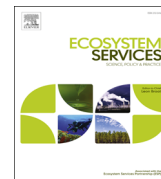




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Perception, acquisition and use of ecosystem services: Human behavior, and ecosystem management and policy implications

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ABSTRACT

Ecosystem services, fundamental to livelihoods and well-being, are reshaping environmental management and policy. However, the behavioral dimensions of ecosystem services and the responses of ordinary people to the management of those services, is less well understood. The ecosystem services framework lends itself to understanding the relationship between ecosystems and human behavior. Ecosystem services, according to the psychological theory of motivational functionalism, are motivations—the personal and social processes that initiate, direct and sustain human action. Thus, how people perceive, acquire and use ecosystem services influences the initiation, direction, and intensity of their behaviors. Profound understanding of how people perceive, acquire and use ecosystem services can help influence behavioral compliance with management and policy prescriptions. We use focus group interviewing to illustrate how ecosystem services relate to human behavior. Results show that people perceive, acquire and use indirect benefits while acquiring direct ecosystem services. Understanding indirect benefits has implications for the constitution and regulation of human behavior through ecosystem management and policy. Perceived ecosystem benefits, expressed in people's own words and from their own frames of reference, can facilitate better valuation of ecosystem services and setting of prices, compliance with ecosystem management and policy directives, recruitment and retention of ecosystem stewards, development of use policies, enhancement of user experiences, and encouragement of pro-environmental attitudes and behaviors.

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1. Introduction

Since the Millennium Ecosystem Assessment (MEA, 2005), increased recognition that ecosystem services—the benefits people gain from ecosystems—are fundamental to the global economy and human well-being has begun to reshape contemporary environmental management and policy. Ecosystem services are the building blocks of human societies and include—among many other benefits—the provision of food, fiber, medicines, and clean water; protection from flooding, storms, and pests; and cultural and spiritual well-being. A growing field of research has sprung up to address how to value and account for these services in regional and global economies and decision-making.

However, the social and behavioral dimensions of ecosystem services and the responses of ordinary people to the management of those services, are poorly understood (Kline et al., 2013). Although economic and ecological valuations of ES have received much attention (e.g., Balmford et al., 2002; Farber et al., 2002), they are not the only ways of valuing ecosystem services (Ruckelshaus et al., 2013). Some have pointed to the failure of the economic valuation of ecosystem services to capture the true range and value of the benefits people obtain from ecosystems (e.g., Kumar and Kumar, 2008). In this article, we illustrate the link between ecosystem services and human behavior. We explain the important role of understanding how human motivations to acquire and use ecosystem services may mediate people's responses to ecosystem management and policy. We present some existing work in the area, and then use an approach that allows beneficiaries to express the benefits they receive from ecosystems, and how they acquire and use those benefits, in their own words and from their own frames of reference. We chose this approach to facilitate the expression of perceived benefits such that it captures the

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contextual essence of the range and variety of benefits that people may ascribe to ecosystem services. We use a case study of interviewees from the Warm Springs Confederated Tribes in Oregon State, USA to illustrate the implications of interviewees' perceived benefits as well as mechanisms of acquisition and use for behavioral compliance with ecosystem management and policy efforts.

1.1. Human motivations, behavior, and ecosystem services

Ecosystem management is largely about managing how people claim and use ecosystem services (Gerlach and Bengston, 1994). That is, ecosystem management and policy often include the constitution and regulation of human action (Cortner and Moote, 1999). Thus, management and policy decisions prescribe what kind of persons or entities can engage in particular behaviors and to what extent. For example, fern-gathering permits on public lands often have a cost per unit harvest. Thus, the structure of fern gathering permit management and policy constitutes behavior by implying that only people who have paid a certain amount and are in possession of a valid permit can harvest ferns in a particular area. Permits also regulate behavior by stipulating that permit holders can only harvest so much and only during a certain period. Several factors motivate permit management and policy decisions. For example, harvest limits are likely based on the prospect that those limits ensure the sustainable production of ferns at acceptable levels without compromising ecosystem integrity. Behavioral compliance with permit restrictions—harvesting only if you have a permit, only so much and, sometimes, only in certain areas—is therefore a vital piece of the sustainable management of ecosystems.

