



# From land to sea: Governance-management lessons from terrestrial restoration research useful for developing and expanding social-ecological marine restoration



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## ABSTRACT

Coastal regions are complex social-ecological systems (SESs) critically important for their diverse and invaluable services for human well-being. The marked losses of these systems on a global scale has led to proposals for the protection of healthy habitats which, however, have proven to be less than completely successful, thereby necessitating the restoration of impacted habitats. Although the effective delivery of restored ecosystem services or natural capital is determined by governance and management, these important topics have only rarely been examined (and never comparatively so) in the marine literature. Because marine ecological restoration is still very much in its infancy, it is necessary to turn to terrestrial examples for guidance. The present paper reviews the wider, terrestrially-based literature that has developed on the conceptual and practical relationships of governance to ecological restoration, towards an end of importing five lessons from this experience that might prove useful for the sustainable management of marine SESs, particularly in relation to the praxis of marine social-ecological restoration. These lessons are: avoid science/engineering only; instill adaptive management; hybrid governance models work best; establish an experienced advisory committee; and put stakeholders front and centre. Recommended actions needed to adopt these lessons include: assessing the cultural modification of the restoration location; including a social scientist on the restoration team; identifying multiple stakeholders; integrating technical knowledge of experts and local wisdom of residents; and implementing flexibility in governance to facilitate project resilience.

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## 1. Introduction

“The restoration of terrestrial and freshwater systems has a long history and experience from which the estuarine and marine systems can learn”

(Elliot et al., 2007)

The concept of a productive or ‘bountiful’ ocean providing vital renewable resources for nurturing humankind is an oft-used trope in marine conservation. It is also a truism, given that up to a sixth of the world’s population derive more than a third of their animal protein from the sea (Rothschild, 1996; FAO, 2012). Furthermore, not only did our distant ancestors rely upon marine resources for sustenance, clothing, fuel, medicine, and ornaments (Rick and

Erlandson, 2008; Lotze and Worm, 2009), but the actual peopling of the planet (Erlandson et al., 2007) and, indeed, the very evolution of our species’ cognitive abilities—the ‘sapiens’ in *Homo sapiens*—(Cunnane and Stewart, 2010), depended upon food from the coastal littoral. Tallis et al.’s (2012) paper entitled “New metrics for managing and sustaining the ocean’s bounty” indicates that the concept is still in use in marine management and policy.

Today, coastal ecosystems are critically important for their diverse and invaluable services for human well-being (Costanza et al., 1997; Lotze and Glaser, 2009; Barbier, 2012). For example, seagrasses provide nursery habitat for commercially important fishes, coral reefs contribute to financially important ecotourism efforts, and rockweed supports important harvesting industries. However, the global phenomena of dramatic habitat loss of submerged aquatic vegetation and coral reefs, often as a result of eutrophication, overharvesting, or cumulative effects (Worm et al., 2006; Lotze et al., 2006; Waycott et al., 2009), pose a serious threat to the abundance and biodiversity of littoral species. Increasingly

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referred to as being in a state of ‘crisis’ (Bellwood et al., 2004; Orth et al., 2006), these ecological problems have led to proposals for the protection of healthy habitats as well as for the restoration of impacted habitats.

Because, with some notable exceptions (Roberts et al., 2001; Gill and Roberts, 2003), marine protected areas on their own have proven insufficient to prevent declines in biodiversity (Knowlton, 2012; De'ath et al., 2012; Abelson et al., 2016a), and that rates of natural recovery are too slow or impossible to reverse past perturbations (Borja et al., 2010; Lotze et al., 2011; Graham et al., 2014), marine resource managers are beginning to turn to the possibilities and potentials offered by active restoration. With this in mind, Borja (2014) recently identified the recovery of ecosystem structure and function through active restoration as being one of the “grand challenges in marine ecosystems ecology.”

As marine ecological restoration (MER) is still very much in its infancy, several practitioners of such activities have highlighted the need to turn to terrestrial examples for guidance (Carr et al., 2003; Rinkevich, 2005; Elliot et al., 2007; Van Dover et al., 2014). In terms of developing and expanding upon the theory and praxis of the emerging paradigm of ‘social-ecological marine restoration’ (*sensu* Beck, 2014; Abelson et al., 2016b), I believe a knowledge gap exists among marine resource managers with reference to the literature concerning terrestrial restoration. The purpose of the present paper is therefore to provide a land-to-sea knowledge transference in terms of providing lessons about governance-management frameworks gleaned from the terrestrial literature that will be useful for the new, rapidly evolving field of social-ecological marine restoration.

