

Landscape Conservation Cooperatives: Bridging Entities to Facilitate Adaptive Co-Governance of Social–Ecological Systems

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To address rapidly changing and uncertain environmental and social change on large landscapes/seascapes, conservation organizations need to overcome barriers to collaboration and create governance structures that integrate ecological, biological and physical sciences with social science insight and refine decisions based on new information. Adaptive co-governance frameworks are social networks supported by diverse stakeholders that use dynamic learning to inform adaptation. Disincentives for adaptive co-governance include entrenched organizational cultures, conflicting mandates/jurisdictions, and disparate interests among stakeholders. Bridging entities can foster adaptive co-governance by providing platforms for communication, relationship building and stakeholder engagement. This article reinforces the need for institutionalization of adaptive co-governance of social–ecological systems and suggests that Landscape Conservation Cooperatives (LCCs) are bridging entities within a broader co-governance framework. LCCs, a network of conservation organizations both governmental and nongovernmental, have great potential to facilitate conservation of rapidly changing social–ecological systems by providing structure and incentives for collaboration and shared learning.

Keywords LCC, bridging organizations, adaptive co-governance, social–ecological systems, participatory process, collaboration, human dimensions

Introduction

Conservation of functional landscapes/seascapes that are beneficial to fish, wildlife, and humans is challenging and fraught with uncertainty primarily because of human-caused environmental stressors, including rapidly accelerated global climate change, habitat loss and fragmentation, invasive species, and disease (Munns Jr., 2006). To address contemporary challenges and uncertainty—particularly increasing human demand for and impact on

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natural resources—facing these landscapes and the social–ecological systems within them (Folke, Hahn, Olsson, & Norberg, 2005), the conservation community needs to broaden its conservation paradigm so it is more robust and holistic (Berkes, 2004; Jacobson, Organ, Daniel, Batcheller, & Carpenter, 2010). By adopting a collaborative and adaptive conservation framework that accounts for system complexity and uncertainty and seeks and shares information regularly to refine and coordinate conservation actions, the conservation community will be better able to maintain resilient and functional social–ecological systems on landscapes. A key first step in transforming the conservation institution (i.e., the network of conservation organizations and its shared cultural norms, values and behaviors; Jacobson et al., 2010) is broad acknowledgment that fundamental change is needed to effectively and efficiently address contemporary conservation challenges.

Although humans need to organize and segregate based on sociopolitical foundations (Aldrich & Ruef, 2006), fish, wildlife, forests, and water are not constrained by these anthropogenic boundaries nor do they operate by societal laws and rules. This is not to imply that human-designed boundaries are arbitrary, but their meanings are often tied to human constructs such as property ownership (e.g., public versus private) and political/jurisdictional factors (e.g., country/state boundaries). In large part, these boundaries are meaningless to the natural world, and their enduring and stationary nature limits our ability to adapt to rapidly changing and uncertain environmental conditions.

In addition, most natural resource organizations, particularly government entities, have clear and specific mandates based on statutory or regulatory authority. They manage or regulate land, water, air, fish and wildlife. Even those that have a diversity of roles (e.g., U.S. Fish and Wildlife Service, the Environmental Protection Agency, National Oceanic and Atmospheric Administration) are organizationally segregated. Once these structural and programmatic boundaries are in place, they become part of the organizational culture (Wilson, 2000) and can serve as barriers (e.g., our refuge, our authority, our data) to functional collaboration. Rigid organizational cultures make timely adaptation to address impacts to social–ecological systems challenging (Folke et al., 2005).

These challenges will require not only the conservation institution but a broader collection of partners—including those who are not commonly associated with conservation—to work together to overcome barriers and find common ground and innovative options for adapting to change. Chapin III et al. (2010) stress that innovation and social learning in response to changing social and economic conditions is critical to success in the business world. These adaptive measures, he notes, are not commonly used in natural resources management, and instead, emphasis is placed on reducing variability and preventing change. Unprecedented rates of change and uncertainty facing social–ecological systems (e.g., climate change, resource extraction, and development pressures), will require the conservation institution to think about conservation at larger scales (i.e., landscapes/seascapes), strive for system functionality versus stationarity (Milly et al., 2008; Zavaleta & Chapin III, 2010), and partner effectively with a diversity of entities, both traditional and nontraditional partners. Although organizations do collaborate regularly on single projects or issues, more often than not, organizational barriers prevent the most efficient and innovative use of collective resources, expertise, and knowledge (Olsson, Folke, Galaz, Hahn, & Shultz, 2007). Because many environmental stressors have landscape/seascape-level impacts, effective conservation will require close collaboration, including data and resources sharing and coordination of conservation planning and actions (Dietz, Ostrom, & Stern, 2003). Working in silos created by programs, agencies, property boundaries, organizational mandates, and funding sources is simply ineffective for the landscape-scale approach necessary to address contemporary conservation challenges. Although most conservation organizations

