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CONTENTS

Integrating Ecological Sciences and Environmental Ethics into Biocultural Conservation in South American Temperate Sub-Antarctic Ecosystems

A Special Issue

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NEWS AND NOTES

❍ *Environmental Ethics* will soon be available online through libraries as part of POIESIS, a subscription-based reference and publishing service offering searchable access to the full text of hundreds of current, recent, and back issues of a growing number of philosophy journals and series, developed and maintained by the Philosophy Documentation Center (http://www.pdcnet.org). Every word in every available issue will be fully searchable, including all articles and book reviews as well all abstracts, footnotes, and bibliographic listings. To have access, libraries will have to subscribe to POISESIS and be a current institutional subscriber to *Environmental Ethics.* The Philosophy Documentation Center is also in the process of developing an online electronic-only subscription service for its journals. *Environmental Ethics* plans to participate in this program at the institutional level. Details about online access, including pricing and terms, will be available in December 2008 at http://www.pdcnet.org.

❍ The 2009 International Academic and Community Conference on Animals and Society: Minding Animals will be held from Monday 13 to Saturday 18 July 2009 at Civic Precinct, Newcastle, NSW, Australia. The conference boasts a distinguished line up of international speakers, who will be giving keynote addresses and be very much part of conference proceedings. Delegates will have the choice of attending a diverse range of concurrent sessions, panel presentations, and seminars, as well as a public lecture being held on Friday 17 July. If you wish to submit an abstract for an oral or poster presentation, please visit the website http://www.mindinganimals.com and follow the instructions. Queries regarding the conference should be sent to Rod Bennison at the Conference Secretariat, rod.bennison@newcastle.edu.au.

❍ The Seventh International Conference on Environmental Aesthetics, titled "Celestial Aesthetics: The Aesthetics of Sky, Space, and Heaven," will be held at the Valamo Monastery, Heinävesi, Finland, Thursday to Saturday, 26 to 28 March 2009. This conference is the seventh held over a fifteen-year period starting in 1994. Previous conferences reflected on the Earth itself: forests, bogs, water, fields, and rocks. For more information, visit http://webit.pkky.fi/skyconference/english/eng-index.htm.

❍ The Fifth World Environmental Education Congress will be held at the Palais des Congrès in Montreal from 10 to 14 May 2009. Information about this congress can be found on the congress site: http://www.5weec.uqam.ca. The congress has three objectives: (1) promoting the role environmental education plays in developing and enriching human identity and constructing more healthy individuals, communities, and societies; (2) highlighting the contribution environmental education brings to social innovation by addressing socio-ecological issues and contributing to eco-development within all societies; and (3) emphasizing the role environmental education can play in public policy development, and how public policy can strengthen environmental education.

FROM THE EDITOR

About this Special Issue

This issue is a rare special issue dealing with environmental ethics and frontier ecosystems at the southern tip of South America. It is the third special issue of *Environmental Ethics.* The first special issue, Summer 1982, was on "Environmental Ethics and Contemporary Ethical Theory" and was a collection of papers from an environmental ethics conference held at the Georgia Center for Continuing Education at the University of Georgia in October 1981. The second special issue, Winter 1986, was on "Asian Traditions as Conceptual Resource for Environmental Ethics" and was a collection of papers from sessions on environmental ethics and Asian and comparative philosophy, held at American Philosophical Association meetings in December 1985 and March 1986. These sessions were cosponsored by *Environmental Ethics,* the Society for Asian and Comparative Philosophy, and the journal *Philosophy East and West.* Additional papers from the sessions appeared as an issue of *Philosophy East and West,* volume 37, no. 2 (April 1987).

There have been no other special issues for several reasons. Two candidates for special issues were a conference cosponsored by *Environmental Ethics* held at the University of Denver in 1982, "Ethical Issues of the Environment: Some Religious Perspectives," and another conference at the Georgia Center at the University of Georgia in 1985, "Environmental Ethics and the Solar System." However, the papers from these conferences eventually became books: *Religion and Environmental Crisis,* published by the University of Georgia Press in 1986, and *Beyond Spaceship Earth: Environmental Ethics and the Solar System,* published by Sierra Club Books also in 1986. Special issues in the 1990s and the early 2000s were not possible because a backlog of accepted papers made it difficult to publish accepted papers on a timely basis. Special issues would have made this situation worse.

