Chapter 2
Ecological Science and Practice: Dialogues Across Cultures and Disciplines

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Abstract Promoting earth stewardship entails re-examining economic arguments, such as the "tragedy of the commons" logic, which are coercive, out of step with cultural values, and often lack empirical support. A counter-example is the effort by Chesapeake Bay watermen to resist privatization of the commons, while adopting an alternative strategy more in keeping with their cultural values. Creating trust between scientists and watermen has been difficult, however. Research from the social sciences, notably by the late Elinor Ostrom and colleagues, and William Burch Jr., suggests that human ecology can be developed in a way that is more attuned to human values. Citizens have important roles in fostering good stewardship when they can mobilize support, as illustrated in Jane Jacobs's writing about urban communities, and by citizen-led creation of a nature reserve in Toronto, Canada. Two challenges in promoting earth stewardship are to create trust between scientific experts and resource users, and to create an academic culture that values interaction between scholarly disciplines.

Keywords Biocultural conservation • Common-pool resources • Ecological economics • Tragedy of the commons • Urban ecology

Promoting earth stewardship[1] involves enhancing public understanding of the ecosystems of our world and how they support us. Too often our dependence on these systems comes to our attention only in a crisis, as happened during the American Dust Bowl of the 1930s, a stunning example of the collapse and loss of ecosystem services that prompted the U.S. Department of Agriculture to pay more attention to soil conservation and curbing the bad habits of over-plowing, over-grazing, and over-cutting of timber. Two generations later we express our debt to nature and duty to future generations when we assert the importance of protecting ecosystems so as

[1] Throughout the book *Earth stewardship* refers to stewardship at a planetary scale, while *earth stewardship* refers to a local community stewardship at the scale of ecosystems or landscapes.

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to maintain ecosystem services. Earth stewardship involves making this awareness part of the fabric of our society.

Historical and contemporary examples from modern ecology and environmentalism suggest that a multicultural perspective that combines values and perspectives both from the culture of science and the culture of ordinary citizens can be more productive than an approach that seeks to apply scientific expertise without regard to local culture and custom. Research in social science also underscores the importance of studying human behavior, institutional structures, and the conditions that lead to effective stewardship, rather than relying on over-simplified logical arguments, such as the "tragedy of the commons" argument popularized by Garrett Hardin (1968). In this chapter I consider one example that illustrates the problem of trying to impose the "tragedy of the commons" logic on resistant resource users, before highlighting some of the interdisciplinary scholarship that has provided an alternative approach to understanding problems of governing the commons. I end by considering a couple of instances of citizen-led stewardship that has countered modern forces of development in order to foster an ecological viewpoint that conforms to human values and needs.

2.1 Two Cultures: Scientists and Watermen

Today, ecology affirms that humans are intrinsic parts of ecosystems, and their values and cultural beliefs, which motivate their actions, are aspects of these systems (McDonnell and Pickett 1993). As Ricardo Rozzi (2013) has pointed out, preserving human cultures is an important aspect of earth stewardship. This endeavor can be seen as a problem of ethics that invites collaboration between ecologists and philosophers. He cautions however that environmental ethics must depart from the philosophical traditions that have separated humans from other animals, in order to understand what connects humans, the environment, and the species that co-inhabit the environment. With such understanding one can appreciate how the conservation of cultural diversity – the diverse cultures that have evolved in close interaction with other species and environments – must be part of the broader goal of working toward sustainable practices. Rozzi refers to this viewpoint as "biocultural ethics" which serves the goal of "biocultural conservation." He views this approach as also capable of addressing problems of social and environmental justice that are inextricably linked to broader problems of environmental stewardship. The scientifically trained ecologist who enters local communities with this goal in mind has to be capable of discovering, internalizing, and perhaps even recovering the environmental perspectives of local communities. That such discovery is a means of enlightenment for ecologists has been emphasized in several essays in the volume *Linking Ecology and Ethics for a Changing World*, for example Stuart Chapin's reflections on his interactions with native communities in Alaska (Chapin et al. 2013).

It has proved more difficult to accord non-indigenous local communities, even those that have lived off the land for generations, the same attention and respect.