likely recognize the importance of meaningful, functional collaboration to achieve desired conservation outcomes, there are strong organizational disincentives (e.g., disparate and incompatible mandates, funding sources with divergent requirements, stakeholders with varying expectations) (Dietz et al., 2003). Without transformation that results in the institutionalization of a participatory, adaptive framework by the conservation institution, the conservation institution will continue to lose ground on the shared goal of maintaining healthy landscapes comprising functional and resilient ecosystems.

This article reinforces the need for participatory, adaptive governance (adaptive co-governance) of our social–ecological systems and suggests that the recently initiated Landscape Conservation Cooperatives (LCCs) can serve a key function within an adaptive conservation framework. LCCs are an international conservation network of organizational entities that facilitate adaptive co-governance by offering a much needed structure and process for analytic deliberation; refinement of perspective based on exposure to new information and social learning; coordination of information generation, conservation planning, and delivery; and leveraging of resources to improve conservation at a landscape scales. By stressing the importance of adaptive management and partnerships, LCCs seek to transcend cultural and structural boundaries that no longer serve conservation well. We discuss the role of LCCs as bridging entities that provide structure and process for integration of sociological, ecological and physical science into a deliberative and adaptive process to inform conservation of social–ecological systems. We offer conclusions to help nest this initiative within a broader adaptive co-governance framework for ensuring efficient and effective conservation of rapidly changing social–ecological systems.

Adaptive Co-Governance of Social–Ecological Systems

With the emergence of the human dimensions of natural resources field in 1970 (Decker, Brown, & Siemer, 2001), came the recognition that stakeholder input and participatory management was a key component to fish and wildlife conservation. The human dimensions field seeks to understand people's attitudes, values, interests, and behavior as it relates to natural resources conservation and incorporate that information into decision-making. For the purposes of this article, human dimensions includes stakeholder involvement in governance of natural resources or systematic social science inquiry (e.g., via survey research, focus groups).

With growing interest in landscape conservation to address contemporary challenges and the inherent complexity (e.g., scale, diversity of stakeholders) of a large-scale approach, the need for collaborative governance informed by sound social, ecological, and other sciences, is even more important (Beierle, 2002; Reed, 2008). Although some critics contend that participatory decision-making can be cost-ineffective and result in poor-quality decisions (i.e., have political but not technical merit), it has been demonstrated that, if done properly, the cumulative good—including improved and implementable decisions—can be served by strategic stakeholder engagement (Beierle, 2002). Even so, it is recognized that a one-size-fits-all approach to stakeholder engagement is insufficient to address the diversity of existing conservation challenges (Reed, 2008).

For complex social–ecological issues, particularly on landscape/seascape scales, governance processes must be inclusive, innovative, flexible (Armitage et al., 2009), and strive for ecosystem resilience versus steady-state outcomes (Folke et al., 2002). Further, they must facilitate continual integration of knowledge and foster social learning and adaptive responses. Reed et al. (2010) note that social learning is a specific outcome that should not

be confused with other possible benefits of participatory processes (e.g., relationship building, information exchange). According to the authors, social learning occurs when there are changes in understanding/perspective through interaction of stakeholders, and that change transcends beyond those who participate in the learning process. Prell, Hubacek, and Reed (2009) observe that social learning is more likely to occur among stakeholders within a social network (i.e., those who have established meaningful relations) than those who have no established ties to one another. The authors stress that social networks in which members lack strong connections, however, can provide greater diversity and expertise to a process and thereby may be more receptive to adaptation. Social learning informed by scientifically generated information and interaction among participants is the foundation of adaptive processes, and participatory processes should be designed to embrace diversity and differences of perspective in order to identify alternative actions and facilitate adaptive outcomes.

