



## Capturing multiple values of ecosystem services shaped by environmental worldviews: A spatial analysis



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### ABSTRACT

Two related approaches to valuing nature have been advanced in past research including the study of ecosystem services and psychological investigations of the factors that shape behavior. Stronger integration of the insights that emerge from these two lines of enquiry can more effectively sustain ecosystems, economies, and human well-being. Drawing on survey data collected from outdoor recreationists on Santa Cruz Island within Channel Islands National Park, U.S., our study blends these two research approaches to examine a range of tangible and intangible values of ecosystem services provided to stakeholders with differing biocentric and anthropocentric worldviews. We used Public Participation Geographic Information System methods to collect survey data and a Social Values for Ecosystem Services mapping application to spatially analyze a range of values assigned to terrestrial and aquatic ecosystems in the park. Our results showed that preferences for the provision of biological diversity, recreation, and scientific-based values of ecosystem services varied across a spatial gradient. We also observed differences that emerged from a comparison between survey subgroups defined by their worldviews. The implications emanating from this investigation aim to support environmental management decision-making in the context of protected areas.

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### 1. Introduction

How can we better articulate and understand multiple values of nature? This question has attracted considerable research attention in the social and behavioral sciences. Previous investigations have indicated that tangible and, at times, monetized values of nature can maintain traction in political arenas and create meaningful opportunities to examine tradeoffs among competing “ecosystem services,” defined as the direct and indirect benefits (e.g., clean air, flood control, timber, recreation) that nature provides to people (Costanza et al., 1997; Daily, 1997; de Groot et al., 2002; MEA, 2005). Although compelling evidence of ecological and economic values has been gathered to demonstrate the implications of changing social-ecological conditions, a growing body of research has called for broader conceptions of value encompassing ethical imperatives and expressions of the nonmaterial qualities of nature (Chan et al., 2012; Cordell et al.,

2005; Daniel et al., 2012; Martín-López et al., 2012; Raymond et al., 2009). Specifically, insights on behavioral antecedents (e.g., value orientations, worldviews, belief structures) are rarely incorporated in the study of ecosystem services despite their ability to help explain why valuation occurs and reveal the complexities of human behaviors that benefit the environment (Kumar and Kumar, 2008; Turaga et al., 2010).

In this paper we call for stronger integration among disciplines that espouse value-related concepts to help ensure that policy outcomes are not rendered unsuccessful. Information about psychological processes can be harnessed to better understand external (e.g., markets) and internal factors (e.g., dispositions) that confound decision-making (Guagnano et al., 1995), as well as complement a well-established bridge between economics and ecology. Multiple values – especially those extending beyond the assumptions of rational choice theory – influence the implementation process and carry potential to ensure science is successfully incorporated in management activities (Knight et al., 2008; Pressman and Wildavsky, 1984). Social science scholarship must establish a more inclusive posture toward integrating concepts from psychology, economics, and ecology to enhance

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management decisions about resource allocation. Given broader representation of multiple values in decision-making, agencies will be better positioned to: (a) negotiate consensus-based outcomes and create space for trust to be developed in scientific expertise (Brown, 2009); (b) ensure more equitable and transparent policy-making (Bridge and Perreault, 2009); and (c) encourage greater compliance with rules and regulations among the individuals most affected by policy change (Ban et al., 2013; McCook et al., 2010; Sutton and Tobin, 2009).

Past research has called attention to tiers of the value concept that range from core belief structures processed on an individual basis to more reflective and interactive place-based values (Brown, 1984; Manning et al., 1999; McIntyre et al., 2008; Sabatier, 1988; Schroeder, 2013). Extending this line of enquiry, we empirically analyzed two different forms of value across spatial scales to reveal variation in stakeholder interests that may otherwise be marginalized in environmental planning and management. Specifically, we investigated “held” environmental value orientations that ranged from biocentric (i.e., nature-based) to anthropocentric (i.e., human-based) worldviews and “assigned” values of ecosystem services that were mapped by survey respondents via Public Participation Geographic Information Systems (PPGIS) methods (Sieber, 2006). We also used a Social Values for Ecosystem Services (SolVES) analysis tool (Sherrouse et al., 2011) to spatially analyze assigned value patterns reported by subgroups with differing worldviews, and in turn, identify high priority locations within the terrestrial and aquatic ecosystems of our study area. Thus, the purpose of this paper was to determine how worldviews gave rise to different preferences for tangible and intangible values of ecosystem services across spatial scales. In the following subsections we elaborate on our definition of value, review methods for examining this concept, and situate our investigation in the context of parks and protected areas. Finally, we present the research objectives that guided this study of outdoor recreationists visiting Channel Islands National Park.

