC might fall somewhere between the two poles of anthropocentrism and biocentrism. That is, NAC may reflect a situation where our relationship with the natural environment and nature's role as a community member is recognized and valued somewhat independently of nature's role as a resource. Consequently, one of the questions guiding the present research is: *How does NAC psychologically map onto the anthropocentric–biocentric dichotomy?*

3. Summary

Nature can be valued for reasons that focus on its benefits to people (N4P), its inherent value (N4N), and its role as a contributing member of the community (NAC, Pascual et al., 2017; O'Connor & Kenter, 2019). Although drawing distinctions between the three is not always clear-cut (c.f., O'Connor & Kenter, 2019), the important takeaway is that these three value-bases are distinct enough to warrant independent treatment and consideration within environmental psychology. However, environmental psychology has not yet measured or studied NAC and its associations with pro-environmental outcomes. Our research fills this gap.

4. Empirical research on valuing nature

Valuing nature for any reason would seem to imply that one would act to protect nature. Research, however, suggests that it is important to consider the reasons for valuing nature when considering the pro-environmental effects of valuing nature (e.g., Schultz et al., 2005). Yet, this research has left out NAC as a predictor of pro-environmental outcomes; thus, predictions about the pro-environmental consequences of NAC are unclear. Moreover, while the extant research indicates that it is important to consider the underlying reasons for valuing nature, there is still considerable ambiguity in the specific pro-environmental consequences associated with the various value-bases. The following sections draw on research focusing on closely related topics (e.g., self-interested reasons for protecting nature, self-interested concern for nature, egoistic values) to inform our understanding of the broader construct they reflect (e.g., self-interest).

N4N vs. N4P. Empirical research tends to show that valuing nature for its own sake is a robust predictor of pro-environmental outcomes and potentially better than self-interested reasons for valuing nature (e.g., De Groot & Steg, 2008, 2009; Joireman et al., 2001; Schultz, 2001; Schultz et al., 2004; Schultz et al., 2005; Swim & Becker, 2012; van Riper et al., 2019). Moreover, self-interest often appears as a poor predictor of pro-environmental behavior (e.g., De Groot & Steg, 2008, 2009; Schultz, 2001; van Riper et al., 2019) and is sometimes associated with undesirable environmental outcomes (e.g., Evans et al., 2013; Schultz et al., 2004; Schultz et al., 2005; Swim & Becker, 2012). Further suggesting that N4P might be antagonistic toward pro-environmental outcomes, making financial arguments in favor of environmental protection, compared to making moral arguments—which map onto N4P and N4N, respectively—may result in less environmentally desirable outcomes (Rode et al., 2017; Bolderdijk et al., 2013). Thus, contrary to arguments in favor of highlighting instrumental ecosystem services as a means of fostering pro-environmental outcomes, N4P might be an ineffective predictor of environmentally desirable outcomes. Instead, the better predictor of pro-environmental outcomes appears to be endorsements of N4N.

However, the unfavorable prognosis for N4P is not clear-cut. Some research suggests that it may have some benefits. For example, on its own, self-interest-based reasons for protecting the environment (i.e., egoistic concern) have sometimes shown positive correlations with pro-environmental outcomes (e.g., Asah et al., 2014; Joireman et al., 2001). Further, some ecosystem services-based messages may effectively promote pro-environmental outcomes so long as they do not overtly focus on money (e.g., Goff et al., 2017). Thus, further research is still needed to compare the associations between N4P and N4N and pro-environmental outcomes.

Altruistic concern as N4P. Research evidence paints an uncertain picture of how altruistic (environmental) concern impacts environmental outcomes. In some studies, there is no relationship (Schultz, 2001; Schultz et al., 2004; Swim & Becker, 2012). In other studies, there is a negative association between altruistic concern and pro-environmental outcomes (De Groot & Steg, 2008, Study 3; Swim & Becker, 2012, German sample). And in still others, there is a positive relationship (Joireman et al., 2001; Swim & Becker, 2012, U.S. Sample). To the extent that altruistic concern—which focuses on impacts *for people*—best reflects N4P, this inconsistent pattern of effects further confuses our understanding of how N4P affects pro-environmental outcomes and how it compares to the other value-bases.

NAC vs. Other value-bases. The neglect of NAC in the quantitative literature means it is unclear whether and how NAC would predict pro-environmental outcomes. Further, it is also unclear how it would predict those outcomes directly compared to the other two value-bases. Therefore, there is a need to include NAC in research on the impacts of different environmental value-bases. Given the conflicting findings around altruistic and egoistic environmental concerns, there is also a need to clarify the empirical implications of endorsing N4N versus N4P. Together, these needs highlight the second question guiding this research: *Do N4P, N4N, and NAC differentially predict pro-environmental outcomes?*

5. Current research

The purpose of the present research was to construct measures of N4P, N4N, and NAC and investigate their association with pro-environmental outcomes in three studies approved by the university's IRB. In Study 1, after constructing and validating our measures, we investigated the environmentally relevant correlates of endorsements of these value-bases to shed light on precisely how useful (or problematic) they might be in promoting pro-environmental outcomes. In Studies 2 & 3, we confirmed the factor structure of our measures and their association with behavioral intentions (Study 2 & 3) and actual behavior (Study 3). Additionally, in Study 3, we sought to differentiate NAC from CtN.

6. Study 1

As noted above, two research questions guided Study 1. First: *How do N4P, N4N, and NAC psychologically map onto the anthropocentric–biocentric dichotomy?* We were primarily interested in how NAC was associated with anthropocentrism relative to biocentrism. On the one hand, NAC might align more closely with anthropocentrism than biocentrism, owing to the undeniable focus on people featured in NAC. On the other, NAC might act as a middle ground between anthropocentrism and biocentrism. Consequently, we regressed NAC subscales onto existing measures of anthropocentrism and biocentrism without making *a priori* predictions.

We also tested how our new measures of N4P and N4N mapped onto the anthropocentric–biocentric dichotomy. In the case of N4P and N4N, unlike NAC, the expected pattern of associations was quite clear. We expected that N4P would most uniquely be associated with anthropocentric constructs (i.e., egoistic and altruistic environmental concern

and anthropocentric desire to protect the environment). N4N, on the other hand, was predicted to be most positively associated with biocentric constructs (i.e., biospheric concern and biocentric desire to protect the environment).