In an effort to integrate the types of social learning discussed above to expand adaptive ecosystem conservation (i.e., conservation frameworks that continually adjust actions based on dynamic learning), Dietz et al. (2003) used the term adaptive governance, an umbrella phrase for collaborative, participatory alternatives to top-down decision-making (Folke et al. 2005). According to Folke et al. (2005), adaptive governance of social-ecological systems involves continual generation and integration of knowledge; social learning and refinement of approach based on new information; flexible institutions and multilevel governance to foster shared responsibility and collaboration within a social network; and development of adaptive capacity to address uncertainty and change. Adaptive co-management is another term that emphasizes the importance of involving stakeholders in an adaptive management process. We combined the two concepts into *adaptive co-governance* to expand beyond management to include the broader meaning of governance as described in Folke et al. (2005), but also to further emphasize the importance of collaboration (“co”) among diverse groups of stakeholders. If the overall goal of adaptive co-governance is to ensure functional and resilient social-ecological systems in the face of social-ecological uncertainty, the importance of understanding and integrating information derived from social science inquiry with that generated through biological, physical, and other research into the adaptive process is imperative.

Adaptive co-governance, particularly at landscape/seascape levels, will only be effective if all relevant organizations, at all relevant levels, participate. Inherent in the process of bringing together a large group of individuals representing organizations at various levels (e.g., federal, state, local and tribal governments, nongovernmental organizations, universities, and the public) is some degree of conflict and mistrust. A coordinating or “bridging” entity is needed to facilitate the circumstances necessary for adaptive co-governance to occur, including providing a platform for equal participation among stakeholders and for knowledge exchange/social learning to occur (Folke et al., 2005). Olsson et al. (2007) describe bridging organizations as entities with broader scope than the organizations being convened, and that can avoid or resolve conflict that can result from differing perspectives, values, power, and interests. Bridging organizations, such as Ecomuseum Kristianstads Vattenrike (EKV) in southern Sweden (Hahn, Olsson, Folke, & Johansson, 2006) and Migratory Bird Joint Ventures in North America (Austen, 2011), have been successful in building trust, resolving conflict, and facilitating collaborative learning. Evaluations of EKV have shown that social networks of diverse stakeholder groups can result in social learning and increased capacity to adapt to changing conditions (Hahn et al., 2006). In the following section, we suggest that LCCs have the capacity to serve as bridging entities to facilitate multilevel, adaptive co-governance of landscape-scale social-ecological systems.

LCCs: Bridging Entities to Facilitate Adaptive Co-Governance

LCCs are an international network of self-directed, applied science–conservation partnerships consisting of federal and state agencies, local governments, and nongovernmental organizations. Although the concept of LCCs has been discussed for nearly a decade, they were officially established by the United States Department of the Interior in 2009 (Austen, 2011). Currently, LCCs exist in North America only, but the potential exists to broaden the network worldwide. LCCs were modeled on the National Fish Habitat Action Plan (NFHAP) and Migratory Bird Joint Venture (JV) partnerships (Austen, 2011), but are not limited in focus to one taxonomic group. Similarly to NFHAP and JVs, LCCs foster collaboration at multiple levels in and among organizations in an effort to address landscape-scale stressors that no one agency or organization could manage alone. Although LCCs are early in their evolution, they have demonstrated potential to increase the efficiency and effectiveness of the collectivity of partners by reducing duplicative activities, identifying shared conservation goals and information needs, and leveraging funding and other resources (Austen, 2011). For example, the North Atlantic LCC is playing a central coordinating role in the development of a multipartner Northeast Conservation Framework for a geographic area extending beyond that of the LCC geography and building on the northeastern states' State Wildlife Action Plans (www.northatlanticlcc.org/rcn_workshop.html). Through the communication and information-sharing platform provided by the North Atlantic LCC, disparate stakeholder groups are identifying shared conservation priorities and designing coordinated conservation actions to address those priorities. Such coordination among existing partnerships with shared conservation goals can help minimize redundancies and maximize conservation impact on large landscapes/seascapes. It is important to note that LCCs are not governing bodies (i.e., statutory/regulatory) but rather provide forums to identify shared conservation and management concerns at the landscape/seascope level and identify and provide information and tools needed to inform management activities (Austen, 2011).

