Ecology and Ethics 2

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Earth Stewardship

Linking Ecology and Ethics in Theory and Practice

Springer

Ecology and Ethics

Volume 2

Ecology and Ethics

This series is devoted to continuing research at the interfaces of ecology and ethics (embedded in the multiple fields of philosophy and ecology) to broaden our conceptual and practical frameworks in this transdisciplinary field. Confronted with global environmental change, the academic community still labors under a tradition of strong disciplinary dissociation that hinders the integration of ecological understanding and ethical values to comprehensively address the complexities of current socio-ecological problems. During the 1990s and 2000s, a transdisciplinary integration of ecology with social disciplines, especially economics, has been institutionalized via interdisciplinary societies, research programs, and mainstream journals. Work at this interface has produced novel techniques and protocols for assessing monetary values of biodiversity and ecosystem services, as illustrated by the Millennium Ecosystem Assessment. At the beginning of the 2010s, however, an equivalent integration between ecology and philosophy still remains elusive. This series undertakes the task to develop crucial theoretical and practical linkages between ecology and ethics through interdisciplinary, international, collaborative teamwork. It aims to establish a new forum and research platform to work on this vital, but until now insufficiently researched intersection between the descriptive and normative domains. The scope of this series is to facilitate the exploration of sustainable and just ways of co-inhabitation among diverse humans, and among humans and other-than-human co-inhabitants with whom we share our heterogeneous planet. It will address topics integrating the multiple fields of philosophy and ecology such as biocultural homogenization, Planetary or Earth Stewardship.

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Foreword

Ethics is embedded in a system of beliefs and practices that orient our behaviors with respect to every external factor in our lives, or what we would like those behaviors to be. In order to examine properly where global and local societies are now in the development of ethics, we must first consider the situation of the human species here on Earth.

In the 4.54-billion-year history of Earth, primates appeared about 85 million years ago and members of our genus, *Homo*, 2.3 million years ago, in Africa. *Homo erectus* and *H. ergaster* migrated out of Africa 1.3–1.8 million years ago, but the evolutionary developments that led to the appearance of modern humans continued in Africa. What are recognized as members of our species, *H. sapiens*, lived in Africa from 400,000 to 200,000 years ago, when we estimate that modern *Homo sapiens* appeared for the first time. Migrating out of Africa from 100,000 to 50,000 years ago, they colonized the whole world, replacing earlier members of the genus *Homo* everywhere they went and, ultimately, becoming the only surviving representative of the human line.

Before our ancestors developed the skills of domesticating animals and growing crops, evidently starting with the dog, they lived as small bands of mostly 20–40 individuals, rarely coming into contact with other bands and in general mostly without social interactions between them. At the time agriculture was begun, it is estimated that the entire human population of Earth amounted to only 3–4 million people, scattered widely over the six habitable continents. These people would have found patterns of behavior and ethics appropriate for their circumstances, but it is likely that many of these have survived and that they are much less appropriate in the modern world than they were originally. Following the development of crop agriculture about 12,000 years ago, some of them would have become inappropriate or even destructive as the conditions in which people lived changed rapidly. At present, though, very different styles of living are characteristic of different groups of people in mountainous, coastal, and other regions, as the chapters of this Earth Stewardship book make clear.

Over the approximately 12,000 years since the domestication of plants and animals made the formation of settled villages, towns, and cities possible by providing

a dependable supply of food, the various elements of what we now consider civilization developed gradually. When large numbers of people lived together in a single place, they could specialize in their activities and thus produce benefits for the population as a whole as well as for themselves. Poets, storytellers, religious and civic leaders, farmers, and builders appeared, and began to produce the trappings of cities and nations that characterize the world in which we live now. Ultimately, about 5,000 years ago, written languages were developed more or less at the same time in Mesopotamia and along the Nile, with cuneiform script forming the basis of most modern writing and hieroglyphics remaining a more local language along the Nile.

The invention of written language began defining for people that part of their history that was well known and understood, as the feats of kings and generals, conquest and defeat began to be recorded as they occurred. Whatever happened more than 5,000 years ago was either remembered or imagined, coming down to the people of later generations in stories and myths. Through these tales and myths, they tried to understand the meaning of life and to develop plausible stories about what had happened on Earth before the means existed to record them in a permanent form. These events pretty clearly define the erroneous belief that the world was created about 5,000 years ago that is so strangely held by fairly large numbers of well-intentioned people.