Second: *Do the three value-bases differentially predict pro-environmental outcomes relative to each other?* As reviewed above, the literature has painted a picture that is both unclear and incomplete; at present, the association between pro-environmental outcomes and N4P is uncertain, and the association with NAC is absent. Therefore, research directly comparing N4P and N4N to NAC is well warranted. In addition to providing needed clarity to our understanding of the differential pro-environmental implications of N4P, N4N, and NAC, this research question also helps to further address whether N4P, N4N, and NAC represent distinct constructs. Here, if our measure of NAC is meaningfully distinct from the other two value-bases (i.e., N4P and N4N), it should predict unique variance in pro-environmental outcomes, even when accounting for endorsements of the other two value-bases. However, if NAC is not distinct, then it will account for no variance above and beyond that accounted for by N4P and N4N.

7. Method

7.1. Participants

We recruited 346 participants from an undergraduate psychology pool in exchange for course credit (see Supplemental Materials for sample size determination). We excluded (a) 2 participants whose standardized duration for the survey was greater than 3 SD from the mean, (b) 6 participants who took less than 1/3 the median time to complete the study, and (c) 16 participants who indicated identical, non-midpoint, responses on all scale items for scales with reverse coded items. After exclusions, our final sample consisted of 322 participants. The sample was majority white (77.6%) and majority female (72.5% Female), with a mean age of 19.23 years (SD = 2.45).

7.2. Materials and procedure

7.2.1. Value-bases

After providing consent, participants completed our N4P, N4N, and NAC Scales. A brief description of the item generation process can be found in the supplemental materials. The goal of each subscale was not to assess all possible elements in the category but to *sample* the content domain of the category. All items from the three scales were presented together in a randomized order and were answered using a six-point scale ranging from "Strongly Disagree" (1) to "Strongly Agree" (6). However, before conducting the CFAs, we used data-driven approaches to identify problematic items (see Supplemental Materials). As a result of this process, two reverse-coded and two cross-loaded items were dropped. Thus, the initial number of items in each scale differs from the final number in each scale.

Endorsements of Nature for People. Initially, the N4P scale had 11 items, which reflected valuing nature for instrumental reasons (e.g., "Nature is important because Humans cannot physically survive without healthy environments"). Some items related to material and regulating benefits derived from nature (e.g., "Nature is important because it provides us with food and water"), others related to supporting human health and wellbeing (e.g., "The environment is important because it ensures human wellbeing"), and still others related to the importance of nature because it benefits people in general terms (e.g., "Nature is important because it benefits humans").

Endorsements of Nature for Nature. The N4N scale was initially comprised of nine items that reflected valuing nature for its own sake (e.g., "Nature is valuable for its own sake" and "Plants and animals are important because they are parts of a flourishing ecosystem"). Some items related to the benefits nature provides to itself (e.g., "Forests are important because they provide habitats for plants and animals"), and others related to the inherent value of nature (e.g., "Ecosystems have the right to exist").

Endorsements of Nature as Community. The NAC scale was initially comprised of seven items that reflected valuing nature for nonmaterial reasons that recognized its role as a member of our culture or community (e.g., "Ecosystems are important because they are part of our community, like a neighbor".) Some items were related to nature being a member of the collective (e.g., "Ecosystems are valuable because they are part of our collective, like a family member"), and others were related to the relational value of nature (e.g., "Nature is important because of the relationships people form with it").

7.2.2. Biocentric desire to protect the environment

Following the N4P, N4N, and NAC subscales, participants completed our measure of biocentric desire to protect the environment. This scale was initially comprised of 10 items that reflected desiring to protect nature for biocentric reasons (e.g., "We should protect the planet in order to provide healthy habitats for plants and animals"). Items were presented in random order, to which participants responded using a six-point scale ranging from "Strongly Disagree" (1) to "Strongly Agree" (6). Two items, both reverse coded, did not load onto the scale in an exploratory factor analysis and were subsequently dropped (loadings <0.35). The remaining items demonstrated strong reliability (α = 0.88).

7.2.3. Anthropocentric desire to protect the environment

We also included the anthropocentrism subscale of the Environmental Attitudes Inventory (Milfont & Duckitt, 2010), which consisted of nine items reflecting a desire for conservation rooted in anthropocentric reasons (e.g., "One of the most important reasons to keep lakes and rivers clean is so that people have a place to enjoy water sports."). Items were presented in a randomized order and answered using a six-point scale ranging from "Strongly Disagree" (1) to "Strongly Agree" (6). The scale approached acceptable reliability (α = 0.69).

7.2.4. environmental concern

Participants then completed a 12-item measure of environmental concern (Schultz, 2000), which assesses three bases of concern for environmental issues: Biospheric, altruistic, and egoistic. Biospheric concern is concern rooted in the impact of the issues on the planet (i.e., "… on plants", "… on marine life", "… on birds", "… on animals".) Altruistic concern is concern rooted in the impact of the issues on other people (i.e., "… on people in my community", "… on all people", "… on children", "… on future generations"). Egoistic concern is concern rooted in the impact of the issues on oneself (i.e., "… on me", "… on my lifestyle", "… on my health", "… on my future"). Participants indicated responses using a six-point scale from "Strongly Disagree" (1) to "Strongly Agree" (6). The order of items was randomly determined. All three scales showed acceptable reliability (αs > 0.85). This scale was included to assess the unique predictive utility of our scale relative to existing, commonly used measures. These analyses can be found in the supplemental materials. Overall, our scales were not redundant with existing measures of similar constructs.

7.2.5. Behavior

Finally, participants completed a 19-item measure of pro-environmental behavior (Kaiser, Midden, & Cervinka, 2008), where they indicated their intention to engage in a range of environmental behaviors (e.g., "I intend to contribute financially to environmental organizations" or "For longer journeys (more than 6 h), I intend to avoid flying") using a six-point scale ranging from "Strongly Disagree" (1) to "Strongly Agree" (6). The scale was reliable (α = 0.89).

7.2.6. Additional measures

At the end of the survey, participants completed a series of demographic questions, including a measure of political orientation (rated from "very liberal" [−2] to "very conservative" [2]). Before providing

demographics, participants also completed several additional measures, which were part of a separate project for future planning purposes and are not reported here.

8. Results & discussion

8.1. Confirmatory factor analyses (CFA)

Although there are philosophical distinctions between N4P, N4N, and N4C, they may not be *psychologically* distinct. Therefore, we used CFA to confirm our expected three-factor structure. We conducted three CFAs to assess the fit between three possible models (see Table 1). The three-factor solution reflected the three distinct value-bases. The two-factor model tested whether N4P as its own factor was distinct from a single factor formed by N4N and NAC. We tested this combination because an EFA for a two-factor model suggested that the N4N and NAC might load together. Finally, the one-factor solution reflected the possibility that all items simply measured valuing nature for any reason.