The LCC concept was designed to break down institutional barriers facing landscape-scale conservation efforts in that they span multiple jurisdictional boundaries, encompass various preexisting governance/management units, involve multiple levels of stakeholders and provide a geographical framework and collaborative process to approach conservation in an adaptive and innovative way. As bridging entities, LCCs foster opportunities for learning and knowledge exchange at multiple levels, directly feeding into the learning cycle of an adaptive co-governance framework (Berkes, 2009; Hahn et al., 2006).

Individual LCC boundaries (Figure 1), delineated by the U.S. Fish and Wildlife Service (USFWS) and the U.S. Geological Survey and modeled (and modified) after the Bird Conservation Regions (Austen, 2011; Millard et al., 2012), were designed to reflect landscape-scale ecoregions. These natural, versus political or institutional, boundaries, facilitate efforts to deliver conservation action to address impacts caused by major ecosystem stressors (e.g., climate change) by organizing diverse stakeholder groups that share broad conservation goals and information needs. Although there is some general guidance provided by the USFWS for LCCs, it is important to note that LCCs are self-directed partnerships, and thus there will be variations that reflect the different conservation issues faced by the 22 LCCs. Even so, national guidance and a broad national network exist to ensure consistency of fundamental purpose and key components (e.g., funding, general structure, core staff). All LCCs provide a forum and incentive to foster broad collaboration, social–ecological learning, and strategic and adaptive use of resources toward the end goal of healthy landscapes to support functional and resilient ecosystems (Austen, 2011).

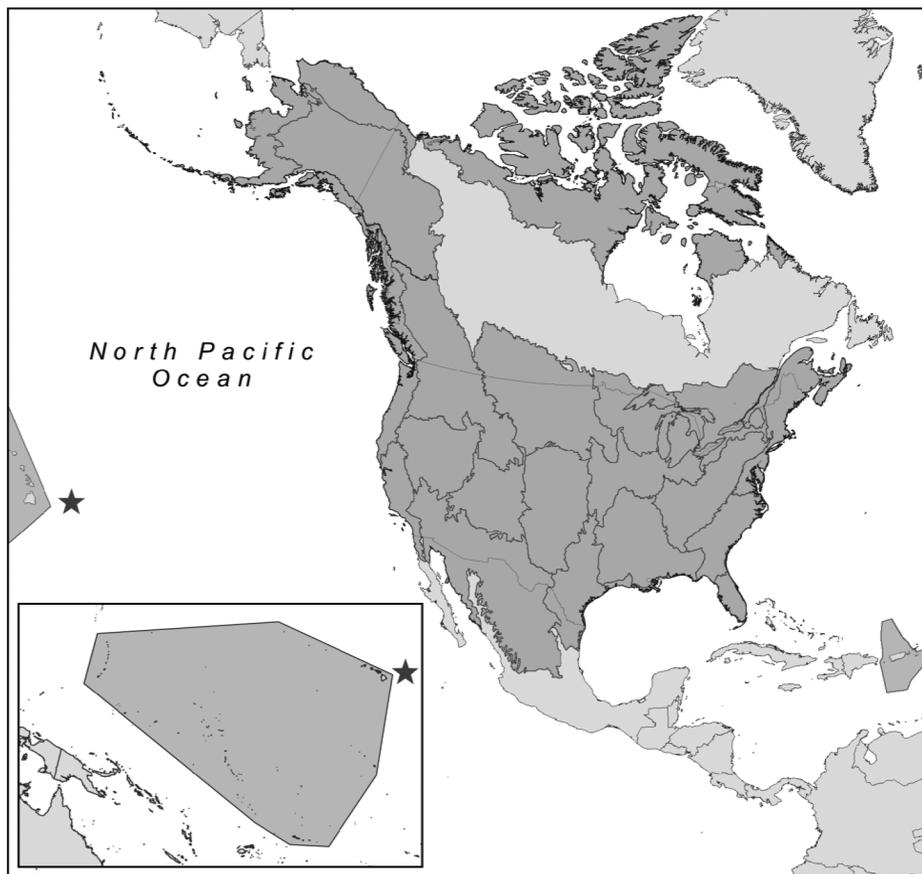


Figure 1. The international network of Landscape Conservation Cooperatives (LCCs). The LCC network is shaded in dark gray. There are currently 22 LCCs; LCC boundaries are denoted by black lines. The Pacific Islands LCC is shown in the inset.

