The background of the cover is a photograph of a desert landscape. In the foreground, there are rocky slopes covered with low-lying green and yellowish shrubs. Several tall saguaro cacti are visible, some with arms. In the middle ground, there are rolling hills and low mountains. The sky is a clear, pale blue, suggesting a bright day.

THE SCIENCE *of* OPEN SPACES

THEORY AND PRACTICE
FOR CONSERVING LARGE
COMPLEX SYSTEMS

CHARLES G. CURTIN

THE SCIENCE OF OPEN SPACES

Theory and Practice for Conserving Large,
Complex Systems

Charles G. Curtin

Washington | Covelo | London

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*We shall not cease from exploration
And the end of all our exploring
Will be to arrive where we started
And know the place for the first time.*
—T.S. Elliot

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Preface

This book stems from a 2009 graduate course I taught at MIT titled “Complexity, Ecology, and Policy Design.” The positive response of the students, who were midcareer conservation professionals from around the world, to the core concepts that were a significant departure from typical approaches to conservation planning convinced me of the fundamental need for a book linking theory and practice that redrew institutional boundaries to include a wider array of perspectives and paradigms. This book was also inspired, in part, by Kai Lee’s *Compass and Gyroscope*,¹ which addressed the foundations of adaptive management in a short and pithy, yet eminently readable, synthesis. My volume was originally intended as an update of Lee’s 1993 book, but expanded to a broader consideration of conservation practice in large and complex systems.

In designing the 2009 course and in subsequent endeavors, I found that there was no single resource I could draw on that reached across disciplines and provided a unified perspective for students, scholars, and practitioners interested in large-scale, transboundary conservation. There are many excellent sources containing significant pieces of the puzzle, from the aforementioned book by Lee, to Gell-Mann’s and Holland’s works on complexity, Daniels’s and Walker’s book on collaborative decision making, Levin and Rosenzweig’s writings on ecology, Berkes’s and Folke’s, and Walker’s and Salt’s work² on socioecological systems and resilience, and numerous others. But I could not find a single resource in a narrative style that provided a compelling overview of the integrated science and policy needed to sustain large ecosystems that would be accessible to broad audiences, while being solidly grounded in the underlying theory. Likewise, there was not a particular discipline that contained all the necessary conceptual underpinnings, although the obvious ones such as conservation biology, ecology, and resource management, all played their part. Equally important were areas not typically recognized by scholars and practitioners as being core to conservation, including insights from

business management, cognition, complexity theory, finance, thermodynamics, and a host of other disparate perspectives.

The volume's title is a play on that of Gretel Erlich's book *Solace of Open Spaces*, about ranching in Wyoming. The term *open spaces* contributed the unifying concept and metaphor to ground the crossdisciplinary synthesis I present. I decided I needed a new term for an approach to conservation that was distinct from others, for it was a necessary departure from previous perspectives. I found in my years of research and conservation action that the disciplinary boundaries that emanate primarily from academic scholarship simply do not map to the reality one encounters on the ground, especially at the large scales needed to address current environmental challenges where the scale of the process requires science that is a fundamental departure from previous approaches.

Large, complex issues such as climate change and sustainability are intrinsically different from many of the historical challenges society has faced and, as such, demand a new approach that matches the scale of the problem with that of the analysis and the solution. But this means re-conceiving the role of science and policy and recognizing that sustaining science and other forms of knowledge gathering requires a synthesis of social and ecological perspectives. A science of open spaces is thus crucial not just for conservation, but in giving society a tool kit for gathering and applying information to the complex and multifaceted problems we currently face.

The core content of the book stems from a series of policy and research experiments I have undertaken. From rangelands of the desert Southwest and overseas to fisheries in the Gulf of Maine, the narratives recounting these experiences provide an intellectual road map of my path of discovery. Though these case studies may seem radically different, their integration illustrates significant commonality to the underlying principles and shows a departure from conventional academic approaches in that they reflect not short-term analysis by an external researcher, but more than a decade of my firsthand experience.

Through these examples and review of the literature, the book can be distilled down to five essential points:

- There is an artificial distinction between theory and practice. In large

and complex systems, an integration of approaches is essential for developing a robust tool kit for problem solving.

- The distinction between disciplines is highly subjective. Therefore, a synthesis of perspectives is essential for developing and sustaining large-scale science and policy.
- The challenges facing society today require a fundamentally different approach that re-scales science to address large and complex problems.
- A placed-based perspective is essential for building an open and transparent process that generates the trust and social capital essential for sustaining programs long enough and at scales large enough to address complex, multifaceted challenges.
- In large and complex systems, there is considerable uncertainty and a need to adapt to constantly evolving challenges. In this dynamic and uncertain context, continually refining knowledge and understanding is key for effective decision making.