## 2. Literature review

### 2.1. Conceptualizing value

Our conceptualization of value is adapted from research that distinguishes between held and assigned values (Brown, 1984). A held value is defined as “an enduring belief that a particular mode of conduct or that a particular end-state of existence is personally and socially preferable” (Rokeach, 1973, p550). This form of value reflects the most basic elements of cognition that facilitate preferences and induce action. For example, Norlund and Garvill (2002) tested a path model of held values and other factors that shaped behavior reported by a sample of Swedish residents. In this study, held values were correlated with beliefs and norms that anteceded action. The authors examined the general and environmental held values of self enhancement and anthropocentrism (i.e., concern for individual interests and human welfare), as well as self transcendence and biocentrism (i.e., concern for all life forms beyond the self). Along similar lines, other scholars have argued that held values play a significant role in attitude formation and influence less stable psychological processes such as place-based preferences for resource conditions (De Groot and Steg, 2010; Schultz and Zelezny, 1999; Vaske and Donnelly, 1999).

Assigned values are defined as the perceived qualities of an environment that provide material and nonmaterial benefits to people (Bengston and Xu, 1995; Rolston, 1988; Zube, 1987). Investigations of assigned value have shown that these place-based preferences can be mapped using GIS and rated in relation to one another (Seymour et al., 2010). As such, tradeoffs among competing

assigned values of ecosystem services can be examined across spatial scales. Past research has related assigned value typologies to categories of the MEA (2005) to further solidify the linkage between assigned values research often explored under the rubric of PPGIS methods and the ecosystem services literature (Brown, 2013; Brown et al., 2012). For example, Sherrouse et al. (2011) linked a series of spatially-anchored ecosystem service values to a suite of biophysical metrics (e.g., distance to roads, elevation) that reflected natural resource conditions in Colorado’s Pike and San Isabel National Forests. Van Riper et al. (2012) also mapped a suite of material and nonmaterial qualities ascribed to places on Hinchinbrook Island National Park, Australia. These past studies have demonstrated that the perceived benefits of environments that support outdoor recreation activities can be mapped across a spatial gradient and conceptualized as distinct processes from held environmental value orientations that encompass biocentric and anthropocentric worldviews.

A rich theoretical foundation underpins the argument that there are multiple values of nature. A class of social psychological theories that guide the study of environmental attitudes, for instance, provides a formal basis to show that held values shape attitudes and less stable psychological processes such as assigned values, which in turn influence human behavior (Dietz et al., 2005; Schwartz, 1992). Stern et al. (1999) developed the value belief norm theory, which indicated that overt responses to feelings of moral obligation could be expected when positively influenced by values beyond self-interest and belief structures such as environmental worldviews. Vaske and Donnelly (1999) also tested a series of psychological processes organized into a cognitive hierarchy model that predicted behavioral intentions reported by Colorado residents. Literature in political science (e.g., Sabatier, 2007) and environmental ethics (e.g., Callicott, 1984) offer parallel arguments about the need for pluralism in the study of value. For example, the advocacy coalition framework of policy change developed by Sabatier (1988) argued that individual decision-making was a function of multiple sources of information including shared beliefs and external events. From the aforementioned lines of research, a multifaceted conceptualization of value can be rationalized whereby broad, core belief structures lead to more specific, malleable preferences for policy outcomes.

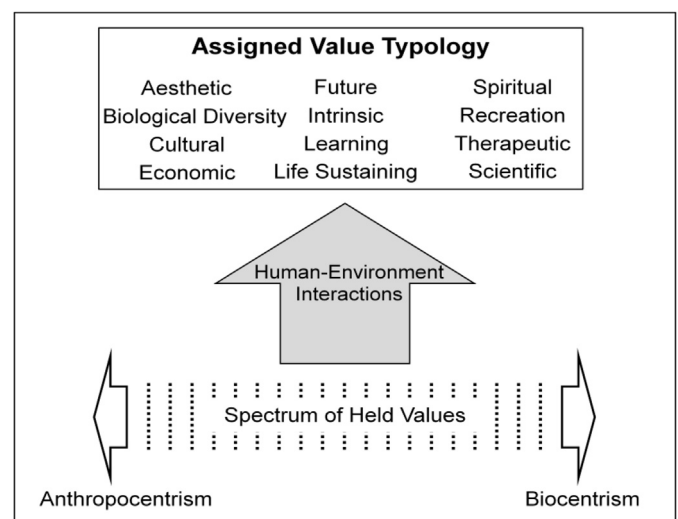


Fig. 1. Conceptual framework of the relationship between “held” values represented by a continuum ranging from anthropocentrism to biocentrism and 12 different types of “assigned” values of ecosystem services. (Adapted from Brown, 1984.)

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