Structural equation models were tested using robust maximum-likelihood estimation with a Satorra-Bentler correction (MLM in *lavaan*; Rosseel, 2012), and three indices were used to assess the fit of our models: The comparative fit index (CFI; values below 0.90 warrant model rejection, values above 0.95 suggest good fit; Bentler & Bonett, 1980; Hu & Bentler, 1999), standardized root mean residual (SRMR; values less than or equal to 0.08 indicate good fit; Bentler & Bonett, 1980), and root mean square error (RMSEA; values $>$ 0.10 warrant model rejection, values near 0.05 suggest good fit; Browne & Cudeck, 1992; Hu & Bentler, 1999) (see Table 5).

Chi-square difference tests indicated that the three-factor solution fit better than the two-factor solution, which fit better than the one-factor solution (see Table 1). Moreover, the three-factor solution fit well, the two-factor solution demonstrated borderline fit, and the one-factor solution did not fit well and warranted rejection. Thus, the CFA supported differentiating the items into three-value bases. Still, the three resulting subscales were highly correlated ($0.54 < rs < 0.67$; see Table 2 for correlations; see Table S1 for the items for the scales and their factor loadings in Study 1; see Table 6 for the final scale items as validated in Study 2 and 3).

8.2. Research questions

8.2.1. How do N4P, NFN, and NAC map onto the anthropocentrism–biocentrism dichotomy?

We conducted three sets of model comparisons using multivariate regressions to test how the three value-bases mapped onto the anthropocentric–biocentrism dichotomy. In each set of comparisons, a given value-basis was regressed onto three measures of anthropocentrism and two measures of biocentrism, each as a block, to determine how much unique variance in each value-basis was accounted for by each (see Table 4). In doing so, we tested how much unique variance in each value-basis was attributable to anthropocentrism and biocentrism. Statistically, we compared an augmented model containing all five measures of anthropocentrism and biocentrism as predictors of a given value-basis to a compact model containing either only biospheric concern and biocentrism or only egoistic concern, altruistic concern, and anthropocentrism as predictors using the modelCompare(.) function in R.

$$Compact\ 1: N4C \sim \beta_0 + \beta_1 Bioshper + \beta_2 Biocentr + +\beta_6 N4P + \beta_7 N4N + \varepsilon$$

$$Compact\ 2: N4C \sim \beta_0 + \beta_3 Ego + \beta_4 Altru + \beta_5 Anthro + \beta_6 N4P + \beta_7 N4N + \varepsilon$$

$$Augmented: N4C \sim \beta_0 + \beta_1 Biospher + \beta_2 Biocentr + \beta_3 Ego + \beta_4 Altru + \beta_5 Anthro + \beta_6 N4P + \beta_7 N4N + \varepsilon$$

By comparing the Augmented Model to Compact Model 1, we determined how much additional variance was accounted for by adding in the block of anthropocentric measures after partialling out the variance captured by measures of biocentrism. By comparing the Augmented Model to Compact Model 2, we determined how much additional variance was accounted for by adding in the block of biocentrism measures after partialling out the variance captured by measures of anthropocentrism. Additionally, because the three value-bases all reflect generally valuing nature, we parsed out the variance attributable to generally valuing nature for any reason by controlling for the two remaining value-bases in our analyses (see supplemental materials for a more elaborate discussion of this approach).

As reported in Table 3, measures of anthropocentrism uniquely accounted for 18.1% of the residual variance (i.e., after partialling out the variance for valuing nature, generally speaking) in N4P, $F(3,313) = 23.11$, $p < .001$. In contrast, measures of biocentrism accounted for no unique residual variance in N4P, $F(2, 313) = 0.10$, $p = .902$. Measures of anthropocentrism accounted for 5.1% of the residual variance in endorsements of N4N, $F(3, 313) = 5.66$, $p = .125$, although this was largely a negative relationship. Measures of biocentrism uniquely accounted for 12.6% of the residual variance in N4N, $F(2, 313) = 22.47$, $p < .001$.

Lastly, inconsistent with the philosophical view that NAC is anthropocentric, measures of anthropocentrism accounted for no residual variance in endorsements of NAC, $F(3, 313) = 1.23$, $p = .289$. In contrast, measures of biocentrism accounted for 14.2% of the residual variance in NAC, $F(2, 313) = 25.91$, $p < .001$. In other words, relative to the N4N and NAC, N4P had the greatest (and most positive) overlap with anthropocentrism and the least with biocentrism. Both N4N and NAC, on the other hand, were primarily associated with biocentrism. Importantly, NAC appears to be predominantly aligned with biocentrism rather than anthropocentrism.

8.2.2. Do the three value-bases differentially predict pro-environmental outcomes?

Finally, we conducted a single analysis in which we regressed behavioral intentions on demographics and the three value-bases simultaneously to test their relative ability to uniquely predict pro-environmental intentions (see Table 4; See Supplemental Materials for incremental validity relative to Schultz's environmental concern measures; the results without demographic characteristics are interpreted in the supplemental materials). Controlling for demographics, endorsements of all three value-bases collectively accounted for a moderate portion of the variance in behavioral intentions, $F(3, 311) = 23.95$, $p < .001$, $R^2 = 0.15$. NAC was a significant predictor of behavioral intentions (see Table 4). N4P and N4N, on the other hand, did not account for any unique variance in behavioral intentions. In other words, what is unique to NAC is associated with a greater desire to protect the environment.

8.2.3. Summary

Overall, Study 1 reveals important implications for the study of environmental value-bases. First, we found evidence for three distinct factors reflecting the types of value-bases people use when valuing nature: N4P, N4N, and NAC. Second, participants' subjective endorsements of NAC correlated more strongly with their endorsement of

Table 1
Confirmatory factor analyses in study 1.

Model	DF	χ^2	CFI	SRMR	RMSEA [90% CI]
3-Factor$_a$	206	381.01	0.93	0.07	0.06 [0.05, 0.69]
2-Factor$_b$	208	574.34	0.86	0.08	0.09 [0.08, 0.09]
1-Factor$_c$	209	753.33	0.78	0.09	0.11 [0.10, 0.12]

Note. Rows with different subscripts indicate significant chi-square differences tests.

Table 2
Correlations among variables measured in Study 1.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Intentions	–												
2. N4P	.19***	–											
3. N4N	.40***	.58***	–										
4. NAC	.49***	.54***	.67***	–									
5. Anthropocentrism	−.38***	.13*	−.32***	−.23***	–								
6. Biocentrism	.57***	.35***	.66***	.65***	−.52***	–							
7. Egoistic	.01	.30***	.21***	.20***	.17**	.18**	–						
8. Altruistic	.20***	.36***	.42***	.31***	−.05	.38***	.69***	–					
9. Biospheric	.39***	.37***	.62***	.50***	−.31***	.59***	.35***	.52***	–				
10. Age	.00	.06	.01	.03	−.05	−.01	−.03	.01	−.02	–			
11. Liberal	.44***	.01	.27***	.23***	−.36***	.44***	.01	.20***	.25***	−.03	–		
12. Male	−.13*	−.10†	−.16**	−.16**	.13*	−.19***	−.16**	−.14*	−.08	.02	−.07	–	
13. White	−.20***	.04	.00	−.11†	.01	.00	.13*	.06	.05	−.08	−.16**	−.10†	–

Note. ***p < .001, **p < .01, *p < .05, †p < .10.

