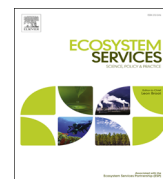




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Managing cultural ecosystem services

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ABSTRACT

Cultural ecosystem services (CES) substantially contribute to human wellbeing as the nonmaterial benefits of ecosystems. However, they remain poorly understood due to their often nonmarket and intangible nature. We analyzed management characteristics of coastal and watershed – based CES in contrast to provisioning and regulatory services from surveys of environmental managers in Hawaii. CES were the most frequently managed type of ecosystem service, a top management priority among local-scale decision-makers and nongovernmental organizations, and managed for security. However, only 10% of managers could articulate specific policies they used to manage CES. Follow-up interviews with a subset of managers further revealed that half of all CES managed were considered to benefit people beyond the spatial scale in which management decisions were made. Identifying management characteristics of CES will inform the development of indicators to monitor changes in CES, and develop policies that maintain the relationship between ecosystem function, CES and human wellbeing.

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1. Introduction

Increasing human population and subsequent alteration of ecosystems has greatly diminished the ability of the environment to provide the goods and services on which human communities depend (Vitousek et al., 1997). Consequently, environmental decision-makers are forced to balance difficult tradeoffs between societal pressures and preserving healthy ecosystem functions. The ecosystem services framework has been proposed as means to navigate these difficult decisions since it communicates, in explicit terms of feedback to human wellbeing, the costs of increasing demands on the environment (Daily, 1997).

The ecosystem services framework originated in resource economics (Gómez-Baggethun et al., 2010), but more recently has been used to formally communicate the market and non-market value of ecosystems, thereby providing a framework for decision-making (Granek et al., 2010). The framework entered the mainstream in the 1990s (see Daily, 1997; Costanza et al., 1997), followed by a comprehensive revision by the Millennium Ecosystem Assessment (MEA, 2005) which extended the framework to include relationships between categories of ecosystem services (provisioning, regulatory, cultural) and categories of human wellbeing (security, basic material

for good life, health, good social relations) on a global scale. Additionally, the MEA suggested the ease by which these relationships could be sustained by socioeconomic factors and, in doing so, established a set of globally relevant hypotheses about ecosystem services, human communities, and their ability to be maintained by common policy mechanisms. Although influential in the natural and social sciences, little empirical information exists about the variation in these linkages between ecosystem services and human wellbeing at a regional scale and place-based context.

Although the MEA increased research application of the ecosystem service framework, research effort has been applied unevenly across the categories of ecosystem services (Hernández-Morcillo et al., 2013). Specifically, research pertaining to valuing and managing cultural ecosystem services (CES) – the nonmaterial benefits of ecosystems – has fallen behind regulatory and provisioning services (Vihervaara et al., 2010) because their value is difficult to assess monetarily and biophysically, they are interrelated with other services, and there are few indicators to monitor their nontangible effects on – or direct contributions to – social systems (Atkinson et al., 2012; Daniel et al., 2012). Further, like all categories of ecosystem services, CES require a human beneficiary in order to be valued. CES benefits (and their resulting value) depend upon the individual cultural context that a person is using to perceive information provided by the structure and function of an ecosystem (Braat and de Groot, 2012). Although CES remain difficult to assess and understand within a management context, they are thought to

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contribute significantly to people's quality of life (Chan et al., 2012b).

Several attempts have been made to incorporate CES into the broader framework of ecosystem service valuation which have relied on economic accounting methods such as stated (e.g., contingent valuation) or revealed preference (e.g., hedonic pricing). However, these accounting methods are only able to improve the quantification of a particular set of CES (e.g., aesthetic appreciation and recreation opportunity) (Daniel et al., 2012). Thus, current methods fail to address more experiential CES such as heritage, education, and spiritual services considered to have distinct contributions to humans beyond economic valuations (Hernández-Morcillo et al., 2013).