Their ability to be successful in this endeavor will depend in large part on their attention to the human dimensions side of the conservation equation, meaningful engagement of a diversity of partners and incorporation of people's values and attitudes into the adaptive co-governance process.

As a relatively new initiative (e.g., some LCCs were not initiated until 2012), LCCs are undergoing an adaptive process themselves. As part of an adaptive process, there is much still to be learned and improved to ensure that they fulfill the expectations of the USFWS as architects and administrators of LCC funding and the many stakeholders who are now investing considerable time and resources into them. Recognizing that the LCCs are in different stages of their evolution, we describe a co-governance model (Figure 2) that highlights LCCs' *potential* to incorporate social and ecological information into a participatory adaptive conservation framework. The LCC process begins by identifying and segmenting the larger stakeholder community within the LCC geography (Figure 2, Box 1). Social science inquiry may be helpful early in the process to identify conservation concerns, assess interest and otherwise analyze the broad stakeholder community (Prell et al., 2009). Stakeholder groups include conservation practitioners such as managers and

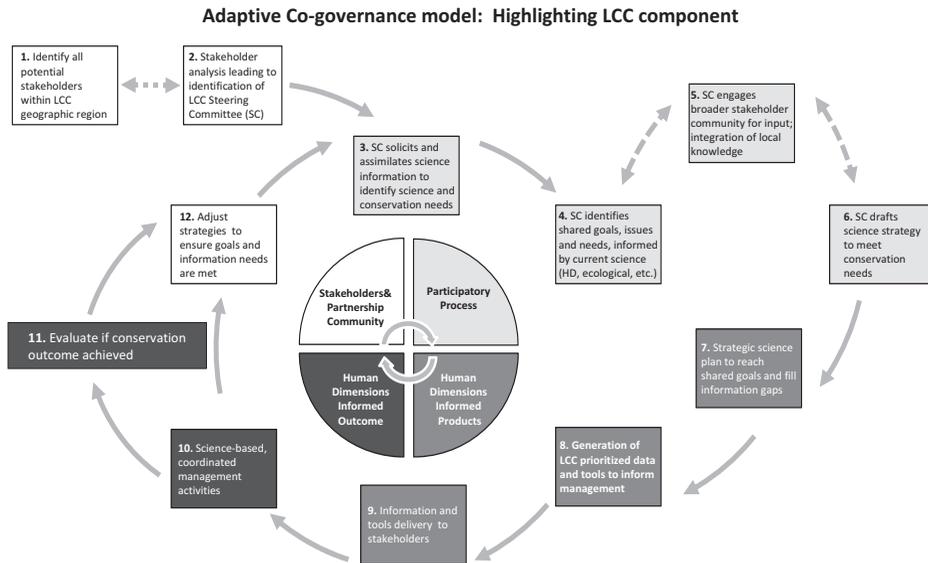


Figure 2. The adaptive co-governance framework highlighting Landscape Conservation Cooperatives (LCC). This figure demonstrates how ideally, LCCs are nested within a broad adaptive co-governance framework. The framework incorporates human dimensions input via a participatory process, and systematic inquiry can be incorporated strategically throughout the process to facilitate knowledge transfer, co-learning, and adaptation. Shading of boxes refers to the respective theme of the central wheel.

biologists from government agencies, tribal governments, nongovernmental organizations, industry as well as interested members of communities within the LCC boundaries. Due to differences in interest level and capacity, some stakeholders engage fully with LCCs, while others with general interest participate as part of a larger stakeholder community. Fully engaged stakeholders are likely represented on LCC Steering Committees (SCs) (Box 2), which act as the “Board of Directors,” or participate within subcommittees/working groups. Although LCC SCs are self-directed (Austen, 2011), all will assimilate scientifically collected information (e.g., biological, physical, and ideally sociological) to inform identification of landscape-scale conservation issues (Box 3); develop broad conservation goals for addressing those issues (Box 4); and facilitate the generation of scientific information or products (Boxes 7–11) needed to inform related conservation actions. Input such as that from social science inquiry and participation from the broader partnership (i.e., both interested and fully engaged stakeholders) is needed at critical stages (e.g., Box 5) to gain insight on preliminary products (e.g., draft conservation goals or science strategy [Box 6]) and facilitate appropriate revisions. Social science inquiry should be solicited and incorporated as needed to inform social learning and adaptive refinement.