In the Bible, some of which seems to have been written at the time of David and Solomon about 4,000 years ago, two different versions of human's role on Earth are presented in the first two chapters of Genesis. Presumably the views of two different authors dating from different periods, one (the first) celebrates human's domination of Earth, to be subdued for their purposes, and the other (the second) counsels us to save and care for the Earth. This second interpretation aligns with Earth stewardship.

It is likely that after some 8,000 years of building ever-larger fields and running herds of animals over the semi-arid hills of the Near East ecological damage was obvious. In the face of these developments, it is not strange that people would have begun to recognize the need for sustainable practices locally as their numbers grew. When people existed only as widely-scattered bands foraging in natural communities, individuals and groups would have gained benefit by gathering and hoarding whatever supplies of food or other valuable commodities that they could find. Similar behaviors in the very different modern world have become highly destructive and are widely recognized as inappropriate. However, no one seems to have developed a suitable theory of what might be done about it – in some ways essentially the subject of this Ecology and Ethics book series.

In this book focusing on Earth stewardship, an effort has been made to represent a range of different land ethics and procedures practiced in different parts of the world and to use them as the basis for considering what we could learn from one another, and what we could do together. What I consider a particularly useful discussion of this aspect, and one that perhaps assists in understanding the conditions for developing general modes of globally-suitable behavior, is that of May. He points out that in Latin America, sectors of the dominant Roman Catholic Church, which traditionally have defended social justice, have in recent years integrated

concern for the natural environment into their social justice agendas. Indeed, as many Evangelical Christians emphasize, neglecting the environment is clearly at odds with the traditional admonition to care for the poor.

The science of ecology, less than a century old in its predictive form, is a necessary ingredient for the evolution of any generally effective land ethic. As Covich brings out so well in his fine review of Frank Golley's lifelong contribution, and as the various chapters on long-term ecological research in this book illustrate, we must continue making important scientific advances in ecology throughout the world. It is the knowledge we gain of these principles that put us in a position to respond to the challenges we face.

Despite this knowledge, it is by no means a simple matter to reconcile the principles of ecology with those of practical politics (as documented by Kingsland). In this context, the strong efforts of Aguirre to integrate environmental knowledge with ethics through hermeneutics and the novel methodology of field environment philosophy seems very useful to me. Although there is clearly much about living systems that we do not know (Li et al.) – for example, I estimate that we have named only about 2 million of the estimated 12 million species of eukaryotic organisms – there is a great deal of available knowledge that we can apply to enhancing the sustainability of these systems. This knowledge can be applied to building a sustainable Earth (Callicott). Such an Earth, however, must also feature social justice and the encouragement of individual talents for children, women, and men everywhere if it is to succeed. We evolved into a complex biological world that not only supports us but determines our features, and we must use practices like those proposed by the Earth Stewardship Initiative of the Ecological Society of America (Chapin and collaborators) to provide a stable basis for civilization in the future. As Rozzi has put it, echoing Leopold, we need to take all of nature into consideration from an ethical perspective, honoring and preserving it for our own sakes. His biocultural ethic emphasizes that we are coinhabitants in the natural world, no matter how complex our inventions may become. We should not neglect the understanding that that realization brings, in order to avoid being at our very great peril. In the face of these relationships, we are so dominant that we must manage the Earth's living systems actively and sustainably.

How can we work together to modify our collective behavior, driven by competitive and essentially greedy nations and individuals into what many see as an unstable nightmare? Several chapters open avenues for answering these questions by documenting pathways that are being forged by socio-ecological research networks (Hideaki, Maass and Equihua, Redman and Miller, Orenstein and Groner, Barbosa and Villagra, Goralnik et al.), religious alliances (Kerber, Tucker), policy actions (Viola and Basso), environmental citizenship and participation (Hargrove, Taylor), and new forms of conservation (Enkerlin et al., Berchez et al., Valenti and da Rocha), based on both traditional and contemporary ecological knowledge and values (Gao, Mamani, Sarmiento). However, no situation like the one we confront today has ever existed in the past, so that our future, with that of everything we hold as important, is at stake.