This special issue is the result of a commitment by the Center for Environmental Philosophy, the parent of this journal, to participate in a workshop in South America, "Integrating Ecological Sciences and Environmental Ethics: New Approaches to Understanding and Conserving Frontier Ecosystems," sponsored by the Department of Philosophy and Religion Studies at the University of North Texas and the Institute of Ecology and Biodiversity at the University of Chile, with funding from the National Science Foundation and the Chilean Ministry of Planning.

The possibility of projects such as this one began with a decision by the UNT Department of Philosophy and Religion Studies, when I was still chair, to hire a faculty member who could interact with environmental philosophers in South America. After a national search, we selected Ricardo Rozzi, an ecologist from the

University of Connecticut with a graduate degree in philosophy and a specialty in environmental ethics. He has exceeded our expectations in all respects, putting the philosophy department into contact with philosophers and ecologists throughout Latin America and making UNT a key player in a consortium of institutions and organizations in North and South America in environmental science and philosophy.

In 2000 Rozzi lead an effort to create the Omora Ethnobotanical Park on Navarino Island in the Cape Horn Archipelogo. In 2005 he lead a second effort to create the UNESCO Cape Horn Biosphere Reserve. The creation of the park and the biosphere reserve, in turn, set the stage for a cooperative agreement between UNT and the University of Magallanes, the southern most university in the Western Hemisphere, for research and instruction in the park and the biosphere reserve. The consortium is made up of the two universities plus in South America, the Omora Foundation, a nonprofit associated with the park, and the Institute of Ecology and Biodiversity at the University of Chile, Santiago, and in North America, the Omora Sub-Antartic Research Alliance and the Center for Environmental Philosophy. Within the University of North Texas itself, moreover, a new program has been created, the UNT Chile Program, a cooperative effort between the Department of Philosophy and Religion Studies and the Environmental Science Program of the Institute of Applied Sciences.

This consortium is not intended as an exclusive group, but rather is expected to serve as a hub through which other universities in North and South America can participate. For example, arrangements can be made for students from other universities to participate in the Omora Study Abroad Program, currently a course called "Tracing Darwin's Path," focused on both the sciences and the humanities.

The workshop upon which this special issue is based began with academic sessions at the Senda Darwin Biological Station on Chiloé Island, followed by a four-day trip down the coast of Chile by ship from Puerto Montt to Punta Arenas, with additional sessions at the Univeristy of Magallanes in Punta Arenas, and for some a meeting at the Institute of Ecology and Biodiversity in Santiago, Chile. The workshop was held in a part of Chile that is very lightly populated and can therefore appropriately be characterized as a land of frontier ecosystems.

This issue is the first to have guest editors. In addition to Ricardo Rozzi, the guest editors are Juan J. Armesto, President of the Senda Darwin Foundation and a distinguished ecologist with the Institute of Ecology and Biodiversity, and Robert Frodeman, the director of the UNT Center for the Study of Interdisciplinarity and until recently chair of the UNT philosophy department.

While it is not possible to mention here all of the people of critical importance to the consortium's success, four deserve special attention: Mary Kalin Arroyo of the Institute of Ecology and Biodiversity, Francisca Massardo of the University of Magallanes and the Omora Foundation, Christopher Anderson of the Omora Sub-Antarctic Research Alliance, and Vish Prasad, UNT Vice President for Research and Economic Development.

For more information, visit the UNT Chile Program at http://chile.unt.edu.

