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Perspective Essay

The iCASS Platform: Nine principles for landscape conservation design

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ABSTRACT

The Anthropocene presents society with a super wicked problem comprised of multiple contingent and conflicting issues driven by a complex array of change agents. Super wicked problems cannot be adequately addressed using siloed decision-making approaches developed by hierarchical institutions using science that is compartmentalized by discipline. Adaptive solutions will rest on human ingenuity that fosters transformation towards sustainability. To successfully achieve these objectives, conservation and natural resource practitioners need a paradigm that transcends single-institution interests and decision-making processes. We propose a platform for an emerging and evolutionary step change in sustainability planning: landscape conservation design (LCD). We use existing governance and adaptation planning principles to develop an iterative, flexible innovation systems framework—the "iCASS Platform." It consists of nine principles and five attributes—innovation, convening stakeholders, assessing current and plausible future landscape conditions, spatial design, and strategy design. The principles are organized around four cornerstones of innovation: people, purpose, process, and product. The iCASS Platform can facilitate LCD via processes that aim to create and empower social networks, foster stakeholder involvement, engender co-production and cross-pollination of knowledge, and provide multiple opportunities for deliberation, transparency, and collaborative decision-making. Our intention is to pivot from single-institution, siloed assessment and planning to stakeholder-driven, participatory design, leading to collaborative decision-making and extensive landscape conservation.

1. Introduction

The dawn of the Anthropocene—an era characterized by human-induced global ecological change and uncertainty—presents a preview of a possible future quite different from the environment that fostered the emergence and prosperity of present-day human societies. Adapting to the Anthropocene's complex array of change is a "super wicked" problem (Levin, Cashore, Bernstein, & Auld, 2012, p. 2; Waddock, 2013), comprised of multiple, contingent, and conflicting issues. Super wicked problems cannot be fully assessed using siloed decision-making approaches developed by hierarchical institutions using disciplinary science (Norris, O'Rourke, Mayer, & Halvorsen, 2016). Finding adaptive solutions for how to thrive in the Anthropocene rests on human ingenuity fostering transformability toward social, economic, and ecological sustainability. To that end, we propose a platform for an emerging and evolutionary step change in sustainability planning: landscape conservation design (LCD) (see Table 1).

Our theory of change (Fig. 1) is grounded in the belief that just as

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Table 1
Glossary of Terms.

Term	Definition
adaptive comanagement	A process by which institutional arrangements and ecological knowledge are tested and revised in a dynamic, ongoing, self-organized process of learning-by-doing (Folke et al., 2002)
adaptation pathway	An analytical approach to planning that allows for uncertainty and change by encouraging consideration of multiple possible futures and the robustness and flexibility of options across these futures (Bosomworth, Harwood, Leith, & Wallis, 2015)
double- and triple-loop learning	Double-loop learning: revisiting assumptions about cause and effects; triple-loop learning: reassessing underlying values and beliefs, potentially resulting in changes to institutional norms (Argyris, 1976; Butler et al., 2016; Pahl-Wostl, 2009)
governance	Sustaining coordination and coherence among a wide variety of stakeholders with different purposes and objectives (Pierre, 2000)
heuristic	Involving or serving as an aid to learning, discovery, or problem-solving by experimental and especially trial-and-error methods (Merriam-Webster Dictionary, http://www.merriam-webster.com/dictionary/heuristic)
iCASS Platform	A heuristic for landscape conservation design. The *iCASS Platform* is an innovation systems framework consisting of five attributes and nine principles. The *iCASS* acronym stands for: i = innovation, iC = inclusiveness: convene stakeholders, iA = interdisciplinary assessment of current and plausible future conditions, iS^1 = interactive spatial design, and iS^2 = informative strategy design
innovation systems framework	A holistic and dynamic approach to problem-solving that utilizes creative thinking to solve societal challenges (Iizuka, 2013)
landscape	A bounded area of indeterminate size that humans have an affinity for or connection to, and within which they assess appearance, quality, and function of the landscape based on social norms and interest (Termorshuizen & Opdam, 2009)
landscape conservation	Landscape conservation is the rapidly growing practice of people working together across large geographies, regardless of political boundaries, to conserve our natural and cultural heritage and ensure a sustainable future for both people and nature (Network for Landscape Conservation. (n.d.). Retrieved August 23 (2017)). It connects wild lands, working lands, and urban areas into whole, healthy landscapes [or social-ecological systems], and enhances the conservation value of all lands [and waters] through the development of strategies that promote adaptation and resilience (Center for Large Landscape Conservation, (n.d.))
landscape conservation design (LCD)	A stakeholder-driven, participatory process that: 1) integrates societal values and cross-jurisdiction, multisector interests with the best available interdisciplinary science and traditional knowledge; 2) assesses spatial and temporal patterns, vulnerabilities, risks, and opportunities for landscape elements valued by stakeholders; 3) results in a set of spatially explicit products and multi-objective adaptation strategies; and 4) which protects biodiversity, conserves ecosystem services, and promotes social-ecological systems (e.g., landscapes) that are resilient and sustainable for current and future generations.
silo	A system, process, department, etc. that operates in isolation from others (Oxford Dictionary, https://en.oxforddictionaries.com/definition/silo
social-ecological system	An integrated system of ecosystems and human society with reciprocal feedback and interdependence. The concept emphasizes the humans-in-nature perspective (Folke et al., 2010)
social learning	Where multiple agents combine different values, experiences, and knowledge to identify issues and potential solutions, analyze alternatives, debate choices, and identify priorities through inclusive and deliberative processes (Ojha et al., 2013)
stakeholder	All human agents and agencies, regardless of expertise, title, or role in the design process
transformability	The capacity to create a fundamentally new system when ecological, economic, or social (including political) conditions make the existing system untenable (Walker et al., 2004)

