Place, Scale, and Decision-making: Institutional Challenges for Managing Multi-Scaled Natural Resource Systems

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Introduction: Fish, Fire and Fourteeners

This paper begins by drawing attention to a recurring theme I have observed over the course of participation in three recent meetings all dealt in some way with the challenge of bridging the science-practice gap. These meetings dealt with a range of issues from managing endangered fisheries to future scenarios for fire management, and designing regional approach to managing Colorado's high elevation wilderness trails. At first blush these various meetings would not appear to have much in common. But from a social science perspective what appears to managers as diverse substantive issues (fish, fire and so forth), have common institutional underpinnings. What was similar in all of three recent consultations was that the decisions managers face are increasingly made more complex by our increasingly sophisticated scientific understanding of the multi-scaled, dynamic context of complex social and ecological systems. The more science reveals the complexity of the systems we manage, the more complex and intractable are the decisions managers face, and the more they look to scientific information to deal with that complexity. Ironically in the search for better science to reduce uncertainty, science produces ever more complexity and uncertainty. To better illustrate let me describe some of what I heard at the "Fish and Fire" meeting.

This meeting brought together scientists from several federal agencies to respond to managers needs for information to help them make decisions about the use, suppression, and/or prevention of wildfire in riparian areas, especially when they threaten endangered fish species. There was a lot of talk about dynamic landscape processes and what constitutes a resilient landscape. The reason managers keep calling for more or better scientific syntheses and decision support systems is that they simply can't absorb all the nuance and complexity of what scientists are learning about ecosystems and apply it to a specific decision. From the fire management perspective, it wasn't all that long ago that we believed fire management was a simple problem – put it out before 10am. Likewise with fisheries, at one time the idea was that streams needed to be maintained in certain conditions (temperature, turbidity, woody debris and so forth). But listening carefully to the [bio/ecological] scientists own words I found they were pointing out ever greater complexity of the phenomenon (patchy, multi-scaled, dynamic landscapes) in which the right prescription for any one stream network was elusive if not indeterminate. According to some of the ecologists at the meeting, no singular, particular riparian condition could be described as necessarily healthier than another because the viability of endangered fish populations actually hinges on dynamic spatial variety in which some streams are in the process of becoming better habitat for a given species and some streams worse habitat. And if you take the culverts out (a metaphor for things that disrupt the movement of fish populations) to increase the connectivity of streams (ostensibly a good thing for the survival of T&E species), you also make it easier for invasive species to spread. What's a manager to do? I came away thinking that the problem managers and scientists overlook is that their demands for more science (and more integrated science and decision support) – whether to perfect decisions or simply protect decision makers from lawsuits – is built on a false and largely unexamined assumption that more science will make decisions not only better, but easier, more obvious, and more politically defensible.

Why Science Fails to Simply Decision Making (The Limits of Progressive/Scientific Management)

The idea that science can perfect environmental decision making may be taken for granted in the cultures and institutions of environmental management, but it has received considerable scrutiny among social scientists. For example, in *Collapse of Complex Societies,* Tainter (1988) looks at ancient societies to develop the argument that knowledge of complex systems tends over time to outstrip our institutional capacity to manage these systems. The cost of problem solving generally increases and the benefit decreases as the easy solutions are replaced by difficult solutions. Because human societies tend to apply the easiest (cheapest) solutions first, over time problem solving becomes progressively more costly (that is we experience a diminishing return on problem solving – sometimes to the point of collapse or the deliberate adoption of simplification). Sometimes societies delay collapse by subsidizing complexity (what Tainter describes as complexification) through developing new resources (historically through territorial/spatial expansion) and more recently through fossil fuels (which appears to have reached its "peak"). But even if we can subsidize complexity to some degree, the situation still leaves the decision maker with the cognitive challenge of complexity (the need for decision makers to synthesize and integrate the exponential growth of knowledge at multiple scales).