Integrating Ecological Sciences and Environmental Ethics into Biocultural Conservation in South American Temperate Sub-Antarctic Ecosystems

Ricardo Rozzi, Juan J. Armesto, and Robert Frodeman*

I

This special issue of *Environmental Ethics* is based on the workshop "Integrating Ecological Sciences and Environmental Ethics: New Approaches to Understanding and Conserving Frontier Ecosystems," held in the temperate sub-Antarctic region of southern Chile, in March 2007.[1] The workshop was jointly organized by the Department of Philosophy and Religion Studies of the University of North Texas (UNT) and the Institute of Ecology and Biodiversity (IEB-Chile), in collaboration with the Center for Environmental Philosophy, and followed a three-week field graduate course, "Conservation and Society: Biocultural Diversity and Environmental Ethics," involving graduate students from the U.S. and Latin America. These events built on a decade of collaboration between UNT environmental philosophers and Chilean ecologists, and were followed by two symposia held subsequently at two annual meetings of the Ecological Society of America (2007 and 2008).[2]

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[1] The field course and workshop were held at Senda Darwin Biological Station, University of Magallanes, and the Institute of Ecology and Biodiversity (IEB), and included a navigation through the sub-Antarctic archipelagos. See http://www.phil.unt.edu/chile/research/workshop2007/workshop.html.

[2] Regarding the collaboration of UNT philosophers with U.S, and Chilean ecologists developing a transdisciplinary approach to integrating ecological sciences and environmental philosophy, see Max Oelschlaeger and Ricardo Rozzi, "El Nudo Gordiano Interdisciplinario: Un Desafío para la Sustentabilidad," *Ambiente y Desarrollo* 14, no. 3 (1998): 71–81; Ricardo Rozzi, Eugene Hargrove, Juan J. Armesto, Steward T. A. Pickett, and John Silander, Jr., "Natural drift" as a Post-Modern Metaphor,"

Conservation biology is a transdisciplinary field which has succeeded in incorporating environmental economics and ecological restoration into its research and practice.[3] However, it has been less successful thus far in including insights from environmental philosophy. The main objective of the March 2007 workshop was to develop a conceptual framework and an experimental approach to integrate environmental ethics and ecological sciences not as a purely theoretical exercise, but focusing on the conservation concerns of a specific region of the world: the temperate sub-Antarctic ecosystems of southern South America (fig. 1).

Today, just one fifth of the world's original forest cover remains in relatively large tracts of undisturbed land. These areas have been called frontier forests.[4] Only three percent of the world's frontier forests are found in temperate zones. The temperate regions of North and South America and the rest of the world have suffered more intense and prolonged modern industrial impacts than their tropical counterparts.[5] In this context, the temperate sub-Antarctic region of South America is one of the twenty-four most pristine areas in the world.[6] It contains the largest span of continuous temperate forests in the Southern Hemisphere, including the world's southernmost forest ecosystems, which reach 56ºS at Cape Horn. During the first decade of the twenty-first century, however, the remote character of southwestern South America is being rapidly transformed by the opening of new terrestrial and navigational routes, damming of major rivers for hydroelectric power generation, mining, expanding salmon farming, increasing tourism, the spreading of exotic invasive species, and global climate change.

Revista Chilena de Historia Natural 71 (1998): 9–21. The abstracts of the papers presented at the two symposia are available at: http://eco.confex.com/eco/2007/techprogram/S1199.HTM (2007), and http://eco.confex.com/eco/2008/techprogram/S2755.htm (2008).

[3] See Laura Nahuelhual, Pablo Donoso, Antonio Lara, Daisy Nuñez, Carlos Oyarzun, and Eduardo Neira, "Valuing Ecosystem Services of Chilean Temperate Rain Forests," *Environment, Development and Sustainability* 9 (2007): 481–99.

[4] For definitions of frontier forests, and their world distribution, see Dirk Bryant, Daniel Nielsen, and Laura Tangley, *The Last Frontier Forests: Ecosystems and Economies on the Edge* (Washington D.C.: World Resources Institute, 1997). For a critical assessment of the term, see John L. Innes and Kennteh B. Er, "Questionable Utility of the Frontier Forest Concept," *BioScience* 52 (2002): 1095–109.

[5] In the Americas, temperate regions represent the primary places of colonization by European immigrants, involving the most intensive exploitation of natural resources and land-use changes during the industrial age. Consequently, these are the most threatened forest biomes. This situation highlights the significance of the frontier temperate sub-Antarctic forests of South America. See John Silander, Jr., "Temperate Forests: Plant Species Biodiversity and Conservation," in S. A. Levin, ed., *Encyclopedia of Biodiversity* (New York: Academic Press, 2000), pp. 607–26.