In much of the world, family planning is still regarded as wrong or unaffordable in the face of individual strategies for survival. In view of this, how do we reach a stable population, when we are already using more than 1.5 times what the world can produce on an ongoing basis (http://www.footprintnetwork.org), unevenly distributed in different countries and regions, and adding a net of 200,000 people per day to our current population of approximately 7.2 billion people? We don't even know that the world can indefinitely support its present human population, much less the even more appalling population numbers, an estimated 9 billion people 36 years from now in 2050. As for limiting consumption, what politician could run successfully on the basis of limiting individual consumption? Perhaps each subconsciously envisions himself in a hunter-gatherer world, so "Follow me over the next hill, and we'll all find plenty of food for everyone." In any case, limiting our consumption, although the time to do so has long since passed for many of us, is absolutely necessary but for the world as a whole seems largely unattainable. As for the development of necessary new technologies, perhaps the current shifting of the world view toward dealing in a meaningful way with global climate change offers hope for the future. In any case, I view the concepts of Ogden et al. as necessary, in understanding properly global differences in degrees and kinds of consumption, but also perhaps visionary, in their implicit assumption that people given the proper array of sound ecological knowledge will behave in increasingly appropriate ways.

In view of these factors, I believe that only a major, ultimately worldwide shift in our ethics and morals will bring about change. At the first Earth Day in the United States, April 1970, some 20 million people turned out for an individual activity somewhere, a tenth of the nation's population at that time, and politicians were quick to take notice and pass strong environmental legislation. The philosopher-biologist E.O. Wilson in his book *Social Conquest of the Earth* (2012) offers the diversity of populations that occur in some major cities as part of the hope for the future. In principle, such situations offer the possibility of overcoming prejudice and working together to achieve necessary common goals, as those proposed by Earth Stewardship. Many people remain unconcerned even with the poor and needy in their own areas, much less worldwide, but despite this we are all tied together in operating what Adlai Stevenson aptly termed "Spaceship Earth," and we must ultimately all succeed if any of us is to do so.

In view of these relationships, what I am calling for is nothing less than a worldwide moral revolution, one to which the impressive contributions of this volume linking ecology and ethics, in theory and practice, have advanced importantly. Given the structure of the society that we have evolved over the years, nothing less is likely to insure success and the continuation into the indefinite future of what we value so deeply and appropriately in our civilization.

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Chapter 1
Introduction: Linking Ecology and Ethics for an Interregional and Intercultural Earth Stewardship

Ricardo Rozzi, F. Stuart Chapin III, J. Baird Callicott, S.T.A. Pickett, Mary E. Power, Juan J. Armesto, and Roy H. May Jr.

Abstract Earth Stewardship implies a paradigm shift in linking facts and values, multiple forms of ecological knowledge and practices, and broadening the mission of the ecological sciences. However, two core limitations need to be addressed: (i) geographical gaps in the coverage of long-term ecological and socio-ecological research (LTER, LTSER, and other long-term environmental research networks) across the planet; (ii) philosophical gaps in the epistemological, political, and ethical dimensions of LTSER. If the rates of anthropogenic damage to the biosphere are to be reduced, both research and its application on a planetary scale requires transdisciplinary as well as inter-hemispheric, and intercultural inputs. Also both scientific and traditional ecological knowledge are dynamic. The integration of biocultural diversity is not an integration of a collection of biological, physical, or cultural objects; it is the incorporation of dynamic, often conflictive, processes of intercultural dialogue, negotiation, and poetic creativity. These intercultural, interdisciplinary, inter-institutional, and international processes generate forms of ecosystem co-management, which constitute Earth stewardship. Three areas of discussion contribute to finding the way forward: (1) embracing the multiple forms of

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understanding and co-inhabiting the biosphere; (2) undertaking the transdisciplinary work of long-term socio-ecological research networks; and (3) integrating ethics and ecological sciences through environmental citizenship. Bringing these broad areas together will contribute to overcoming the geographical and philosophical gaps that limit effective Earth Stewardship.

Keywords Biocultural ethics • Ecological economics • Environmental justice • Intercultural • Long-term socio-ecological research (LTSER)

Earth Stewardship implies a paradigm shift that links facts and values, multiple forms of ecological knowledge and practices, and broadens the mission of the ecological sciences. To confront global environmental change it is necessary, but not sufficient, to conduct long-term socio-ecological research. It is also necessary to act. Earth stewardship calls ecologists to engage not only in the production of knowledge, but also in public discourse, as well as in decision making, education, and governance. As a means of engaging science and society in rapidly reducing the rates of anthropogenic damage to the biosphere, the Ecological Society of America launched the Earth Stewardship Initiative in 2009 (Power and Chapin 2009; Chapin et al. 2011a, b).[1] Since then, this call for action has been appealing not only to ecologists, but also to anthropologists, sociologists, engineers, economists, religion scholars, philosophers,