Final products (Boxes 7–9) should reflect input gained through an iterative and adaptive process. The information, data and tools produced (Box 8) as part of this process, are made available to the broader stakeholder community (Box 9). Practitioners should be engaged throughout the process as SC or technical group members. Products prioritized and supported by the LCC should inform governance and management decisions (Box 10). If desired conservation outcomes are not achieved, refinements (Box 11,12) may need to be made based on additional sociological or ecological information and social learning. Note that this model reflects the basics of and potential for an adaptive co-governance framework

and that inherent throughout the adaptive processes are iterations and adjustments based on changing stakeholder needs and values. Continually throughout the process, LCC SCs can solicit and incorporate new input into its conservation planning and make refinements as needed. The LCC framework is designed to be flexible and iterative to improve the resiliency and capacity of partner organizations to better cope with and plan for disturbance and social–ecological change.

As bridging entities, LCCs convene a diversity of organizations to create social networks as LCC partnerships. Likely, strong ties exist among some SC members (e.g., organizations with common missions), but it is important for LCC partnerships to embrace diversity of perspectives representing broad interests (e.g., sometimes disparate interests of private versus public landowners, government versus nongovernmental organizations) across large landscapes to gain innovative perspectives and facilitate adaptive thinking. Conversely, trust and social learning capacity may take time to develop within these groups.

Inherent in the LCC concept is an emphasis on broad partnerships and identification of shared conservation goals, tools and information needed to achieve applied science objectives. Research has demonstrated that ideas generated and recommendations made via collaborative processes can be of both high “technical” and “political” quality (Beierle, 2002). The desired landscape-scale outcome (i.e., effective and efficient conservation) is not possible without resource and information sharing and broad support for conservation actions among stakeholders. In the context of future social–ecological uncertainty, the role of managers is no longer to maintain stable ecosystems corresponding to historical baselines (Stephenson, Millar, & Cole, 2010), but rather to act as facilitators by engaging and participating in stakeholder groups to respond collectively and strategically to changing conditions (Chapin III et al., 2010). Likewise, the roles of scientists broaden from that of specialists and experts who sometimes communicate knowledge to managers to that of engaged participants helping to direct and inform co-learning and knowledge transfer (Folke et al., 2005). In addition to the opportunity to increase conservation impact through collaboration, LCCs provide incentives (e.g., funding, sharing information and expertise) to seek innovate solutions and achieve conservation efficiencies and outcomes that would not be realized with single-agency conservation.

As the initiative matures, it becomes more apparent that human dimensions insight is necessary to inform LCCs as they seek to address complex social–ecological systems within landscapes. As an example, the Western Alaska LCC recognized early in its evolution the importance in having community-level participation in identifying conservation concerns and potential management actions (Karen Murphy, Western Alaska LCC Coordinator, pers. comm.). It convened a series of meetings in local communities as an initial step in its process and incorporated input from communities into its planning and implementation process. The current focus on impacts of climate change and coastal storms on Alaskan communities reflects priorities expressed by communities within the LCC geographic region. Similarly, the Pacific Islands LCC (Pacific Islands Climate Change Cooperative [PICCC]) has been successful in incorporating Traditional Ecological Knowledge (TEK) of Native Hawaiian communities into the framework of the cooperative (Stanton Enomoto, Pacific Islands LCC Cultural Adaptation Coordinator, pers. comm.). TEK is the result of collective social memory of local communities, and is widely recognized as an important source of information for scientific research, impact assessments and ecological understanding (Huntington, 2000), particularly in terms of historical conditions and patterns of change. The PICCC region is particularly vulnerable to the effects of climate change, such as sea-level rise, that threatens both cultural and natural resources, as well as the way of life for the people who live in the region. The PICCC partnership

identified climate change and its effects as the primary stressor in the region and are developing adaptation strategies accordingly. Part of adaptation planning includes identifying and prioritizing cultural resources that can be protected as well as resources that need to be documented or recorded but are unlikely to be saved. To achieve this objective, PICCC incorporated TEK and in the following ways: (1) ensuring local communities are well represented on the SC and (2) establishing a working group tasked with developing a common understanding of the meaning of cultural resources and how to effectively engage existing partnerships and communities in the LCC process.