[6] See Russell Mittermeier, Christine Mittermeier, Thomas M. Brooks, John D. Pilgrim, William R. Konstant, Gustavo A. da Fonseca, and Cyril Kormos, "Wilderness and Biodiversity," *Proceedings of the Natioinal Academy of Science of the United States* 100 (2003): 10309–13. For biodiversity and conservation of South American temperate forests, see Juan J. Armesto, Ricardo Rozzi, Cecilia Smith-Ramírez, and Mary Kalin-Arroyo, "Conservation Targets in South American Temperate Forests," *Science* 282 (1998): 1271–72. For the sub-Antarctic Magellanic ecosystems, see Ricardo Rozzi, Juan J. Armesto, Bernard Goffinet, William Buck, Francisca Massardo, John Silander, Jr., Mary Kalin-Arroyo, Shaun Russell, Christopher B. Anderson, Lohengrin Cavieres, and J. Baird Callicott, "Changing Biodiversity Conservation Lenses: Insights from the Sub-Antarctic Non-Vascular Flora of Southern South America," *Frontiers in Ecology and the Environment* 6 (2007): 131–37.

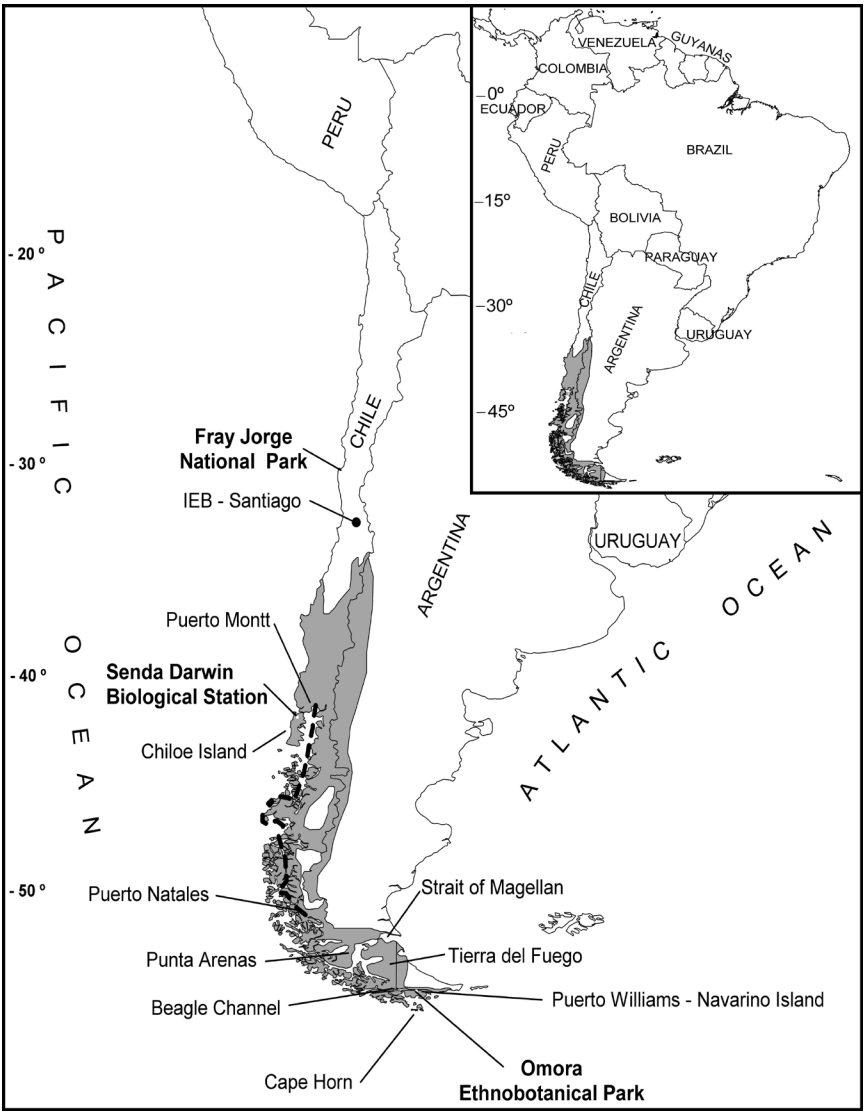

Figure 1. The temperate sub-Antarctic region of southwestern South America (gray area), where the workshop "Integrating Ecological Sciences and Environmental Ethics: New Approaches to Understanding and Conserving Frontier Ecosystems" was held in March 2007. The dashed line indicates the navigation route through the archipelago. In bold, the three sites of the Chilean Long-Term Socio-Ecological Research (LTSER) network—Fray Jorge National Park (30ºS), Senda Darwin Biological Station (42ºS), and Omora Ethnobotanical Park (55ºS)—are shown. The map also shows the locations of places in Chile frequently mentioned in this issue. The gray shading shows the distribution of the temperate sub-Antartic forests.

It is against this backdrop of rapid cultural, social, economic, and ecological transformation in this unique area of the world that a group of Chilean and U.S. philosophers and ecologists proposed the workshop that gave origin to this special issue of *Environmental Ethics*. Developing sustainable scenarios for the future of frontier ecosystems demands innovative, transdisciplinary, inter-institutional approaches implemented through local, regional, and international collaborations. This collection of articles provides complementary perspectives that build on an integration of philosophy and ecology, to better understand the challenges of conserving frontier ecosystems, especially in temperate sub-Antarctic South America. We hope that the papers included in this volume will catalyze further development of transdisciplinary approaches for ecological-philosophical research, education, and conservation, as well as nurturing collaborative efforts associated with the goals of the temperate sub-Antarctic biocultural conservation program jointly coordinated by IEB and UNT.[7]

II