Using a more contemporary political science approach, Sarewitz (2004) argues that science makes environmental controversies worse for three reasons: (1) it supplies contesting parties with their own bodies of relevant legitimate facts; (2) the necessity of looking at nature through a variety of disciplinary lenses brings with it a variety of normative lenses; and (3) scientific uncertainty is for a lack of scientific understanding but a lack of coherence among competing scientific understandings – amplified by the various political, cultural, and institutional contexts within which the science is carried out. In another example, van Wyk, et al. (2008) highlight the persistence of a contextual/cultural gap between information providers and information users as reasons that scientific information fails to be incorporated into decision making. Social analysis of the science-mangers nexus suggests that complexity decreases institutional efficiency and increases scientific uncertainty and amplifies policy conflict.

As some have argued, progressive era institutions of governance were built on a set of assumptions that are not well suited to modern social-ecological systems theory with its emphasis dynamic, multi-scaled complexity. A growing body of literature in sociology (Urry, 2003) and public administration (Goldsmith & Eggers, 2004; Pierre, 2000; Pierre & Peters, 2005; 2000; Rhodes, 1997) has begun to focus on the governance of such complex systems. These emerging theories of governance start by recognizing that much of task of governance lies outside of formal bureaucracy and involves complex linkages and collaboration among multiple public and private organizations. The challenge of governance increasingly emphasizes the need to reconcile traditional top-down hierarchical management built on vertical lines of authority (as exemplified in Progressive Era notion of technical expertise employed in the public interest) with emerging complex, social networks of actors, stakeholders and governmental and non-governmental organizations dominated by horizontal lines of interaction.

How can place help us?

As a way of seeing and thinking about the world place offers a more holistic and embedded view of socio-ecological reality, which can help to balance a long-standing tension in Western thought between universalist and particularist views of knowledge. Specifically, place helps to address the disciplinary fragmentation of knowledge, connect empirical and normative lenses, bridge the epistemological divide between local/contextual knowledge and global/generalizable knowledge and organize and validate knowledge originating in a bottom up synthesis of networks of actors. Building on Robert Sack's relational model of place in *Homo Geographicus* (1997), I offer a three part definition of place as it relates to natural resource decision making. The most familiar is *ontological* place, typically conceived as a location of sentiment and symbolism, that is, a socially constructed site that organizes and constitutes human social relations and meaning. The second part is *epistemological* place or place as a perspective and way of knowing that emphasizes context (situatedness) and seeks to combine objective (scientific) and subjective (local) knowledge. The third part, and most closely tied to decision making, is *axiological* place. Axiological place focuses on prescriptive statements or valuations of place. This framework is then discussed in relation to emerging ecological and social theory of complexity to suggest an alternative framing for understanding the science-practice relationship. I develop the argument that the knowledge and wisdom required to manage complex ecological-social systems is not likely to emerge out of top-down expert driven knowledge systems (which become too unwieldy and expensive) but through the combined and less formally coordinated efforts of more embedded practitioners (managers) learning though their own local efforts. In other words the future of decision making and problems solving is more likely to organized and directed from an epistemological position of betweenness with stronger engagement from the bottom up in which practitioners play a more prominent role in the production and validation of knowledge.

Social Science for Sustainable Problem Solving

Drawing on Bent Flyvbjerg's book *Making Social Science Matter* (2001) this chapter concludes with a discussion of some of the characteristics of knowledge that matters. A key argument of Flyvbjerg is that social science should not try to emulate natural science by trying to build predictive models, but instead focus on case study knowledge, which typically reveal "practical wisdom" emphasizing value rationality and power rather than the maximization of specific outcomes or objectives (typically prescribed from above). More socially and ecological integrated knowledge will not result from social science increasingly emulating the natural science's quantitative and mechanistic view from nowhere, but by natural science adopting a concept of nature that emulates the social realm as active, creative, and agentive (closer to somewhere). This kind of practical wisdom need not be managed from above, but is augmented, refined and validated by systems of networked learners. In other words, practical wisdom is shaped, evaluated, and refined by the practitioners themselves rather than produced and transmitted via expert systems (though experts can certainly help in this effort). Finally, such a distributed, bottom up system of knowledge creation helps to counter the otherwise diminishing returns and escalating costs of traditional hierarchically directed information systems.

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