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The Science of Open Spaces: Theory and Practice for Conserving Large, Complex Systems. Charles G. Curtin.

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The Science of Open Spaces: Theory and Practice for Conserving Large, Complex Systems. Charles G. Curtin. 2015. Island Press, Washington D.C., USA. 255 pp + xiii. \$80.00 (hardcover). ISBN: 9781597269926. \$40.00 (paperback). ISBN: 9781597269933. \$39.99 (e-book). ISBN: 9781610912051.

The phrase “open spaces,” may bring to mind expansive tracts of prairie, rangeland, or even desert, stretching lonely and unchanged to the horizon. Open spaces also could conjure open oceans or interstitial rural lands between urbanized hubs, dotted with farms, fields, and woodlands. In an abstract sense, open spaces could represent gaps in human understanding or blank spaces on a map. In his book *The Science of Open Spaces*, landscape ecologist Charles Curtin combines all these perspectives, expanding the definition of “open spaces” to multi-layered and multi-scaled complex systems that are “greater than the sum of their parts.” He populates these vastnesses with the diversity of species, hierarchy of biotic and abiotic interactions, and human social elements that comprise and link open spaces together as social-ecological systems. *The Science of Open Spaces* provides readers with a roadmap to 21st century land management, where the stakes are high, collaboration is crucial, and profound uncertainty in the face of the complexity often hampers decision-making.

The scope of issue could easily intimidate, leading to quick, reactive choices or even paralysis. Curtin instead offers a structured, accessible approach for tackling the understanding and management of open spaces, starting with an honest assessment of the difficulties of modern land management in the first chapter and following with case studies derived from personal and investigative experience, a blending of interdisciplinary theories, and finally synthesis and practical guidelines in the final chapter. Some readers may feel Curtin places the onus on them to derive essential concepts, has a bit of a harsh outlook on certain management choices, or does not adequately condense material into applicable solutions. Regardless, Curtin does an exceptional job of balancing interesting yet readable case studies with underlying ecological and sociological theory. He is able to blend economic ideas such as Elinor Ostrom’s design principles with ecological theories such as resilience and panarchy while, for the most part, avoiding conceptual jargon. This makes *The Science of Open Spaces* entertaining and educational without being condescending. A reader only needs a perceptive, curious mind to benefit from and enjoy this text.

Curtin gets to the heart of the problem in the first chapter, describing the difficulty of managing large expanses of land. Curtin argues that while traditional scientific and policy approaches examine isolated variables at small scales very well, they lose efficacy and insight as extent and extrapolation increase. For example, focusing on a single, small-scale variable such as maximizing forage production in rangelands may fail to capture critical interactions among components

such as the need for heterogeneous grazing and fire for sustaining desirable species composition while also ensuring resilience following unexpected environmental changes. As a result, traditional science may poorly predict long-term outcomes. He also points out that land management must include input and collaboration from a wider range of stakeholders—many of whom have, historically, been shut out of the decision-making process. Although Curtin paints a daunting, but honest, picture, he quickly moves into case studies that demonstrate the achievability and potential missteps of management of open spaces.

In the first case study, Curtin offers readers his personal, yet analytical, perspective of an initially successful, but now defunct, complex systems working group in the Malpai Borderlands. The borderlands straddle the boundary between the United States and Mexico, spread over four states, and extend over six different biomes, hosting a wide, somewhat disparate, spectrum of communities and cultures. In the midst of this complex socio-ecological system, a need arose to conserve the rare and sensitive mid-elevation desert grasslands by preventing the rampant shift from grassland to desertified shrublands. To meet this need, various local and distant stakeholders came together under a shared vision to form the Malpai Borderlands Group (MPG). Curtin attributes the group’s initial success to involvement of local ranchers, transparency of researchers, and recognition among participants of the value of fire in maintaining wildlife habitat and range quality. The group operated successfully for some time, and its legacy significantly contributed to reframing landowners as stewards of land, rather than just consumers of resources. However, over time eroding trust, conflicting motives, lack of equal and non-partisan decision making, and lagging funding ultimately led to a reduction in the effectiveness of the MPG. Curtin claims the story of the MPG’s rise demonstrates the importance and benefits of collaboration for conserving large landscapes. However, the MPG’s decline teaches us that without governance structures enforcing stakeholder equality and the ability to actively adapt, these same collaborations, and the conservation goals they seek, become vulnerable to dissolution and collapse.