Table 3
Unique variance in each value-basis accounted for by anthropocentrism and biocentrism.

Predictor	Outcome								
	N4P			N4N			NAC		
	B	%	p	B	%	p	B	%	p
Anthro Block	**—**	**18.1**	**< .001**	**—**	**5.1**	**< .001**	**—**	**1.2**	**.289**
egoistic	0.05	0.3	.366	−0.09	1.1	.061	0.04	0.2	.476
altruistic	0.06	0.3	.370	0.11	1.5	.033	−0.10	0.9	.091
anthropocentrism	0.35	13.6	<.001	−0.13	2.8	.003	0.04	0.2	.415
Biocentrism Block	**—**	**0.1**	**.903**	**—**	**12.6**	**< .001**	**—**	**14.2**	**< .001**
biospheric	−0.02	0.0	.790	0.22	6.9	<.001	0.06	0.4	<.001
biocentrism	0.03	0.1	.687	0.19	3.7	.001	0.39	12.7	<.001

Note. Bolded rows represent statistics for the respective block. Each row except for the two block rows reflects the output from the augmented model; Here, we used η_p^2 given that we were interested in the variance associated with a given value basis and *only* that value basis (see supplemental materials).

Table 4
Unique variance in behavioral intentions predicted by N4P, N4N, and NAC with and without controlling for demographics in Study 1.

Predictor	No Demographics			Demographics		
	B	%	p	B	%	p
N4P	−0.17	1.8	.006	0.08	0.4	.175
N4N	0.20	1.9	.005	0.11	0.6	.097
NAC	0.45	10.3	<.001	0.36	7.0	<.001
Age				−0.01	0.0	.880
Ideology				0.31	8.1	<.001
Ethnicity				−0.12	1.4	.008
Gender				−0.05	0.0	.287

Note. % reflects R^2 change from a model with all other predictors when adding a given predictor. Gender coded as Male = 1, Female = 0. Race/ethnicity coded as white = 1, not white = 0.

Table 5
Study 2 and 3 sample composition.

Ethnicity	Percentage of Sample 2	Percentage of Sample 3
Asian	7.2%	5.6%
Black	12.4%	8.3%
Hispanic/Latino	6.7%	5.6%
Native American	1.0%	0.8%
White	70.8%	75%
Biracial	0.8%	2.7%
Other	1.0%	1.3%
Gender		
Female	50.6	49.6
Male	49.4	50.1

biocentric ideas than anthropocentric ones. This pattern suggests that NAC—although *philosophically* anthropocentric—might be better aligned with biocentrism, psychologically speaking. This may lessen the concern that NAC is inadvertently promoting anthropocentrism. Lastly, our findings reveal NAC as an important and unique predictor of pro-environmental outcomes (i.e., intentions). Whereas N4P did not have a unique association with behavioral intentions and N4N's association with intentions was relatively weak, NAC showed a strong positive association with behavioral intentions above and beyond the other two measures.

9. Studies 2 & 3

Study 1 provided evidence that NAC is a distinct and important value-basis and the validity of our scale. We conducted two additional studies to (a) validate our measure with nonstudent samples (Study 2 & 3), (b) explore the overlap between NAC and currently existing measures of CtN (Study 3), and (c) test the ability of the value-bases to predict actual pro-environmental actions (Study 3). In Study 2, we recruited a demographically-representative US sample using Prolific. In Study 3, we recruited a general US Prolific. In both Studies 2 & 3, we retained the value-bases and the pro-environmental behavioral intentions measure from Study 1. However, we did not include anthropocentrism, biocentrism, or environmental concern to reduce the survey length.

10. Method

10.1. Participants

10.1.1. Studies 2 & 3

We recruited 430 participants for Study 2 and 451 participants for Study 3 from Prolific (Palan & Schitter, 2018). The Study 2 sample was selected to match the US age, sex, and ethnicity distribution. Due to

resource limitations, in Study 3, we recruited a standard sample.

We adopted improved exclusion criteria from Study 1 to be more confident of the quality of our data. Exclusions were based on: Taking too long (i.e., greater than 1.5xIQR the median time to complete the survey; Study 2: >10.25 min, n = 20; Study 3: >33.40 min, n = 35), going too slow (i.e., less than 1/3 the median time to complete the study; Study 2: <1.5 min, n = 1; Study 3: <4.5 min, n = 1), non-midpoint, responses on all scale items for scales with reverse coded items (Study 2, n = 0; Study 3 = 7), and, indicating at the end of the that they rushed, were distracted while taking the survey, or did not take the survey seriously (Study 2, n = 23; Study 3, n = 33; see Supplemental Materials for more details). After exclusions (n = 43 and n = 76), the sample sizes were 387 in Study 2 and 375 in Study 3. The samples were majority white and balanced for gender (See Table 6 for more details). Participants were older than Study 1, with Study 2 being slightly older than Study 3 (Study 2: 18 to 81, M = 45.4, SD = 15.9; Study 3: 18 to 78, M = 39.16, SD = 13.61).

10.1.2. Measures

10.1.2.1. Value-bases. ***Study 2 & 3.*** We made minor improvements to the value-bases measure. First, we better ensured that the term "humans" did not inadvertently dominate the N4P items (i.e., we changed some instances of "humans" to "people"). Second, for clarity, we changed an instance of the word "collective" to "community" and corrected two grammatical errors. Third, based on feedback from experts, we added two items to the NAC scale (i.e., "Nature is important because it is part of human spirituality" and "Nature is important because it is embedded in peoples' traditions"; see Table 6).

Across both studies, we attempted to improve the loading of the reverse-coded items on the scale (with little success) and included an additional reverse-coded item in each study to meet Prolific's exclusion protocol requirements. Specifically, in Study 2, we changed the reverse-coded item for the N4N subscale from Study 1 and added a reverse-coded item (i.e., "Nature is not important") at the end of the scale. This item was presented last in the set of items and was not intended for use in analyses. In Study 3, we replaced the generic reverse-coded item with a reverse-coded NAC item (i.e., "Nature's impact on culture is overvalued"). The reverse-coded items were ultimately only used for detecting straight-lined answers.