## 2. Sociological issues in marine restoration

The marine environment is recognized to be a complex social-ecological system (SES) (Wilson, 2006; Cinner et al., 2009; Pollnac et al., 2010; Kittinger et al., 2012). Issues of governance have been frequently discussed in the marine literature, as witness to several journals specializing in such. With respect to marine protected areas, for example, Heylings and Bravo (2007) heralded the benefits of developing a co-management regime based on strategic vision, participation, and consensus building, whereas Grafton and Kompas (2005) called for a governance system that uses socioeconomic criteria in the development of management goals as well as the physical design of the reserves themselves. With regard to the complexities implicit in larger-scale SESs, Norgaard et al. (2009) decried the lack of clarity from policy-makers and lawmakers concerning setting objectives and accountability. Further, he cautioned that because professionals often participate more as individuals than as representatives, the knowledge lines can be very fuzzy among different groups. Also, because adaptive management is often a better theory than it is a practice, in situations where there is a multiplicity of perspectives confounding interpretation, a cardinal need exists to strengthen interactions among scientists, policy-makers, stakeholders, and the public. In short, a narrow focus on the ecological nuts and bolts of delivering ecosystem services without due consideration of the socio-economic complexities entailed in accruing societal benefits will result in an ineffective management strategy (Atkins et al., 2011).

Despite this, consideration of the importance of sociological perspectives has been slow to be integrated into discussions about marine restoration. Instead, creation of development matrices for the adaptive management of coastal restoration projects have focused almost exclusively on technical aspects of ecological structure, with only scant and superficial discussion of the importance of goal statements in decision frameworks (Thom, 1997,

2000). Teal and Weishar (2005) and Ysebare et al. (2016), for example, are typical of the marine restoration literature in that authors' concerns about adaptive management are focused on the science products that ensue rather than on the social processes upon which those products are predicated. After more than a decade of published work on marine SESs, Duarte et al. (2015) show that it is still possible to produce a review of recovery paradigms that gives little consideration to the importance of sociology in restoration. And although Elliot et al. (2007) state that cultural perceptions may be paramount in successfully moving restoration from ecological concepts to a management framework, they too miss an opportunity to expand on the social-ecological complexities of restoration in their review.

In contrast, there are several studies that do explicitly devote attention to social-ecological issues in marine restoration. By positioning restoration within a broader framework of sustainability, Baird (2005) believes that what he terms “good” restoration practice must consider the cultural milieu of the environment, by which he means both the regulatory climate and the sociological and economic circumstances. Admitting that restoration is a young and inexact science at the time of his writing, he issued the clarion call—unfortunately for the most part ignored by many marine ecologists in the intervening years since—that cultural knowledge (i.e. the complex of socioeconomic/governance interrelationships that collectively determine societal response to environmental problems) “is often paramount to successful implementation and long-term success” in marine restoration.

For Weinstein (2008), restoration, from goal conception to product evaluation, is above all a human endeavor, such that, if we ignore the differential economic and political powers that enter into the human equation, we are unlikely to ever reach consensus governance. Marine restoration projects need be evaluated based on a combination of ecocentric and anthropocentric criteria that are proportionate to the extent of human development in the immediate region. It is necessary, the author believes, citing the work of Naveh (2005), to embed restoration activities in an ecosystem-based management framework that is trans-disciplinary in scope and which addresses the thorny issue of multiple-use objectives of stakeholders in complex SESs.

Because governance has been rarely discussed in the literature on marine restoration and is actually “non-existent for deep-sea restoration”, Van Dover et al. (2014) created a suite of decision metrics directed toward marine ecological restoration. In addition to many that deal with ecological and technological concerns, the authors list a series of socio-economic decision parameters that pertain to ecosystem benefits, governance, legalities, costs, societal pressure, financial incentives, and wider impacts such as jobs and poverty reduction.

At this juncture, given the rarity with which these issues are covered in the wider literature on coastal zones, it is necessary to step back from marine environments in particular and into the terrestrial literature that has developed on the conceptual and practical relationships of governance-management to ecological restoration.

## 3. General perspectives on governance-management in terrestrial restoration

Although there is a voluminous literature on the governance of terrestrial SESs, issues of ecological restoration, if discussed at all, are often given short shrift. Take three representative papers, for example. Kenward et al.'s (2011) survey of the governance structures of more than thirty biodiversity conservation case studies did not mention restoration. This despite growing awareness that conservation without restoration is more often than not bound

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