[1] Note that the ESA defines Earth Stewardship as a science. Chapin et al. (2011a, p. 89) define it as "science that facilitates the active shaping of trajectories of social-ecological change to enhance ecosystem resilience and human well-being." The concept has since evolved to be "a strategy to shape the trajectories of change…;" i.e., the application of sustainability science to problem solving (Chapin et al. in this volume [Chap. 12]). In this book we focus on it as a transdisciplinary science, embedded in social and cultural action. Within the ESA, Earth Stewardship has as antecedents the notions of ecosystem stewardship (Chapin et al. 2009) and planetary stewardship (Power and Chapin 2009), and beyond the ESA it is paralleled by the Planetary Stewardship Initiative developed internationally as part of the scientific planning for Future Earth (Steffen et al. 2011). See chapters by Callicott and by Chapin et al. in this volume [Chaps. 11, 12].

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conservation biologists, and other professionals, decision makers, and citizens interested in the combination of environmental, economic, and social sustainability.

This book contributes to advancing the Stewardship Initiative toward a planetary scale. What is happening today in the Amazon depends partly on environmental policies in North America, Asia, and other continents. What happens to the climate in North America, Asia, and other continents depends in part on the conservation of forests in the Amazon. Therefore, today, inter-hemispheric, intercultural, and transdisciplinary collaborations for Earth Stewardship are an imperative. The call for socio-environmental stewardship at a planetary scale faces, however, two core limitations that need to be addressed:

(i) geographical gaps in the coverage of long-term ecological and socio-ecological research (LTER and LTSER) across the planet;
(ii) philosophical gaps in the coverage of epistemological, political and ethical dimensions in LTSER (Rozzi et al. 2012).

Geographical gaps exist because more than 90 % of LTER or LTSER sites are located in the Northern Hemisphere. As Li et al. (Chap. 13) discuss in this volume, the International Long-Term Ecological Research network (ILTER) offers an ideal research, information, and infrastructural platform for the Earth Stewardship initiative; however, it presents a marked Northern Hemisphere bias, with more than 90 % of the ILTER publications generated by researchers from the Northern Hemisphere. Furthermore, within this hemisphere 89 % of ILTER publications are generated by researchers associated with LTER networks in temperate regions, and only 1 % are in equatorial regions. Consequently, the distribution of ILTER sites is more associated with political and economic resources than with the geographic distribution of biodiversity.

Regarding philosophical gaps, until now the social component considered in socio-ecological studies worldwide has been primarily economic (Rozzi et al. 2012).[2] Furthermore, as documented by Li et al. (Chap. 13), social research is still incipient in long-term socio-ecological research programs. For example, <0.5 % of ILTER publications are included in social sciences databases. Noticeably, however,

[2] ESA's Earth Stewardship call gives special "consideration to both ecological and socioeconomic" (Chapin et al. 2011a). Similarly, the European LTSER platform was designed "as a research infrastructure to support integrated socioeconomic and ecological research and monitoring of the long-term development of society–nature interaction within the context of global environmental change" (Haberl et al. 2009, p. 1798). These quotes show that socio-ecological is subsumed by "socio-economic" in foundational documents of Earth Stewardship and LTSER (see also Parr et al. 2002; Redman et al. 2004; Lui et al. 2007; Ohl et al. 2007). It is also striking that in socio-ecological research, the fields of philosophy, including ethics, are most often absent. For example, in a recent comprehensive review of the state of the art in long-term socio-ecological research in the US and Europe by Singh et al. (2013), philosophy is not included, and the word ethics is not used. The integration of socioeconomic research into the LTSER framework during the last decades represents a significant step forward for the inclusion of the human component in LTER (See Redman and Miller in this volume [Chap. 17]). Our book complements these approaches by incorporating philosophy and ethics as disciplines into the theory and practice of LTSER and Earth Stewardship.

>99 % of all ILTER publications in the arts and the humanities are generated by researchers working in the Southern Hemisphere. This volume calls attention to the opportunities for stronger partnership and complementarity in long-term socio-ecological research and stewardship initiatives across the planet. The southern regions can demonstrably add to the integration of social, ethical, and artistic dimensions to transdisciplinary socio-ecological research at ILTER and other networks, providing a broader intercultural and participatory foundation for Earth Stewardship.