One reason has been the dominance of the logical argument known as the "tragedy of the commons," one modern version of which was articulated forcefully by Garrett Hardin (1968). According to this logic, resources that are held in common will inevitably be over-exploited by the resource users, and therefore a solution can come only from the outside, either in the form of privatization or some type of coercion or regulation of human action. This argument long predates Hardin's influential article and has created a stumbling block to bringing scientific and lay communities together for productive dialogue. A good example is the history of acrimonious debate about oyster conservation in the Chesapeake Bay on the east coast of the United States. The still-unsolved problem is how to preserve this once-productive estuary and the once-abundant oysters that are so important for maintaining water quality. Environmental historian Christine Keiner (2001, 2009) has analyzed the "oyster question" in this region and argues persuasively that one persistent blind spot in trying to solve environmental problems has been failure to recognize the crucial link between conserving oysters and valuing and protecting the culture of the local watermen or commercial fishermen. One reason has been that scientists and policy makers have been in thrall to the "tragedy of the commons" logic.

As Keiner points out, the need to conserve the Chesapeake oyster population was recognized well over a century ago. William Keith Brooks, a zoologist at the Johns Hopkins University, published a book on oysters in 1891 that was an early interdisciplinary work (Brooks 1996). He drew on biology and political economy to argue for the importance of sustaining the Chesapeake oysters. Brooks's studies of oyster reproduction revealed that the Chesapeake oyster could be cultivated, and he concluded that the best conservation strategy was aquaculture, which meant privatizing the commons. For many years he advocated privatizing oyster beds because he thought it would bring prosperity to the impoverished watermen living on the eastern shore of the Chesapeake Bay. Other scientists picked up the refrain: the solution was to enclose the commons and develop oyster culture.

But Maryland's watermen, the people he was trying to help, were vehemently against the idea of privatization because it was expensive and threatened many aspects of their worldview. Quite simply, privatization and aquaculture required capital, for underwater farming was expensive, and the watermen did not have capital. Those with the ability to afford the high costs of aquaculture were the packers and canners, the capitalists of the oyster economy, who if allowed to farm oysters would gain control of the oyster beds. If aquaculture were instituted, the watermen would become the equivalent of farm workers, employees working for the capitalists. Watermen fiercely valued their independence, as they still do today, and being corporate employees was much against their self-image and their culture. As it happened, the watermen had considerable political clout in the state legislature, because Maryland's system of representation favored the rural counties, where the watermen lived, over the city of Baltimore, where the scientists lived. While the scientists in Baltimore continued to define the "oyster question" as a question of privatization, or oyster culture, the watermen continued to resist a "solution" that threatened their core values and their culture.

The scientists had failed to grasp that conserving the oyster also meant conserving the waterman and his culture: the two were part of one system. A solution that tried to conserve the oyster at the expense of the waterman's culture was no solution, as long as the watermen held political power. This historical episode is typically seen as a classic case of the "tragedy of the commons", whereby greedy resource users (the watermen) exploited the commons, the Chesapeake oyster beds, and eventually destroyed the resource on which they depended (e.g., Wennersten 2001). Keiner suggests that the reality is more complicated. Indeed, scientists were forced to acknowledge the watermen's arguments, but she perceived this cross-cultural dialogue as a positive step. Solutions were developed based on replenishing and reseeding the oyster beds, and watermen themselves took part in these conservation efforts, while not sacrificing their sense of independence and their cultural values. Scientists, watermen, and policymakers ended up working together to create a unique system, which turned into a well-managed commons. This system, although not perfect, was a reasonable compromise that worked for several decades.

While not romanticizing the watermen as model conservationists, Keiner seeks to correct the perception that they were enemies of nature. Watermen valued conservation and contributed an understanding of the bay that may not have been couched in the language of science but was nonetheless grounded in their experience on the water. As Keiner suggests, "The ways in which oystermen and their legislative allies crafted a viable alternative to private cultivation can be seen as a case of co-management," and she argues that we need more historical analysis of natural resource management regimes in which "local knowledge played a greater role than elite scientific expertise" (Keiner 2009, p. 10). She further cautions that we should avoid looking back on this long debate and concluding that because the watermen resisted the scientific advice, therefore science was compromised and conservation efforts failed. Moreover, we cannot be sure that the solution advocated by scientists until the mid-twentieth century – private cultivation and enclosure of the commons – would have solved the problem. Her case study was the first to give full weight to the Chesapeake watermen's perspective.