10.1.2.2. Connectedness to nature. ***Study 2 & 3.*** In both Study 2 & 3, we included an adapted version of Schultz's Inclusion of Nature in Self scale (INS; Sch ultz, 2002; see Lengieza & Swim, 2021) as a single-item measure of CtN (see Supplemental Materials for details). Analyses for the INS in Study 2 can be found in supplemental analyses.

Study 3. In Study 3, we included two other measures of CtN. We included Mayer and Frantz's (2004) Connectedness to Nature Scale (CNS) and Nisbet et al.'s (2009) Nature Relatedness scale. The CNS contains 14 items (e.g., "I often feel a sense of oneness with the natural world around me.") rated on a 5-point "strongly disagree" to "strongly agree" scale. To increase our confidence that the measure assessed connections to the self, we included a 15th item (i.e., "Nature is a part of my sense of self"). The scale showed strong reliability (alpha = .91), and no items, including the 15th item, would have improved reliability if dropped.

The Nature Relatedness scale is made up of three sub-dimensions: NR-self (nine items; e.g., "My relationship to nature is an important part of who I am"), NR-perspective (e.g., six items; "The state of nonhuman species is an indicator of the future for humans."), and NR-experience (e.g., six items; "I enjoy being outdoors, even in unpleasant weather."). Participants responded using a five-point ranging from "strongly disagree" to "strongly agree" (coded −2 to 2). Once again, the primary point of emphasis in the definition of CtN is the self. Thus, the subscale we were especially interested in was the NR-self subscale. The

Table 6
Factor loadings and reliabilities from the 3-factor CFA in Studies 2 & 3.

		Factor		
		N4P	N4N	NAC
Study 2	α	.88	.91	.91
	M (SD)	4.40 (.59)	4.60 (.56)	3.88 (.84)
Study 3	A	.92	.90	.91
	M (SD)	4.28 (.65)	4.45 (.66)	3.71 (0.89)

#	Item	Loadings		
1.	Nature is important because it benefits **people**	0.93 (0.97)		
2.	Plants and animals are valuable because of the benefits they provide to **people**	1.00 (1.00)		
3.	The environment is important because it ensures human wellbeing	0.85 (0.94)		
4.	Nature is valuable because it improves our quality of life	0.68 (0.84)		
5.	Biological processes in nature are valuable because they help clean water and air for people	0.75 (0.77)		
6.	Nature is important because it provides us with resources	0.79 (0.86)		
7.	Ecosystems are valuable because they contribute to modern medicine	0.70 (0.89)		
8.	Nature is important because it provides us with food and water	0.66 (0.72)		
9.	The environment has the right to flourish		1.00 $(1.00)_a$	
10.	Nature deserves to be healthy		0.78 $(0.95)_a$	
11.	Ecosystems have the right to exist		0.97 $(0.99)_a$	
12.	Nature is valuable for its own sake		0.71 $(0.85)_a$	
13.	Plants and animals are important because they are parts of a **thriving** ecosystem		1.00 $(1.00)_b$	
14.	Ecosystems are valuable because they support healthy lives for plants and animals		1.00 $(0.91)_b$	
15.	Forests are important because they provide habitats for plants and animals		0.81 $(0.78)_b$	
16.	**Giving legal rights to nature is extreme**		dropped	
17.	Ecosystems are important because they are part of our community, **like neighbors**			0.90 (0.96)
18.	Ecosystems are valuable because they are part of our **community, like family members**			0.96 (1.00)
19.	Nature is important because of the relationships people form with it			0.94 (0.96)
20.	Nature is important because it is inspirational			0.90 (0.87)
21.	Nature is important because it strengthens our community			0.83 (0.82)
22.	Plants and animals are important because they can teach **people** many lessons			1.00 (0.83)
23.	**Nature is important because it is part of human spirituality**			0.95 (0.98)
24.	**Nature is important because it is embedded in peoples' traditions**			0.88 (0.91)

Note. Bolded phrases highlight where changes to items occurred in Study 2. They were not bolded in the survey instrument. Factor loadings in parentheses are loadings from Study 3. Subscripts denote membership to the nested factors forming the primary factor for N4N. The loadings for the nested factors were 1.00 and 0.70 for factors a and b, respectively, in Study 2. In Study 3, they were 1.00 and 0.92, respectively.

overall scale (alpha = .89) and both the self (alpha = .88) and experience subscales (alpha = .81) showed strong reliability. The NR-perspective subscale, however, approached reliability (alpha = .69).

10.1.2.3. Pro-environmental behavior. ***Study 2 & 3.*** The same measure of behavioral intentions used in Study 1 was used in Study 2 and Study 3. The scale showed strong reliability in both studies (alphas = .88), and no items would have improved reliability if dropped.

Study 3. Study 3 also included the Work for Environmental Protection Task (WEPT: Lange & Dewitte, 2022) to measure actual pro-environmental behavior. When completing the WEPT, participants voluntarily completed numerical screening tasks in exchange for the research team donating money to a specified environmental organization (see Supplemental Materials for description). Inspection of the distribution of scores on the WEPT revealed that they were significantly left-skewed (i.e., most people chose not to help). Given the serious non-normality of the dependent variable, we decided to dichotomize scores on the measure to reflect "helping nature" (1) and "not helping nature" (0) and use logistic regression instead.

10.1.3. Procedure

Study 2. Participants completed measures in the following order: INS, value-bases, behavioral intentions, demographic questions, and debriefing questions used for exclusions (see Supplemental Materials). Table 7 shows the correlations between measures used in Study 2.

Study 3. The order of the value-bases measure and connectedness measures was randomized. They were followed by the two behavior measures (with the WEPT always coming last to ensure that the general level of fatigue was relatively constant prior to the task). Finally, participants completed demographics and the same exit items mentioned above. Table 8 shows the correlation between measures used in Study 3.

11. Results

11.1. Confirmatory factor analyses

Study 2 & 3. In Study 2, the initial 3-factor model outperformed the other two models (see Table 9 for fit statistics & chi-square difference tests) but demonstrated borderline fit. Upon inspection, we found that three items (i.e., items 13–15) on the N4N subscale had lower factor loadings ($0.49 > X < 0.62$), and all shared a common theme of one element of nature being important because it supports other elements of nature. Therefore, we considered a model in which N4N was comprised of two nested factors: one factor containing these three items and one containing the rest (i.e., improve 3-factor in Table 9). These changes improved the model fit significantly and brought it above fit standards. An identical pattern of results was found in Study 3 (see Table 9).

Thus, consistent with Study 1, the CFA supported differentiating the items into three-value bases (See Table 6 for loadings & means and standard deviations). As with Study 1, the three factors were highly correlated in both studies ($0.47 < rs < 0.63$), and all showed strong reliability (see Table 6).