This publication has its origin in the 14th Cary Conference held at the Cary Institute of Ecosystem Studies, Millbrook, New York, in 2011.[3] During the conference we acknowledged utmost the importance of global scale and interregional dialogue integrating ecology and ethics. As a follow up, we created the *Ecology and Ethics* book series with the publishing house Springer. This volume is the second in the series. It is conceived as a companion to the first one, *Linking Ecology and Ethics for a Changing World* (Rozzi et al. 2013), which placed greater emphasis on core concepts of ecological sciences and environmental philosophy. It was organized using conceptual frameworks provided by the notion of worldview and by a biocultural approach to environmental ethics.[4] This second volume places stronger emphasis on the practice of ecology and ethics. It was stimulated by the challenges and opportunities raised by the Earth Stewardship Initiative of the Ecological Society of America (ESA). Indeed, this book elaborates a conceptual framework at the planetary scale for continuing to build Earth Stewardship as part of the centennial celebration of the ESA.

More fully understanding and respecting biocultural diversity, with the multiple forms of land stewardship it implies, will allow us more effectively and justly to confront local and global socio-environmental challenges. Through dialogical processes and partnerships it will be possible to achieve novel forms of stewardship. Both scientific and traditional ecological knowledge are dynamic. The integration of biocultural diversity is not an integration of a collection of biological, physical, or cultural objects. Rather, it is the incorporation of dynamic, often conflicting, processes of intercultural dialogue, negotiation, and poetic creativity. These

[3] The 14th Cary Conference was jointly organized by three institutions: the Cary Institute of Ecosystem Studies (New York), the Institute of Ecology and Biodiversity (IEB-Chile), and the University of North Texas (UNT). The Cary Institute has a tradition of frontier research on ecosystem science and coupled human-nature systems. IEB is a leading Latin American research center that coordinates and supports the Long-Term Socio-Ecological Research network (LTSER-Chile) in southwestern South America. The UNT Department of Philosophy and Religion Studies and its Center for Environmental Philosophy represent a world-leading center for environmental ethics. With the joint coordination of the Sub-Antarctic Biocultural Conservation Program (www.chile.unt.edu), these three institutions are supporting this *Ecology and Ethics* book series (see Rozzi et al. 2013).

[4] The formal proposal of the biocultural ethic interrelates the habits and habitats with the identities and wellbeing of the co-inhabitants, human and other-than-human beings. Consequently, the conservation of habitats and access to them by communities of co-inhabitants becomes an ethical imperative. The biocultural ethic's proposal demands to incorporate this imperative into development policies as a matter of socio-environmental justice (see Rozzi 2013).

intercultural and interdisciplinary processes generate forms of co-management of ecosystems, which contribute to planetary stewardship.

Our ultimate goal is to contribute to dynamic, intercultural, and interregional approaches to planetary stewardship initiatives. We have organized the book into three parts. Part I presents contrasting forms of understanding and co-inhabiting the biosphere, forms that often remain outside of academia and prevailing government discourses. Part II examines the Earth Stewardship Initiative, relating it to transdisciplinary work conducted at ILTER sites and networks around the globe. Part III introduces environmental citizenship and participatory approaches, policy and conservation actions, religious belief systems and alliances, and exemplary lives of people who have made, and are making, a difference for practicing Earth stewardship. These approaches and initiatives place the value of life, human and other-than-human, above the value of capital, and have the capacity to implement Earth stewardship practices driven by that reoriented value hierarchy.

1.1 Part I: A Biocultural Approach to Earth Stewardship

Earth stewardship is a biocultural practice because it operates at the interface of biophysical and cultural domains. Different forms of stewardship have evolved from ancient, collective practices in Global Western, Southern, and Eastern societies. Ricardo Rozzi indicates that preserving the diversity of ways of understanding the natural world and of co-inhabiting with it is an essential aspect of the stewardship of both local places and the entire Earth. Part I examines multiple current forms of ecological knowledge and practices in various regions of the world—such as crab- and oyster-harvesting communities living on the Chesapeake Bay, the ancient agricultural tradition of *satoyama* that today molds the life of remnant rural communities in Japan, and lifeways of the Aymara and Quechua people in the high Andean Plateau that relate to the Earth as a living being and regard themselves as integrally connected to the forces of nature. In these living ecological worldviews and practices we can find vital elements to enrich our understanding of Earth stewardship today.

Focusing on local ecological knowledge in North America, Sharon Kingsland calls attention to the complex history of integrating ecological sciences and vernacular conservation practices. Based on a case study in Chesapeake Bay (eastern United States), Kingsland criticizes the split between two cultures: that of scientists and that of "watermen" whose livelihoods rely on harvesting of shellfish. The first culture is based on faith in theoretical models and logical arguments, while the second on knowledge grounded in everyday experience. The historical analysis of this case illustrates how this split was overcome through collaborative work that led to the establishment of co-management practices involving watermen, scientists, and policy makers. Kingsland remarks that scientists are now being challenged to overcome disciplinary constraints in order to be able to produce innovative responses to address the environmental, economic, and social challenges of the twenty-first century.