Ultimately the oyster population did crash, but late-twentieth century population declines must be attributed to many changes in the region. High population densities were producing significant levels of stress on the ecosystem and transforming the watershed. One consequence was that during a period of prolonged drought, possibly linked to human-caused climate change in the 1980s, conditions favored the spread of lethal parasites that devastated the oyster populations. Understanding the many causes contributing to extreme weather conditions requires a broad understanding of modern industrial society, including what is occurring globally, not just in the immediate Chesapeake region. Likewise casting environmental problems in terms of the remorseless logic of arguments like the "tragedy of the commons" oversimplifies and distorts the reality. Keiner also insists that the oyster question cannot be removed from its political context or be seen as a purely scientific problem.

Arriving at a method of co-management that combines the perspectives of scientists and resource users requires a degree of trust between these different stakeholders. Today scientists and watermen work together, although distrust

between the two groups has been hard to overcome and has not completely evaporated. Anthropologist Michael Paolisso (Greer 2003) has worked with communities of Chesapeake watermen and has tried to identify the core beliefs of both watermen and scientists that are important for conservation practice. In this case the conservation problem centered on the Chesapeake blue crab, whose populations can fluctuate dramatically from year to year. Paolisso noted some similarities in core beliefs but also striking differences between the two groups, most notably in the watermen's belief that "God and nature" were the best "managers" of natural resources. While it can seem nonsensical to a scientist to make such a statement, the watermen were trying to express the idea that population fluctuations of the blue crab were not predictable, nor were they capable of being controlled by humans. In addition, the watermen had a faith-based view of natural cycles which came from their daily experiences on the water. To the watermen, the scientists' faith in their models was perplexing. While the two sides maintained their points of difference, these dialogues about core values and perceptions of nature nonetheless helped them to find some common ground. The kind of work Paolisso does to facilitate dialogues across the cultures of science and watermen helps to build respect and trust on both sides.

2.2 Challenging the Tragedy of the Commons Logic

The importance not just of understanding other cultures, but of building respect and trust between different communities, is emphasized in a growing literature that has been challenging the tragedy of the commons logic since the 1980s. This critique forms the basis for a powerful analysis and synthesis by social scientists such as the late Elinor Ostrom and her colleagues and collaborators. Ostrom shared the Nobel Prize in Economic Sciences in 2009 for her analysis of economic governance, especially the governance of common-pool resources (such as local fisheries, pastures, irrigation systems, and forests). *Common-pool resources* refers to cases where one person's consumption subtracts from the availability of consumable benefits to others, but where it is difficult to exclude people from access to the resource.

Ostrom (1990) recognized that the tragedy of the commons argument, in tandem with other economic arguments in the same vein, had become dominant without being properly tested by empirical studies. Essentially these models were being used metaphorically to invoke an image of looming disaster, and when such images were used as the basis of policy, this made the models dangerous in her view. Empirical studies that would provide tests of these dire predictions had in fact been accumulating, but they were dispersed across different disciplines, were not coordinated, and on their own no single case study offered definitive conclusions. This situation started to change in the 1980s, as a result of a National Research Council (NRC) Panel on Common Property Resource Management, which published its report in 1986 (National Research Council 1986). The panel's steering committee first met in 1983 and quickly found that there were a large number of existing case studies relevant to their task (Poteete et al. 2010). Scholars from different disciplines

joined to assess the results of these worldwide studies. This panel also promoted a framework that had been developed in the 1970s by several social scientists, including Ostrom, called the Institutional Analysis and Development Framework. The framework was meant to provide a conceptual map that would help to organize thinking about how individuals or groups dealt with collective-action problems. Participation in the NRC workshops led Ostrom to try to synthesize the findings from the case studies, and this effort in turn stimulated an extensive research program on common-pool resources.