11.2. Predicting behavioral intentions

Study 2 & 3. Having confirmed the three-factor structure, we regressed behavioral intentions onto the three scales simultaneously when controlling for demographics (see Table 10 & Table 11; see supplemental materials for the effects without demographics). Replicating Study 1, all three value bases (as a block) remained significant unique predictors of behavioral intentions and predicted a significant portion of the variance above and beyond demographics in both Study 2, $F(3, 380) = 18.57$, $p < .001$, $R^2 = 0.12$, and Study 3, $F(3, 366) = 28.50$, $p < .001$, $R^2 = 0.17$. Specifically, in both studies, when controlling for demographics and the other two value-bases, N4P was negatively, and N4N was positively, associated with behavioral intentions. Thus, these studies suggest that what is unique to N4P is associated with a *reduced* desire to protect the environment, and what is unique to N4N is associated with a greater desire to protect nature. Finally, replicating Study 1, NAC was positively associated with behavioral intentions in both studies. In other words, what is unique to NAC is associated with a greater desire to protect the environment.

11.3. Predicting actual environmental behavior

Study 3. In Study 3, we also conducted a set of logistic regressions predicting actual pro-environmental behavior from the three value-bases while controlling for demographics (see Table 12). Consistent with the other analyses reported in this paper, NAC positively predicted—and N4P negatively predicted (although this effect bordered on non-significance)—the likelihood of engaging in pro-environmental behavior when controlling for the other two value-bases. In contrast to the analyses using behavioral intentions, N4N was not a significant predictor of actual pro-environmental behavior. Thus, once again, NAC was a uniquely positive predictor and N4P was a uniquely negative predictor of pro-environmental outcomes.

11.4. Differentiating CtN from NAC

Finally, in Study 3, we tested the possible overlap between CtN and the *unique* variance in NAC. To simplify analyses and to avoid placing CtN at a disadvantage by forcing it into an overly complex factor structure, we focused on the CNS and NR-self subscale (rather than the full NR scale).

We assessed five nested models to confirm that NAC and CtN were distinct constructs: First, items from the CNS, NR, and NAC scales were loaded on a single factor ("1-Factor"). Second, we tested three 2-factor models where one factor was formed by a given measure by itself and the other factor was formed by the two remaining measures combined ("NAC-alone", "CNS-alone", "NR-alone"). These three 2-factor models were primarily used to confirm that the biggest improvement in fit was produced by separating measures of CtN from NAC. Third, a three-factor model was tested in which items from each scale were loaded on their own factor ("3-factor").

As demonstrated in Table 13, there was little evidence that NAC and

Table 7
Correlations among variables measured in Study 2.

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Intentions	–								
2. N4P	.00	–							
3. N4N	.30***	.47***	–						
4. NAC	.29***	.58***	.57***	–					
5. INS	.34***	.21***	.25***	.37***	–				
6. Age	.01	.00	−.05	−.07	.15**	–			
7. Liberal	.32***	−.04	.23***	.10†	.01	−.22***	–		
8. Male	−.01	.01	−.10†	−.09†	−.02	−.02	.03	–	
9. White	−.06	.05	.06	−.01	.13**	.10*	−.01	−.00	–

Note. ***p < .001, **p < .01, *p < .05, †p < .10.

Table 8
Correlations among variables measured in Study 3.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Behavior	–												
2. Intentions	.24***	–											
3. N4P	−.02	.11*	–										
4. N4N	.09†	.33***	.55***	–									
5. NAC	.13*	.39***	.54***	.63***	–								
6. INS	.08	.43***	.17***	.33***	.47***	–							
7. CNS	.16†	.49***	.21***	.50***	.63***	.73***	–						
8. NR-total	.19*	.55***	.24***	.58***	.61***	.71***	.84***	–					
9. NR-s	.19*	.55***	.24***	.53***	.65***	.73***	.87***	.93***	–				
10. Age	−.06	−.04	.03	−.01	−.02	.15**	.12*	.17**	.14**	–			
11. Liberal	.13*	.32***	.08	.24***	.09†	.10†	.15**	.17***	.15**	−.14**	–		
12. Male	−.01	.09†	.06	−.11*	.01	.08	−.06	−.04	−.08	−.10†	−.09†	–	
13. White	−.03	−.08	−.03	.08	.01	.02	.02	.06	.02	.23***	−.02	−.00	–

Note. ***p < .001, **p < .01, *p < .05, †p < .10.

Table 9
Confirmatory factor analyses in studies 2 & 3.

Model	DF	χ^2	CFI	SRMR	RMSEA [90% CI]
Study 2					
Improved 3-Factor$_a$	225	533.35	0.91	0.08	0.08 [0.07, 0.08]
3-Factor$_b$	227	646.88	0.88	0.08	0.09 [0.08, 0.10]
2-Factor$_c$	229	1046.72	0.75	0.10	0.12 [0.12, 0.13]
1-Factor$_d$	230	1278.967	0.65	0.12	0.15 [0.14, 0.15]
Study 3					
Improved 3-Factor$_a$	225	575.98	0.90	0.07	0.08 [0.07, 0.09]
3-Factor$_b$	227	647.74	0.88	0.07	0.09 [0.08, 0.10]
2-Factor$_c$	229	1022.49	0.78	0.09	0.12 [0.11, 0.13]
1-Factor$_d$	230	1348.52	0.67	0.11	0.15 [0.14, 0.16]

Note. Rows with different subscripts indicate significant chi-square differences tests.

Table 10
Unique variance in behavioral intentions predicted by N4P, N4N, and NAC with and without controlling for demographics in Study 2.

Predictor	No Demographics			Demographics		
	B	%	p	B	%	p
N4P	−0.30	5.6	<.001	−0.25	3.8	<.001
N4N	0.26	4.3	<.001	0.20	2.2	.001
NAC	0.31	5.2	<.001	0.30	5.0	<.001
Age				0.10	1.1	.022
Ideology				0.25	5.6	<.001
Ethnicity				−0.06	0.4	.166
Gender				−0.03	0.1	.458

Note. % reflects R^2 change from a model with all other predictors when adding a given predictor. Gender coded as Male = 1, Female = 0. Race/ethnicity coded as white = 1, not white = 0.

Table 11
Unique variance in behavioral intentions predicted by N4P, N4N, and NAC with and without controlling for demographics in Study 3.