Although the use of systematic social science inquiry is not institutionalized within the LCC network currently, the social network created by the LCCs has broad reach and infiltrates the larger stakeholder community, both by seeking input and sharing information among stakeholders at multiple levels (e.g., organizational leaders, managers, researchers, communities). SCs will benefit from actively soliciting input from a broad diversity of stakeholders via inquiry or more interactive approaches. Although identifying science and management information needs is a critical step for all LCCs in articulating regional conservation priorities, the process is often *ad hoc* and unsystematic. For example, in 2011, 8 of the 22 LCCs incorporated human dimensions informally, including LCC community outreach efforts and surveys. Five LCCs conducted formal needs assessments, such as workshops, intended to facilitate participation and input from a larger stakeholder community. Inconsistency in approach is likely due both to the self-directed nature of LCCs and the “social” component of social–ecological systems that has been historically deemphasized within the conservation community (Folke et al., 2005). A more systematic and consistent approach to incorporating social science information with other science would help facilitate LCCs ability to effectively address landscape/seascape-scale stressors.

Summary and Conclusions

In summary, the conservation institution faces great challenges in its efforts to maintain or create resilient and functional ecosystems. Although it is widely recognized that collaboration among diverse partners is a means of achieving desired conservation outcomes, particularly on landscape/seascape scales, institutional barriers make it difficult to maintain functional and adaptive partnerships. To overcome structural, cultural, and jurisdictional impediments, the conservation institution must engage in transformative change and embrace a new conservation framework (Jacobson et al., 2010). The framework should recognize the interrelatedness of social and ecological dimensions; consider system resiliency versus steady state as the desired outcome; be structured appropriately to solicit and integrate scientifically derived information and modify goals, outputs, and outcomes accordingly; and foster diverse and meaningful stakeholder participation.

Inherent in adaptive co-governance of social–ecological systems is recognition of the importance of human dimensions in shaping the future of ecosystem processes and functions (Folke et al., 2005). Incorporating human dimensions input early in an adaptive co-governance process will help ensure that conservation outcomes will be socially acceptable and implementable. As bridging entities, LCCs facilitate the creation of social networks including structure, process and incentives for diverse stakeholder participation in the conservation of functional and resilient social–ecological systems at landscapes/seascape scales. By design, LCCs are collaborative, so they have the potential to foster social learning and adaptive thinking. The need for social science inquiry to help inform LCCs is recognized by some LCCs, but has not yet become a priority at the network level. Because the LCC network is very well coordinated and communicates regularly,

diffusion of ideas—particularly those that have clear benefits—occurs regularly. The importance of human dimensions input to informing conservation of systems so profoundly affected by and affecting humans seems intuitive. Folke et al. (2005) stress that to achieve enduring and desired outcomes, a diversity of stakeholder input should be incorporated into an adaptive process early, often and well before decisions have been made.

Institutionalization of an adaptive co-governance framework is needed now more than ever as we are losing ground on maintaining healthy landscapes that support functional and resilient ecosystems. The LCC network described herein is already having an impact on coordinating conservation delivery and applied science to inform management (Austen, 2011). As a young initiative, the true impacts of LCCs as bridging entities remains to be seen, however, early successes (e.g., LCCs funding development of needed information and tools, working with existing partnerships to maximize efficiencies) have started to increase interest and engagement in LCCs and initiated the breakdown of at least some institutional barriers. Although stakeholder participation is inherent in the LCC design, integration of systematically collected human dimensions input with other types of scientifically derived information is needed to inform adaptive co-governance of social–ecological systems. As LCCs evolve, we believe that recognition of the need for broad stakeholder input will continue to emerge and diffuse throughout the LCC network. As bridging entities, LCCs will want to solicit and incorporate all relevant scientific information into the adaptive co-governance process. To fulfill their full potential as bridging entities, LCCs must institutionalize the use of social science information, along with ecological and other scientifically collected input, as a critical part of an adaptive co-governance framework to ensure that functional and resilient social–ecological systems persist into the future.

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