The work of Ostrom and her collaborators involved consolidating data from empirical studies ranging across many disciplines, carefully designed laboratory experiments to test the assumptions of economic theory, extensive field studies, and theory development. In her ground-breaking book, *Governing the Commons*, she argued that any theory of human organization should be "based on realistic assessment of human capabilities and limitations in dealing with a variety of situations that initially share some or all aspects of a tragedy of the commons" (Ostrom 1990, pp. 23–24). Her approach was interdisciplinary. It used the strategy then being developed by social scientists under the rubric of "the new institutionalism," which called attention to the importance of understanding the details of institutional structures. But she also adopted the strategy biologists used when they linked empirical work to a theoretical understanding of the biological world. Her inspiration in biology came not from ecological studies but rather from the idea of selecting a simple organism in which a process to be studied occurs in a clear or exaggerated way. Her equivalent "representative organism" was instead a human situation, namely a small-scale common-pool resource situation having certain characteristics. Among the many lessons of her decades of work, as summarized in her Nobel Lecture (Ostrom 2010), was that humans have much greater capacity to solve dilemmas than early economic theories suggested. Moreover she concluded that "designing institutions to force (or nudge) self-interested individuals to achieve better outcomes" may be far less effective than facilitating "the development of institutions that bring out the best in humans" (Ostrom 2010, pp. 435–436).

Ostrom's work and that of her colleagues focused on human behavior and institutions and recognized the importance of a multi-level attack that includes the socio-ecological context. This broad and ambitious program complements the literature of ecological science and suggests that dialogue between these disciplines would be highly productive. The kinds of problems that Ostrom studied, and the issues she confronted in the course of that study, such as how to deal with complexity and contingency, are closely parallel to the problems and methodological challenges that ecologists face. An excellent summation is the book *Working Together: Collective Action, the Commons, and Multiple Methods in Practice* (Poteete et al. 2010). This book offers much food for thought for ecologists who are grappling with problems of stewardship and should suggest many ways of engaging with economists.

Like Ostrom, sociologists have also warned against over-simplification of environmental problems and the need to engage with communities in a productive way. William R. Burch, Jr., a sociologist at Yale University, was an early critic of the way environmental debates had split into either extremely pessimistic or overly optimistic viewpoints which both adopted a simplified view of things. Reflecting on the

environmental crisis emerging in the 1960s, he became interested in the interpenetration of myth, social systems, and ecosystems, developing these ideas in a book, *Daydreams and Nightmares: A Sociological Essay on the American Environment* (Burch 1971). Burch warned academics to be wary of falling into the trap of blaming environmental problems on a flawed human "nature," on single causes like overpopulation, or on various villains and conspirators. Over-simplifying the cause of the problem would not help to solve it, and pinning one's hope on technological fixes was not likely to work either.

Burch's arguments were also relevant to the simplified logic of the tragedy of the commons. Hardin's discussion in 1968 had not been restricted to problems of resource use. Most provocatively he extended his logic to the problem of over-population and concluded that solving that problem also entailed some form of coercion. While much debate at that time focused on the population "explosion," as though humans were cancers on the earth, Burch countered that human reproduction was not a strictly biological phenomenon, over-population was not to be blamed on irresponsible behavior among the underclass, and the solution would not come from handing out the latest birth control technology. Always there were social, cultural, economic, and political dimensions to these problems that had to be understood. Environmental problems had broad ramifications that resisted reductionist thinking. Burch's ideas have been adapted by ecologists and applied to the development of a Human Ecosystem Model, or a framework for studying human-dominated ecosystems, such as those in urban environments (Pickett et al. 1997). The Baltimore Ecosystem Study, part of the Long-Term Ecological Research program, uses this framework. Its objective is to analyze how humans, including their institutions and cultures, operate as parts of ecosystems, but without judging that activity in the stark negative terms that were intrinsic to Hardin's logic.

2.3 Power to the People

This rich literature in social science, in combination with ecological and environmental discussions, opens the possibility for an approach to environmental literacy that would try to put more agency in the hands of the citizenry, or encourage people to be self-educators through their interactions with their environments. It is easy to see the problem of environmental literacy as conveying knowledge from experts to people who are ignorant, in order to get ignorant people to alter their behavior. That kind of knowledge flows in one direction, and the approach would be something like this: teach more about environmental science (and related subjects like natural history), at an earlier age, teach it better, and keep driving home the message throughout people's lives. There is nothing wrong with such teaching, but another goal would be to make people realize that they are capable of making correct decisions even without a lot of expertise, if they can critically analyze what is around them and link what they observe to their values, their culture, and what they think is worth preserving. That is, ecological knowledge is not just about conveying information; it involves a way of thinking. Sometimes it becomes necessary to

challenge the experts, and as Rozzi (2013) argues, to actively reverse the trends toward biocultural homogenization. Such actions may require an active push from the level of ordinary citizens.

