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Insight

A New Paradigm for Adaptive Management

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ABSTRACT. Uncertainty is a pervasive feature in natural resource management. Adaptive management, an approach that focuses on identifying critical uncertainties to be reduced via diagnostic management experiments, is one favored approach for tackling this reality. While adaptive management is identified as a key method in the environmental management toolbox, there remains a lack of clarity over when its use is appropriate or feasible. Its implementation is often viewed as suitable only in a limited set of circumstances. Here we restructure some of the ideas supporting this view, and show why much of the pessimism around AM may be unwarranted. We present a new framework for deciding when AM is appropriate, feasible, and subsequently successful. We thus present a new paradigm for adaptive management that shows that there are no categorical limitations to its appropriate use, the boundaries of application being defined by problem conception and the resources available to managers. In doing so we also separate adaptive management as a management tool, from the burden of failures that result from the complex policy, social, and institutional environment within which management occurs.

Key Words: *Experimental management; experimentation; management; natural resource; participation; stakeholder; uncertainty*

INTRODUCTION

Adaptive management (Holling 1978, Walters 1986) has been put forward as a way of managing natural resources in the face of uncertainty. Developed by C.S. Holling and Carl Walters, and originally termed Adaptive Environmental Assessment and Management (AEAM), this approach emphasizes the identification of critical uncertainties regarding natural resource dynamics and the design of diagnostic management experiments to reduce these uncertainties (Walters 2007). The AM process is a learning cycle that can be distilled down to six stages (Fig. 1). Aside from these six stages, Holling and Walters also emphasized participation of those outside the management institution in the process in order to manage conflict and increase the pool of contributions to potential management solutions (Holling 1978, Walters 1986). This emphasis acknowledged the broader social structure within which management is embedded and is an element of adaptive management that has continued to evolve producing related concepts emphasizing this focus (Table 1). Nevertheless, reduction of ecological uncertainty remains the key objective of AM specifically (Walters 2007), and it is this original meaning that is the focus of this paper.

Adaptive management (AM) continues to have broad appeal four decades after its first formal articulation (Holling 1978, Walters 1986). Yet despite its conceptual simplicity confusion persists about exactly what the approach entails, in which management contexts its use is appropriate, its application feasible, and the extent to which it has been applied successfully (Rist et al. 2013). Some have reported success where the management context is large, complex, and messy, while others claim the approach is most feasible in small-scale applications dealing with relatively simple management questions (Walters and Holling 1990, McConnaha and Paquet 1996, Johnson 1999, Simberloff 2009). 'Appropriateness', 'efficacy', and 'success' are just a few of the terms used, often interchangeably, when AM is evaluated (Gregory et al. 2006, McFadden et al. 2011). Additionally, what is considered to constitute 'success' differs with some authors referring to adherence to the cyclical AM process and others to reduced uncertainty. Thus, while there is little overall clarity one consistent message nevertheless emerges; AM is challenging to implement and appropriate in only a subset of natural resource management problems (Allen and Gunderson 2011).

There have been many commentaries on the 'failures' of AM, including the identification of specific barriers to its application (Moir and Block 2001, Allan and Curtis 2005, Walters 2007, Allen et al. 2011). However, given that interest in its use persists there is a need for clarification over what exactly is being referred to when discussing 'barriers' or 'failures'. Specifically, clarification is needed over three related, but distinct, aspects: 1) What dictates the appropriateness of AM as a method for reducing ecological uncertainty? (i.e., does experimentation represent a possible opportunity to improve management?). 2) What influences its feasibility (i.e., is it possible to do, given, for example, differing values and interests of actors and the complexities of the social, political, and institutional context in which management is embedded?), and 3) Is AM successful in that same context? (i.e., given that AM is both appropriate and feasible, did its application lead to reduced ecological

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