Instead of the single-authored articles usually found in this journal, in the current issue, the reader will find multiple-authored papers, which are the result of biocultural research and conservation demanding teamwork at regional and international scales. Consequently, half of the articles are co-authored by Latin American, European, and U.S. philosophers and ecologists working together to enhance biocultural conservation in the temperate sub-Antarctic region of South America. In addition, some articles modify the usual format of this journal by including figures and tables, which aim to facilitate reading by decision makers. Figures and tables also reflect the transdisciplinary nature of this volume.

Baird Callicott opens the debate by asking: "What is the concept of wilderness?" Is this even a word that can be translated from English into other languages? Through his analysis, Callicott critically revises the wilderness concept with regard to the actual inhabitation of wild landscapes by Amerindians. After contrasting the Puritan and transcendentalist perspectives on wilderness tradition, he refers to the emergence of U.S. twentieth-century conservation within the Ecological Society of America (ESA). This process confronted two challenges that are still relevant for twenty-first-century conservation: (1) the tension between recreational and strictly scientific approaches, and (2) the resistance of members of the ESA to become involved in advocacy, because they feared that this involvement would undermine their scientific legitimacy and credibility. Callicott's perspective offers a conceptual framework for a scientific conservation approach that incorporates natural disturbances and better integrates humans and protected areas.

[7] This volume will be complemented by a set of essays to be published in a Chilean ecological journal, *Revista Chilena de Historia Natural,* including papers presented at the March 2007 workshop, and in a subsequent workshop in June 2008 (see http://www.chile.unt.edu/ltser/index.htm). See also Robert Frodeman, "The Policy Turn in Environmental Ethics," *Environmental Ethics* 28 (2006): 3–20.

In the next essay, Sergio Guevara and Javier Laborde emphasize that Latin American—and the Caribbean region—hosts most of the world's biodiversity. This region requires a conservation model that integrates people and protected areas. For this purpose, biosphere reserves offer the best model.[8] The authors propose a "centrifugal" model for biosphere reserves which aims to facilitate the movement of native plants and animals out from the strictly protected core zones into transition zones of the reserves, and even outside protected areas into anthropogenic landscapes. This fluent and dynamic model is proposed to overcome a prevailing "fence" model of protected areas that excludes humans.