This was the message of Jane Jacobs' landmark book of 1961, *The Death and Life of Great American Cities*. Jacobs fought against the idea that the planning expert always knew best, and that tearing apart urban communities with such things as expressways or any structure that alienated people from their environment was a progressive step. She was not a scientist, but a keen observer of the urban scene, and she perceived that what might appear as clutter could also appeal to urban dwellers, providing aesthetic pleasures and sources of interest as they navigated their environments. A city's downtown core should welcome people in, not drive people away. Her idea was that one did not have to be an expert to evaluate what worked and did not work in an urban environment. The key skill was to be able to observe how people used spaces: where did they cluster, shop or play, and what did they avoid? What made some areas seem dangerous and others inviting? She had faith that if people were attuned to their environments and how they worked, they would make good decisions about the future of those communities. Again the emphasis was to preserve what was culturally valuable, rather than to tear things down for the sake of a modern look that is devoid of unique local characteristics.

A final example illustrates the way an educated and ecologically sensitive public can steer decisions toward ends that promote earth stewardship by asserting the value of biocultural conservation. In Toronto, Canada, an urban wilderness called the Leslie Street Spit was created at first by accident and then with the support of a group of citizens called Friends of the Spit, who formed in 1977 (Carley 1998; Courval 1990). The spit is a human-made peninsula jutting into Lake Ontario, which started as a breakwater for harbor expansion in the 1950s but then became a construction landfill site when the harbor plans were abandoned. In time, vegetation started to grow and the process of ecological succession got underway. The peninsula attracted various wildlife species and became a bird watcher's paradise. Although it continued to be used for construction landfill, limited public access on bus tours was allowed starting in 1973, followed by cyclists and hikers the next year. In 1977 Friends of the Spit formed and began to lobby for greater public access, but otherwise they hoped to keep the land in an undeveloped state, allowing it to mature as an urban wilderness park. They had to fend off efforts to develop the area for recreational use, for instance plans to build a multi-purpose aquatic park, and held firmly to the principle that the best possible thing was to leave it alone and let nature take its course. This struggle was by no means easy and required determined efforts by citizens over many years. Today, after decades of lobbying, the 5-km peninsula is exactly what these citizens envisioned, a unique urban wilderness that draws nature-lovers to what is in effect an ecological experiment, ever evolving and maturing.

This is a different example of what Rozzi has called biocultural conservation, a case where citizens have chosen to adopt a culture of earth stewardship because they recognized the value of biological diversity. It should remind us that cities are very good environments in which to promote ecological awareness, and that there is nothing quite so interesting as an ecological experiment in progress, especially when it emerges as a result of people's intrinsic love of nature.

2.4 Conclusion

Historical and contemporary examples, ranging from late-nineteenth-century debate about oyster conservation in the Chesapeake Bay to the creation of a wilderness reserve in modern Toronto, illustrate the importance of involving resource users and ordinary citizens in decisions about earth stewardship. Expert authority should be challenged when it depends on uncritical application of simplified logical arguments such as the "tragedy of the commons" argument. One powerful lesson emerging from four decades of research is the need for careful evaluation and testing of such logical arguments, which can be long-lived even when unsupported by evidence. As the history of the Chesapeake watermen illustrates, crude applications of such logical arguments can destroy trust between experts and resource users. Such trust is a necessary step toward the goal of biocultural conservation. The work of Ostrom and her colleagues demonstrates that the predictions of conventional theory may be quite wrong and that people are capable of adopting good cooperative solutions. Their work supports Jane Jacobs's inspired idea that one must observe how people actually behave, rather than assume how they might behave, when thinking about how cities function.

In order to understand people and their environments, another type of cross-cultural dialogue must be fostered between disciplines within the academic and professional spheres. As Poteete et al. (2010) recognize, creating opportunities for interdisciplinary interaction is difficult, given our expectations of how academic careers are made. Specialization is often valued over interdisciplinary collaboration. Yet solving the problems of earth stewardship, which involves understanding human behavior and human potential, must involve interactions at the frontiers where the ecological and social science disciplines meet. One of the biggest challenges within the culture of academe is to recognize the value of pioneering efforts at these interdisciplinary and intercultural frontiers. Just as we face the challenge of communication between the cultures of science and the lay public, we also face challenges within academe to find mechanisms or institutional structures that can help to build trust between scholars in different disciplines.

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