Scientists must interact with local communities in more respectful and open-minded ways in order to better assist and participate in Earth stewardship.

Hideaki Shibata presents an elegant example of how scientific and traditional ecological knowledge can complement each other. His overview of Japanese ecosystems and cultures introduces the experience of his country's Long-term Ecological Research network (JaLTER), which explores social-ecological interactions along with the more usual focus of LTER programs on biophysical patterns and processes. Shibata shows that traditional ecological knowledge continues to be important to the biogeochemistry of landscapes, and that environmental ethics and belief systems that respect nature can be guiding references for plans to develop a sustainable future. The example of JaLTER's incorporating traditional ecological knowledge in its core research mandate is a powerful one.

In Chinese philosophical traditions, as well as in everyday life, the aesthetic appreciation of nature is central. Shan Gao examines how aesthetic appreciation of nature is also aesthetic appreciation of *ch'i*, a core concept in Chinese philosophy that has no physical form, is invisible, and is always in an unceasing process of movement that produces and reproduces life. Both Shibata and Gao examine ways of understanding nature that include visible and invisible realities (the *kami* among Japan's Ainu population), and how such understanding shapes social-ecological relationships. Shibata affirms that "from ancient times, there has been an established traditional religion that fosters respect for diverse natural objects, including both visible and invisible entities, through a belief in nature deities that reside in various natural places such as mountains, forests, lakes, and oceans."

Visible and invisible realms of reality also play an essential role in Andean worldviews in South America. Based on his research on sacred sites, Fausto Sarmiento introduces the dynamic integration of the physical, the psychological, and the spiritual realms in the Quechua worldview. The triad of body, mind, and spirit is not exclusive to humans. As a member of an Aymara community and a feminist in Bolivia, Vicenta Mamani presents another Andean worldview. She shows how Aymara life is framed in rituals regarding the *Pachamama* or Mother (*mama*) Earth (*pacha*), based on a close and communicative relationship with nature. Humans and their social organizations, nature, and the spirits of humans, nature, and the divine, constitute an indissoluble unit. The Aymara worldview is based on male-female pairing because reciprocity, duality, and complementarity are fundamental concepts. Even personhood is not granted to the individual but to the couple in Aymara societies. Collective complementarity is the basis of labor relations and forms of collective labor continue to be an important dimension of community life and for respecting the *Pachamama* as a living being. Hard work, honesty and truthfulness, generosity and hospitality are Aymara values that reinforce collective labor practices. These values could acquire a broader cultural significance within the Earth Stewardship Initiative.

Also starting from the Aymara worldview, Roy May discusses the concept of Earth Stewardship. He highlights how this concept arises from peasant societies where the earth or land is fundamental to their well-being. Many ancient peasant traditions (including that of Adam and Eve), emphasize the earth as the substance of

human genesis and as the means that make life possible. Humanity is seen as being part of a network of interrelationships binding together the earth and the human, in such a way that a good and just life is facilitated, as conveyed by the Andean idea of *Pachamama*. In Aymara and other Andean societies, May highlights the multiple and important functions of llamas. Even the dung they produce is worthy of respect and care because it contributes to the cycle of life through enriched soil for cultivation. It is this integral respect for the animal that makes the llama a fitting metaphor for stewardship. Reading stewardship from the praxis of peasant societies such as the Aymara, provides a perspective that emphasizes mutuality, care and protection, and advocacy for the wellbeing of the Earth and its many forms of life.

The closing chapters of Part I address a core question. If there are so many forms of traditional ecological knowledge with associated traditions of ecologically sustainable practices, why do we face environmental crises in Asia, Latin America, and around the globe? The chapters by Ricardo Rozzi and by Laura Ogden and collaborators provide complementary answers. Rozzi combines the conceptual frameworks of the biocultural ethic and of liberation philosophy to argue that the core problem is axiological, that is, a matter of values. Today, the value of capital is ranked above the value of life. As Argentinean-Mexican philosopher Dussel (2003) has demonstrated, this scale of values is in disagreement with the theological and philosophical roots of Western civilization. Therefore, Rozzi argues that it is necessary to re-establish the right hierarchy of values; that is, to rank the value of life above the value of capital. This conclusion coincides with the perspective of influential US environmental philosophers, such as Holmes Rolston (1985) or Mark Sagoff (2008). As concisely stated by Poole et al. (2013, p. 356) in the closing chapter of the first book of this *Ecology and Ethics* series, "inverting the value hierarchy—i.e., treating economic value as the primary value as we usually do—is as incorrect as planting a tree with its roots in the air."