Predictor	No Demographics			Demographics		
	B	%	p	B	%	p
N4P	−0.20	2.6	.001	−0.22	3.1	<.001
N4N	0.22	2.5	.001	0.18	1.6	.004
NAC	0.36	7.2	<.001	0.37	7.4	<.001
Age				0.05	0.3	.240
Ideology				0.28	7.2	<.001
Ethnicity				−0.11	0.1	.017
Gender				0.15	0.1	.001

Note. % reflects R^2 change from a model with all other predictors when adding a given predictor. Gender coded as Male = 1, Female = 0. Race/ethnicity coded as white = 1, not white = 0.

Table 12
Logistic regressions predicting actual environmental behavior from N4P, N4N, and NAC with and without controlling for demographics in Study 3.

Predictor	No Demographics		Demographics	
	B	p	B	p
N4P	−0.30	.035	−0.28	.0496
N4N	0.16	.286	0.10	.542
NAC	0.32	.028	0.32	.027
Age			−0.05	.600
Ideology			0.23	.038
Ethnicity			−0.06	.589
Gender			0.01	.910

Note. % reflects R squared change from a model with all other predictors when adding a given predictor. Gender coded as Male = 1, Female = 0. Race/ethnicity coded as white = 1, not white = 0.

Table 13
Confirmatory factor analyses differentiating NAC from CtN in study 3.

Model	DF	χ^2	CFI	SRMR	RMSEA [90% CI]
1-Factor$_a$	464	1687.73	0.78	0.08	0.10 [0.09, 0.10]
NAC-alone$_b$	463	1115.26	0.88	0.06	0.07 [0.06, 0.08]
CNS-alone$_b$	463	1543.41	0.80	0.08	0.09 [0.08, 0.09]
NR-alone$_b$	463	1652.94	0.78	0.08	0.09 [0.09, 0.10]
3-Factor$_c$	461	1082.15	0.89	0.06	0.07 [0.06, 0.07]

Note. Rows with different subscripts indicate significant chi-square differences tests.
Note. The same pattern of results was found when INS was included in the models as an additional indicator of CNS.
Note. The three two-factor models were not compared to each other (because they had the same DFs).

CtN are the same constructs. The chi-square difference tests indicated that all three models differed from each other. The 1-factor model had the worst fit and had poor fit indices, providing little support for NAC and CtN tapping the same underlying construct. All 2-factor models provided statistically significant improvements in fit over the 1-factor model. Notably, in the comparisons between the 1-factor and 2-factor models, the biggest stepwise chi-square difference was between the 1-factor model and the NAC-alone model ($\chi^2_{difference} = 1208.4$, $p < .001$). While the CNS-alone ($\chi^2_{difference} = 47.86$, $p < .001$) and the NRs-alone ($\chi^2_{difference} = 52.28$, $p < .001$) models did improve the fit, they resulted in much less dramatic improvements (and did not improve the fit up to acceptable standards).

The 3-factor model fit significantly better than all of the 2-factor models. Comparing the NAC-alone model to the 3-factor model resulted in only a modest (relatively speaking) increase in fit ($\chi^2_{difference} = 25.43$, $p < .001$). Together, the comparisons among the models suggest that the biggest improvement in the model resulted from separating NAC

from the two connectedness measures rather than from (a) differentiating either one of the two CtN measures from the other two constructs or (b) differentiating all three measures from each other (see Supplemental Analyses for additional evidence that the two constructs are distinct). This pattern provides strong evidence that NAC is distinct from CtN.

11.5. Summary

The results of Studies 2 & 3 confirm and extend key findings from Study 1. Once again, we found support for three distinct factors reflecting the basis for individuals' valuation of nature. We also found further evidence that NAC is a unique predictor of pro-environmental outcomes (i.e., intentions in both Study 2 and 3 & actual behavior in Study 3). In addition to replicating these findings from Study 1, we also found strong evidence that NAC and CtN are distinct constructs.

12. General discussion

Our findings demonstrate that NAC represents a distinct reason for valuing nature and one that uniquely contributes to predicting pro-environmental outcomes that can help protect the environment. Compared to endorsements of N4N and N4P, endorsements of NAC positively predicted a unique amount of variance in pro-environmental behavioral intentions (Study 1, 2, & 3) and actual behavior (Study 3). These results suggest that by neglecting NAC, the psychological literature on the value-bases individuals use when valuing nature has excluded an important value-basis.

12.1. Clarifying the environmental consequences of different value-bases

Ultimately, this project was born out of interest in debates about which types of value-bases should be encouraged to promote pro-environmental outcomes. Thus, it is noteworthy that our analyses show, like some research with egocentric concerns (e.g., Swim & Becker, 2012), endorsements of N4P are negatively associated with pro-environmental behavioral intentions when controlling for endorsements of the other two value-bases (Study 2 & 3; see Supplemental Materials for additional support from incremental validity analyses in Study 1). This relationship was corroborated when considering actual environmental behavior in Study 3. Thus, while endorsements of N4P were positively associated with pro-environmental intentions on their own (i.e., positive zero-order correlations), the substance unique to N4P was actually antagonistic to pro-environmental outcomes. Perhaps the positive zero-order correlation is merely driven by the effect of *any* degree of ethical value placed on the environment. However, once you dissociate valuing nature *generally* from valuing nature *for people*, you are left with a potentially problematic basis for valuing nature.

Critically, this negative relationship between N4P and pro-environmental outcomes suggests that we should, indeed, be concerned about inadvertently promoting endorsements of N4P with our rhetorical tools because they *may* work against pro-environmental outcomes (Batavia & Nelson, 2017; see; Schröter et al., 2014). Moreover, at the very least, endorsements of N4P are likely less robust predictors of desirable environmental outcomes than NAC (Study 1–3), which *positively* predicts variance in pro-environmental outcomes (i.e., both intentions and behavior) above and beyond the variance that overlaps between the three subscales (i.e., above and beyond valuing nature generally). Therefore, we may have reason to question further the practical value of attempts to increase endorsements of N4P.

It is similarly noteworthy that N4N may also be a poor candidate for intervention relative to NAC. While N4N was positively associated (Study 3 and partially supported in Study 2) with behavioral intentions—even when compared with the other two values—it does not seem to add much predictive utility above and beyond that already captured by NAC. Additionally, N4N accounted for no unique variance in actual environmental behavior. Thus, N4N may not be a robust predictor of pro-environmental outcomes—although it has a positive effect when it does predict pro-environmental outcomes.

However, this conclusion regarding the efficacy of N4N as a leverage point comes with the caveat of considering how receptive individuals may be to different value-bases. Indeed, the present studies suggest that NAC is endorsed to a lesser extent than either N4N or N4P. On the one hand, the descriptive pattern of endorsements might reflect differences in the level of exposure to rhetoric promoting some value-bases more than others. Given the over-representation of the anthro–biocentric dichotomy in environmental psychology and Western discourse, it may be that the general U.S. public is not exposed to NAC rhetoric as much as it is to N4P and N4N rhetoric. On the other hand, the descriptive pattern of endorsements might serve as a partial proxy for the American public's receptivity to such value-bases. Perhaps people are more receptive to notions of N4N and N4P than NAC. If the latter is the case, it would make recommendations to try and increase NAC somewhat less realistic. Thus, in addition to studying the environmental consequences of different value-bases, we should also begin to investigate receptivity to these value-bases as well as effective ways of promoting each value-base.