The framework of ecosystem services is important for natural resource management, in part, because it lends itself to understanding the relationship between ecosystems and human behavior. Because ecosystem services are benefits, according to the psychological theory of motivational functionalism (Smith et al., 1956; Katz, 1960), they are, therefore, motivations—the personal and social processes that initiate, direct and sustain human actions toward ecosystems (Snyder, 1993). That is, the perceived benefits that people get from ecosystems are the reasons why they might likely engage (or not) in behaviors that ensure the continuous supply of desired ecosystem services. Thus, as illustrated in our previous example of fern gathering, how people perceive, acquire and use ecosystem services influences their behaviors (Clary et al., 1998).

The existence and delivery of ecosystem services motivates human behavior with important ramifications for ecosystem sustainability because deteriorating ecosystems and biodiversity loss are primarily caused by human behavior (Vitousek et al., 1997). For example, people who harvest berries, a direct provisioning service, from ecosystems are likely to engage in invasive species removal if they believe invasive species interfere with the production of berries. Conversely, berry harvesters may engage in the suppression of other social-ecologically important species if they believe that those species suppress berry production and harvest. Thus, the capacity of the ecosystem to provide a wide range of benefits beyond berries also depends on the behaviors of those who value and act toward securing the provision of berries. Hence, the desire to acquire perceived direct benefits from ecosystems may initiate, sustain, and direct behaviors that can enhance or compromise ecological integrity and ecosystem's ability to provide either a single benefit or a range of benefits in the long term. For example, intense agriculture can represent the production of food—an inarguably important service—at the expense of a number of other services that might have been provided by that land without intensification. Consequently, we need to scrutinize and understand individual and collective human behavior in order to successfully address ecosystem

deterioration and biodiversity loss (Ehrlich and Kennedy, 2005). Thus, it is critical to understand how people perceive, acquire, and use ecosystem services given the motivational functions of ecosystem services on human behavior.

The psychological theory of motivational functionalism has the potential to facilitate our understanding of, and hence enhance, behavioral compliance with ecosystem management and policy decisions. The theory proposes that the success of efforts to change attitudes [and behaviors] depends on the extent to which such efforts address the functions those attitudes and behaviors serve (Smith et al., 1956; Katz, 1960). That is, if managers want to effectively constitute and regulate certain behaviors, to effectively manage ecosystem services, they must first understand what and how people gain or lose (direct and indirect ecosystem benefits) by engaging in those behaviors. Thus, a good understanding of how people perceive the benefits derived from ecosystems is essential for the effective management of ecosystems and for the setting of effective policies that promote sustainable livelihoods and enhanced well-being. For example, if managers and policy makers aim to regulate the abundance of a particular game species, they must understand why people hunt that species. If hunting is motivated by the need for food, manipulating the cost of hunting permits to make harvesting that species economically more or less competitive than other foods may be a good management strategy to meet the goal of achieving a desired population size. However, if hunting is motivated by a desire to spend time with family and friends, and/or to maintain tradition, hunting serves more as a gateway to the acquisition of culturally relevant ecosystem services—a very different function. In this case, the manipulation of hunting permit cost may have different effects on harvesting rates and consequently on population sizes, because it may have undesirable effects on the extent to which people perceive access to the indirect cultural benefits of spending time with family and friends while hunting.

Despite the direct reliance of the effectiveness of management and policy on behavioral compliance and the strong link between ecosystem services and human actions, we know little about how people perceive, acquire and use the benefits they get from ecosystems. Consequently, we have incomplete understanding of how perception, acquisition, and use of ecosystem services might inform individual and collective behaviors. Thus, management and policy strategies for influencing such behaviors might be inadequate.

In this article, we seek to accomplish three objectives. First, we review the small body of work on people's perception of the benefits they get from ecosystems as expressed in their own words and from their own frames of reference. Second, based on field observations from interviews with Native American tribal members in Central Oregon, USA, we provide additional empirical evidence of people's self-expressed benefits of ecosystems and how they acquire and use those benefits. Then, we discuss the implications of these findings for the sustainable management of ecosystem services and the setting of effective policies that facilitate sustainable ecosystem management and enhance livelihoods and human well-being.

1.2. Perception, acquisition and use of ecosystem services

Although some ecosystem services provide a single or a limited set of benefits, many services provide multiple benefits and not all people perceive the same benefits of a given service. For example, Driver (1977) showed that people obtain several cultural benefits from nature-based recreation. Since Driver's work, several others have provided evidence supporting the notion that people are motivated to recreate in natural areas by the desire to acquire several cultural benefits. These motivations include the desires to

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