The next case study focuses on the fisheries of the Gulf of Maine. Curtin frames the Gulf as an ecologically young system interacting with an economically old industry. For nearly 400 years various groups have been harvesting resources from the Gulf of Maine. Curtin focuses on the collapse of the cod fishery which spurred the growth of the Maine lobster industry to compensate for lost revenue. Curtin compares principles and practices driving the success of emergent, culturally-supported (bottom up) governance of lobster fisheries with the failures of command-control (top down) governance of fishing for cod and other groundfish. He also examines the complex interactions between the ecology and the economy of the marine ecosystem, and the role they play in policy development and maintenance.

One of the greatest strengths of *The Science of Open Spaces*, as seen in the latter chapters, lies in Curtin's embrace of emerging themes and paradigms such as resilience theory, complex adaptive systems, and thermodynamics as they apply to landscape management. First providing a laymen's primer of some of these concepts, he describes the relationships between them and demonstrates how many of these concepts manifest in systems similar to the case studies. Curtin asserts that ecological resilience, defined as the quantity of disturbance a social-ecological system can withstand before changing into another type of system (e.g., the shift from cod- and groundfish-dominated fisheries to depopulated fisheries as a result of overharvesting), could serve as a conceptual structure for the conservation of open spaces. He emphasizes the role of stakeholders and place-based resource use governance in maintaining system resilience, as well as honing our understanding of the ecological processes reinforcing resilience through adaptive management theory. Curtin stresses the necessity of viewing resource management plans as testable scientific hypotheses while allowing for flexibility in policy so that these plans can adapt to lessons learned from monitoring and feedback loops. This is critical, he posits, due to management actions often having unexpected and sometimes irreversible impacts.

In closing, the book returns to its practical roots by outlining how the previously discussed themes can reshape conventional practices, thereby avoiding failures of poor cooperation and static governance seen in management of many complex landscapes. Curtin tries his hand at winnowing what he has already described as incredibly intricate and multifaceted, but falls somewhat short of reaching pithy, operational

conclusions. Instead he leaves readers with a rather confusing web of eight principles, three core elements, five ground rules, and six guiding questions. This leaves the final chapter feeling less like a handy notepad a manager can tuck into their back pocket and carry with them into the fray and more like a reference manual from which to structure entire programs. Nevertheless, what Curtin lacked in brevity in the last chapter, he makes up for in content.

The only dark spots in the book occur when Curtin writes as if he has an axe to grind. Justified or not, his past feuds read as one sided, and detract from an otherwise well-balanced and painstakingly researched book. While it was important to inform readers how projects and collaborations deteriorated, Curtin may have been better served to leave these segues on the cutting room floor lest they create any gulf between author and reader. However, the overall readability and tone of Curtin's writing likely saves him from this fate, leaving his audience only mildly conflicted. This book will appeal to practitioners, academics, students, and general supporters of conservation. Curtin's prose, much like the landscapes he studies, is both open and vivid, synthesizing complex topics into clear, open arenas to be explored. Readers will find this book an engaging and substantive guide to the pitfalls and paths to success of collaborative conservation.—Michelle L. Hellman¹, Caleb Roberts¹, Hannah Birge¹, Zachary Warren¹, and Craig R. Allen². ¹Nebraska Cooperative Fish and Wildlife Research Unit, School of Natural Resources, University of Nebraska-Lincoln, Lincoln, Nebraska 68583, USA; ²U.S. Geological Survey, Nebraska Cooperative Fish and Wildlife Research Unit, School of Natural Resources, University of Nebraska-Lincoln, Lincoln, Nebraska 68583, USA.