13. Implications for future research

13.1. Updating the anthropocentric–biocentric dichotomy

Although NAC, *conceptually* and *philosophically*, seems to have some roots in anthropocentric concerns (see O'Connor & Kenter, 2019)—and appears to align with N4P and anthropocentrism, on the surface—*statistically*, it is more consistent with biocentrism and N4N. Thus, the picture may not be as simple as viewing NAC as an 'in between' of N4P and N4N, and future research may wish to address the nuances of the anthro–biocentric dichotomy. Indeed, based upon this dichotomy alone, it seems that, psychologically, NAC most closely resembles N4N. Still, it is clear from our tests of the predictive utility of the three value-bases that NAC and N4N differ meaningfully, implying that there may be another dimension upon which these two value-bases differ. Consequently, future research should better attempt to situate NAC relative to N4P and N4N because it seems NAC is *not* 'equidistant' from the latter two.

Another possibility is considering whether alternative frameworks better explain how the three value-bases are situated in psychological space. For example, future research could consider whether Schwartz's (Schwartz, 1994) dimensions of self-enhancement (likely mapping onto N4P) and self-transcendence (likely mapping onto N4N and NAC) can capture both the distinctions *and* overlaps between the three value-bases. At the very least, the anthro–biocentrism dichotomy's inability to explain the difference between NAC and N4N suggests that debates about the utility of rhetorical tools—which currently appear to place the most emphasis on *this* philosophical dichotomy—may benefit from greater nuance.

13.2. Investigating the mechanism underlying differential associations

Future research should better investigate the root cause of differences between these three value-bases in their ability to predict behavior. On one side, particular attention should be paid to understanding the *psychological* differences between NAC and N4P, especially regarding underlying mechanisms. For example, what underlying mechanism might explain the obvious differences in associations between pro-environmental behavior and N4P versus NAC despite their conceptual overlap?

One possibility is that the difference between NAC and N4P comes down to the 'replaceability' of nature. 'Replaceability' is a subtle but important point of philosophical distinction between the anthropocentrism–biocentrism dichotomy and the instrumental–intrinsic dichotomy (see O'Connor & Kenter, 2019). Things are only truly labeled

instrumentally valuable if they are viewed as a substitutable means to a human end (a label applicable to N4P but not NAC). In contrast, something is labeled as anthropocentric if it emphasizes any benefit to humans, even if that benefit is recognized as un-substitutable (a label applicable to both N4P and NAC; O'Connor & Kenter, 2019). Thus, because the relational values within NAC emphasize human-focused benefits, they *are* appropriately labeled anthropocentric. However, from this view, NAC is *not* instrumental because the community and relational benefits are, in many ways, irreplaceable (see Neuteleers, 2020; O'Connor & Kenter, 2019).

To the extent that the benefits to humans focused on in NAC are not replaceable, this non-replaceability of nature might contribute to the positive association between NAC and pro-environmental outcomes. In other words, the difference between NAC and N4P may relate more to instrumentality than anthropocentrism. Differences in perceived replaceability, however, are simply an example of one possible mechanism to study when elucidating the underlying reason for differences between the three value-bases. Yet, as an example, it highlights that future research should carefully consider the mechanisms underlying these differential effects.

Future research should also pay close attention to understanding differences between NAC and N4N. NAC and N4N appear to share conceptual similarities but have unique effects. Namely, with both types of value-bases, there is an underlying assumption that natural entities deserve some *default* level of ethical consideration—in N4N, it is because nature is inherently valuable; in NAC, it is because nature is part of the community. Still, NAC was a stronger predictor of behavioral intentions than N4N. Because NAC involves a greater acknowledgment of nature being a part of a community, perhaps endorsements of NAC are *less* associated with the perception of pro-environmental behaviors as a sacrifice that solely benefits nature. N4N, on the other hand, might be associated with a perception that, while nature is owed its protection out of rights-based principle, protecting nature requires sacrifice that *is* solely for nature. In other words, relative to N4N, NAC may involve a lessened perception of zero-sum human–nature relations, which may, in turn, predict a greater willingness to engage in behavior that protects nature. Future research should investigate this and other mechanisms that may explain the differential pro-environmental associations of NAC and N4N.

13.3. Measuring other pro-environmental outcomes

One limitation of this research is that we measured a limited subset of behaviors and intentions. This limitation presents two areas to extend this research. First, different behaviors and outcomes may be associated with value-bases differently. For example, behaviors or outcomes *perceived* as primarily relevant for human health or benefit (e.g., converting urban land to solar farms) might correlate more strongly with N4P. In contrast, behaviors or outcomes *perceived* as primarily relevant for nature's health or benefit (e.g., creating newly protected lands) might correlate more strongly with N4N. Thus, future research should consider a broader range of pro-environmental outcomes.

14. Broader implications

Dismantling the dichotomy of N4P and N4N by including, and measuring, NAC is an essential step in acknowledging the diversity of ways people relate to and think about the environment. Past psychological research on environmental value-bases, which focused on N4P or N4N, had not adequately included many people around the globe who consider themselves to be in communion with nature (e.g., Indigenous communities; see Diaz et al., 2015; & Pascual et al., 2017). Further work, both conceptual and empirical, should be done to include a diverse range of worldviews to enrich the study of environmental phenomena. For example, research using Indigenous epistemologies and methodologies can provide nuanced and cultural ways of knowing to better address the complexity of peoples' environmental beliefs, attitudes, and worldviews (Medin & Bang, 2014). As the world grapples with various environmental threats, recognizing and making space for other ways of relating to and thinking about nature can impact our understanding of how to promote a more sustainable world.

15. Conclusion

While correlated with N4P and N4N, NAC represents a distinct reason for valuing nature, one that is not captured by other common constructs in the literature (e.g., CtN). Endorsements of NAC uniquely predict intentions to engage in pro-environmental behaviors above and beyond endorsements of N4P and N4N, as well as above and beyond demographics. Additionally, NAC uniquely predicted actual pro-environmental behavior. Thus, considering NAC in future research will help us better explain pro-environmental behavior and should be given more attention. In giving due attention to neglected reasons for valuing nature, we have a more complete understanding of how environmental value-bases relate to pro-environmental outcomes.

Author statement

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvp.2023.102127.

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