Earth's biomes and human civilizations evolved during the Holocene and will continue to do so in the Anthropocene, so too must the governance structures and processes societies use to guide decision-making (Armitage, Berkes, & Doubleday, 2010; Voss, Bauknecht, & Kemp, 2006). To be successful in tackling wicked problems, natural and cultural resource practitioners need a flexible, multi-stakeholder governance structure that transcends single-institution interests and siloed decision-making (Knight, Rodrigues, Strange, Tew, & Wilson, 2013; Toomey, Knight, & Barlow, 2016). To attain that vision, we briefly discuss the well-established concepts underlying landscape conservation design, then, using established adaptation principles, we develop an innovation systems framework—the iCASS Platform—and introduce its five attributes and nine principles. The purpose of this paper is to provide practitioners with a framework that can be used to guide, test, and evaluate landscape conservation design initiatives. Our intention is to ignite transformation from single-institution, siloed assessment and planning to stakeholder-driven, participatory design, leading to collaborative decision-making and extensive landscape conservation.

It bears noting that this paper is unique among the many that tackle similar issues and scope: it is written by practitioners from federal/state agencies and nonprofit organizations that are enmeshed in the sociopolitical realities of conservation in the United States, and as such, provides a lens of pragmatism not necessarily present among scholarly papers. We acknowledge every country has a particular conservation context it must operate within, such as the challenges between private property rights vs the commons, economic constraints, etc. This paper, and the iCASS Platform it introduces, incorporates universal truths in adaptation planning and governance, and as such, can be applicable, not only within the United States context, but the global community at large.

2. Landscape conservation design

This paper holds that sustainability—an overall condition of low vulnerability and high resilience (Wu, 2013)—is, and will remain, the single most important concern of the global community (Kuhlman & Farrington, 2010; Waddock, 2013), and that it is best achieved using the adaptation strategy of landscape conservation. Issues surrounding the vulnerability and resilience of linked social–ecological systems are well documented in global and national assessments (IPCC, 2014; Melillo, Richmond, & Yohe, 2014), national strategic planning documents (NFWPCAP, 2012), and international agreements (United Nations, 2015). However, questions remain about how, and at what rate, societies structurally and functionally adapt their decision-making processes when faced with either fully anticipated or completely unknown management challenges.

Achieving a trajectory toward sustainability requires transformation: a shift from traditional decision-making models and a move toward novel approaches designed for the challenges of the Anthropocene (IPCC, 2014). Societies begin the process of transformation when events challenge their resilience or when their support systems begin to show vulnerabilities (Kates, Travis, & Wilbanks, 2012). Ideally, transformational processes gain momentum when stakeholders undergo iterative double- and triple-loop learning to reconsider their values and institutions, question status quo methodologies, and explore broad-scale intensive and extensive strategies (Argyris, 1976; Butler et al., 2016; Pahl-Wostl, 2009).

Sustainability science (Heinrichs, Martens, Michelsen, & Wiek, 2015) has broadened the discussion from incremental management actions focused on individual components of localized systems to holistic, transformational design processes that enhance the coupling of social and ecological systems (Berkes, Colding, & Folke, 2003; Folke et al., 2010; Walker, Holling, Carpenter, & Kinzig, 2004).