From the perspective of political ecology, Laura Ogden et al. argue that social-ecological changes associated with global assemblages—that is, globally extensive and multiform governance arrangements—disproportionately impact poorer nations and communities along the development continuum, or the "Global South," as well as others who depend largely on natural resources for subsistence. Complementarily, they show how transnational networks of grassroots organizations resist the negative social and environmental impacts of global assemblages, thus fostering social-ecological resilience. Thus, new community-based global assemblages have emerged as alternative governance mechanisms to counteract the hegemony of corporate, economic versions of the global order.

In summary, the biocultural approach undertaken in Part I suggests that to build a solid Earth Stewardship initiative, we need to identify more precisely the main agents responsible for socio-environmental problems at all scales, from local to global. They are not humanity in general, but specific agents—unequal power relationships, exclusionary institutional arrangements, inequitable and unjust economic strategies. Rozzi concludes that omitting this specification in the diagnosis of global environmental change would be a mistake as serious as a physician blaming microorganisms in general for a disease, rather than identifying the specific organisms

that are actually responsible for an infection. As Aldo Leopold (1949, p. 258) stated, "health is the capacity of the land for self-renewal. Conservation is our effort to understand and preserve this capacity." A biocultural approach to Earth stewardship helps to achieve a better diagnosis of specific threats and opportunities for conserving the health of the land and people.

1.2 Part II: Integrating Stewardship Across Disciplines and Scales

The chapters in Part I lay out a broad range of topics that form the threads of a stewardship tapestry. These threads are diverse, both conceptually and culturally, suggesting that the formulation of effective approaches to Earth Stewardship will vary with time, place, scale, and audience. It is unlikely that a single formula or strategy of stewardship will be universally effective, but rather that different conceptual threads of stewardship will vary in their importance depending on context. The chapters in Part II explore stewardship across scales, disciplines including the humanities and ecological sciences, and the timely relationship between stewardship and the Long-Term Socio-Ecological Research (LTER) networks.

Paradigm shifts, such as that implied by Earth Stewardship, often require examining the past in order to transform the present and project into the future. J. Baird Callicott traces the history of tension between ecological science and advocacy in the Ecological Society of America (ESA) from its birth nearly a century ago to the present. Callicott examines the work of the first president of the ESA, Victor Shelford. Today, we can learn from Shelford by understanding how he combined theory and practice in his proposal to create the Committee for the Preservation of Natural Conditions for Ecological Study in 1917. In today's terminology, Shelford developed a pioneer transdisciplinary approach by working closely with federal and state governmental agencies to implement "nature sanctuaries" as "research reserves" that were protected from impacts by people. However, as Callicott points out, in contrast to Shelford's early aim to preserve natural reserves free of human influence, stewardship efforts now recognize the importance of integrating humans as essential components of ecosystems.

Chapin et al. describe how renewed concern about human impacts on the biosphere led to the Earth Stewardship Initiative of the Ecological Society of America (ESA). This chapter, coauthored by current and past presidents of the ESA, discusses multiple approaches that were used to develop a platform for stewardship action, as illustrated in four case studies. Approaches included clarification of the stewardship concept through articles and a website, open discussion and elaboration of the stewardship concept at ESA's annual meetings, engagement of ESA members in activities organized by ESA sections, and outreach beyond ecology through collaborations and demonstration projects with academics and practitioners from other disciplines as well as with other groups in civil society.

The following chapters describe the application of diverse stewardship approaches in contrasting cultural contexts, drawing primarily on experiences from the

International Long-Term Ecological Research (ILTER) network. Maass and Equihua discuss the conceptual framework that has guided the ILTER in its stewardship efforts. They undertake a transdisciplinary research approach to understanding socio-ecosystems, representing an important epistemological shift from earlier LTER paradigms that focused on ecology, with people viewed as external influences rather than integral components of the system.