In recent years, new methods of stakeholder participation have facilitated important improvements in the integration of CES into the broader framework. Stakeholder participation methodology has been suggested as a way to begin teasing apart how ecosystems relate to cultural values by having stakeholders define the contribution of ecological structure and function to CES production, relative to other ecosystem services (Chan et al. 2012a; Daniel et al., 2012). As opposed to contingent valuation, deliberation-based valuation is a public process that is more suitable to CES since it evaluates these services as public goods and better reflects the social nature of the market (Wilson and Howarth, 2002). Identifying priority ecosystem services among the public may also play an important role in meeting publically defined management objectives (Chan et al., 2012a), as demonstrated by the Puget Sound Partnership's efforts to develop an ecosystem service-based watershed restoration plan with goals and priorities determined by the broader community. Through interviews with a broad range of stakeholders, Iceland et al. (2008) was able to determine the community's top five ecosystem priorities, among which recreation and existence services were prioritized, which helped inform management strategies. Overall, community involvement not only determines social values of ecosystem services and determines key ecosystem service management strategies, but may also help to generate public support to carry the plan into policy among government and nongovernmental agencies alike (Iceland et al., 2008).

Although recent advancements in the conceptual framework and modeling techniques have improved the theory and measurement of CES (see Daniel et al., 2012), questions remain about how CES relate to the communities that rely on them (Atkinson et al., 2012), especially from a management perspective. Here, we test the hypothesized relationships of the ecosystem service framework provided by the MEA to evaluate (a) what ecosystem services are prioritized for management among different types of decision-makers and decision-making organizations; (b) the relationships between these services and human wellbeing; and, (c) how these services are managed from the perspective of individual, on-the-ground environmental decision-makers. Contrasting the management of CES with other types of services may help us better understand the distinct contributions of CES to human communities and develop management plans that monitor their change over time.

2. Methods

2.1. Study area and survey design

We tested our hypotheses on the Main Hawaiian Islands (hereafter Hawaii) since the archipelago is geographically, culturally, and functionally bounded, and comprised of a diverse set of management agencies that are tasked with managing a range of ecosystem services for multiple and diverse stakeholder groups. Additionally,

Hawaii has a rich cultural history tied to unique and productive ecosystems that provide a series of cultural ecosystem services (Fig. 1). As such, other tropical islands, particularly those with strong and vibrant indigenous communities, may benefit from the results of this study. We used a survey instrument and follow-up interviews with environmental decision-makers (hereafter decision-makers) to test our hypotheses. We defined decision-makers as individuals that worked for organizations that managed, researched, monitored, made decisions about, and/or provided outreach or education about coastal or watershed ecosystem services in Hawaii. The survey contact list included a variety of job roles (e.g., scientists, managers, outreach, and education), government and nongovernment organizations (NGOs), at varying scales of management jurisdiction (e.g., state, federal, international) to represent the diversity of decision-makers currently engaged in natural resource management in Hawaii. We allowed multiple contacts within the same organization, so long as each individual worked for different departments or on distinct programs. Where possible, we specifically targeted managers and program coordinators as points of contact as they are lead decision-makers. We developed the initial contact database from a recent study of decision-makers that managed coastal areas for conservation, preservation, or restoration throughout Hawaii (Carrier et al., 2012). An additional internet search of email contacts was guided by a state agency-developed public list of management organizations in Hawaii spanning international, federal, state, county, and municipal government; NGOs, nonprofits, and professional societies; and inter-governmental NGOs and non-profit organizations in the Asia-Pacific Region.

2.2. Survey

We first administered an internet survey to address what ecosystem services were prioritized for management and why. Respondents were provided a list of 17 individual common ecosystem services (e.g., food from animals, climate regulation, recreation), which together comprised the 3 general ecosystem service categories, developed from a literature review using existing frameworks (MEA, 2005; Fisher et al., 2009). The services included in the survey were then refined through two separate focus groups with experts in ecology and resource management. We removed the supporting services category from the final list used for the survey as it is often conflated with other services (Wallace, 2007).

The internet survey included 19 questions and was administered to 274 environmental decision-makers across 83 different management institutions, both governmental and nongovernmental. The distribution of organizational jurisdiction included: 51% ($n=140$) local, county, or state, 41% federal ($n=112$) and 8% ($n=22$) international. Using a multiple email contact approach (Dillman, 2007), the survey was open for three weeks. To minimize errors of commission, respondents were permitted to skip questions (Peytchev et al., 2006). Thus, the sample size for each question varied, with a maximum of 114 responses and a minimum of 78 responses.

2.3. Follow-up interviews

We conducted follow-up telephone interviews with a self-selected sample of the internet survey respondents following the close of the survey. We contacted participants first by e-mail, followed by up to four telephone calls at random times during the workday. The telephone interview allowed respondents to clarify responses in the internet survey, and contained 25 questions intended to understand how ecosystem services priorities are managed.

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