An initiative at a global scale presupposes information about the different regions of the planet. Ben Li and collaborators examine the cumulative publication output of the ILTER network—some 30,000 publications—to document striking gaps in terms of regions of the world where knowledge is produced and published, and the type of information that is included in ILTER research. This chapter provides a quantitative diagnosis of critical geographical and conceptual gaps in ILTER that an Earth Stewardship initiative should aim to fill. Ways to integrate ecological sciences and ethics should be found in order to solve intercultural and interdisciplinary conceptual gaps. To address these gaps, Jorge Aguirre describes field environmental philosophy (FEP), a methodological approach developed in Latin America that underscores the value of the integration of poetic work with scientific and philosophical research into education and conservation. Aguirre enriches the FEP methodology by incorporating hermeneutics—i.e., theory of text interpretation—with a dual purpose:

(i) to deconstruct a narrow economic-utilitarian rationality, which is not inherent to human nature but emerged in a particular historical and cultural context, and
(ii) to develop innovative practices of biocultural conservation that are informed scientifically and ethically, illustrated with examples from Mexico and Chile.

The arts and humanities also contribute to interdisciplinary research at sites of the US LTER network. Based on an extensive series of questionnaires, Lissy Goralnick et al. describe novel collaborations among ecologists, artists, writers, and philosophers to frame the stewardship discussion in a very different context, using multiple media to explore distinct ways to communicate concerns about Earth's future. They focus on empathy as a key element because empathy touches those scientists and students who have developed a commitment and sense of responsibility to stewardship. This focus coincides with one of the methodological elements highlighted by Aguirre regarding FEP, in resonance with the essay "Thinking like a Mountain," written by Aldo Leopold—another ESA president who articulated a stewardship ethic, as Callicott explains.

To achieve interdisciplinary work, Charles Redman and Thaddeus Miller emphasize the methodological importance of understanding the specific meanings of concepts used with contrasting connotations by different disciplines. They note that infrastructure has both technological and cultural implications. Within a new interdisciplinary framework, they propose that infrastructure should be considered in the context of three equally important domains: social, ecological, and technological/infrastructural systems (SETS).

Part II closes with two chapters that present case studies of interdisciplinary work in remote arid, rural Mediterranean, and urban ecosystems. Daniel Orenstein

and Elli Groner describe an LTER site on the border between Jordan and Israel that provides a venue for developing trust and collaborations in a politically contentious region of the world. They describe discussions about what kind of knowledge is important to local stakeholders. In some cases, experts can clarify which management actions should receive highest priority and which require either more research to fill knowledge gaps or greater dialogue to overcome gaps in values between locals and scientists. For example, the aesthetic value of landscapes often is more relevant to citizens and decision makers than to scientists. Orenstein and Groner propose a social-based research approach to ecosystem services within the LTSER platform that provides a framework for integrating the values and opinions of local communities into the local research and policy agenda. This social-based approach to ecosystem services assessment—which has proven to be a catalyst for constructive, community-level engagement—could be further applied within the Earth Stewardship initiative. Olga Barbosa and Paula Villagra highlight the relevance of combining bottom-up with top-down approaches. Capacity-building in local communities is as important as building relationships with regional and national government institutions and private business organizations.

In summary, Part II explores the integration of historical and cultural analyses, philosophical methodologies, and long-term socio-ecological research platforms, with practices that are essential for creating a stronger stewardship commitment that is conceptually grounded in diverse realities, and is relevant to addressing the practical issues faced by today's global and local societies. Effective approaches depend deeply on cultural context, requiring interdisciplinary exploration, study, partnership, and infrastructural implementation throughout the world.

1.3 Part III: Integrating Ecology and Ethics as a Foundation for Earth Stewardship Action

This final part introduces concepts, ongoing initiatives, and future perspectives for stewardship actions. Earth stewardship, as much citizenship, entails rights and responsibilities. Eugene Hargrove introduces the concept of Earth citizenship as a metaphor for an ecological governance of the planet as its capacity to support human life is pushed to the limits. Following Mark Sagoff, he contrasts the notions of *citizen* and *consumer.* Furthermore, Hargrove argues that stewardship has a religious connotation, whereas citizenship is religiously neutral, and therefore can be widely accepted across the many cultures of the world. Peter Taylor emphasizes the importance of engagement and participation of people, cultivating collaborators, transversality, and fostering curiosity for dynamic environmental planning and management. Engagement and participation of people also is central to the approach to protected areas taken by the International Union for Conservation of Nature (ICUN). Ernesto Enkerlin and collaborators introduce the "Promise of Sydney," the focus of the 2014 World Parks Congress in Australia, to emphasize that protected areas can be an effective strategy to put Earth stewardship into action. They argue that protected