Christopher Anderson and collaborators highlight the incorporation of the human dimension of ecology into a new international concept of Long-Term Socio-Ecological Research (LTSER). They offer an overview of long-term ecological research programs in the U.S., Latin America, and worldwide, and describe initial steps of a nascent LTSER network of study sites in Chile. For international environmental monitoring programs, this Chilean LTSER network not only adds a new and understudied remote region to the map of global monitoring of ecosystems, but also offers a platform for an integration of environmental philosophy and ecological sciences embedded in the temperate sub-Antarctic region through international field courses, research, and conservation actions.

Long-term research conducted by Uta Berghoefer and collaborators demonstrate that even in a very small and remote place—Puerto Williams, the southernmost town in the world—we find a diversity of contrasting human relationships with nature. These findings help us overcome the dichotomous labels of "local" and "global" ecological knowledge. Their approach emphasizes the need for specificity regarding ecological perceptions held by specific persons or socio-cultural groups, at specific localities and historical moments.

In turn, Robert Frodeman explores what is pertinent knowledge and argues that a de-disciplined notion of philosophy is central to achieving transdisciplinary understanding. He underlines that interdisciplinarizing knowledge is "slow, inefficient, and painful." In order to advance in this direction, the joint research teams from UNT and IEB are conducting what can be called "field philosophy" in the sub-Antartic region of Chile.

Gene Hargrove recalls that environmental ethics is a discipline which provides a conceptual foundation for environmental education that goes beyond the prevailing economic approach to valuing nature. Hargrove identifies three roots for economic thinking: positivism, pragmatism, and utilitarianism. He concludes by emphasizing the need to find conceptual foundations for sound environmental ethics and education in the cultural and historical contexts of each region. This view is compatible with

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[8] Biosphere reserves include a gradient of human influence arranged in three concentric zones: strictly protected core zones at the center, surrounded by buffer zones admitting low impact human activities, which are in turn surrounded by transition zones where more intensive development can take place. See fig. 3a in Guevara and Laborde, "The Landscape Approach," p. 261, in this issue.

the approach developed by researchers at the Omora Ethnobotanical Park in the Cape Horn Biosphere Reserve, who conduct programs on Amerindian ecological knowledge and practices, and their implications for environmental philosophy.

Ricardo Rozzi and collaborators describe a program of field education based on "direct encounters" with people, mosses, birds, and other organisms in their native habitats; a type of "face-to-face" encounter that liberates us from omnipresent economic rationality by discovering other worldviews and life forms. Through these field experiences, biocultural diversity ceases to be a just a concept and becomes an experience of re-encounters with actual human and non-human beings with whom we co-inhabit. Their singularities are ungraspable by universal disembodied thinking. Accordingly, the UNT-IEB ecology-philosophy program has undertaken an *in situ* biocultural conservation approach in temperate sub-Antarctic South America.

III

History is not linear; there are several biocultural histories, simultaneously taking place in different regions of the biosphere. To discover them requires field experiences of co-inhabitation. *In situ* experiences contribute to diversify the biotic and cultural picture, pluralizing environmental philosophy and ecological sciences. This favors hybridization of knowledges of different disciplines, different cultures, grounded in different ecosystems.

The UNT-IEB temperate sub-Antarctic program introduces a bioculturally contextual ethic. Specific biotic and socio-cultural contexts hold specific forms of ecological knowledge and relationships with nature, which are habitually ignored by dominant global discourses. In this special issue, we introduce an integration of environmental philosophy and ecological sciences, which is embedded in the biocultural diversity of temperate sub-Antarctic South America, a region whose enormously rich biological and cultural diversity have been largely overlooked. We not only disclose a biocultural diversity that enriches environmental philosophy and ecological sciences, and prevents broad generalizations, but more importantly we go beyond a case-study approach. The region and its inhabitants are not merely objects of study, but are partners in the search for a sustainable biosphere.

The efforts detailed in this volume—including the recent creation of a collaborative network of three long-term socio-ecological research sites across Chile, and the consolidation of an international field environmental philosophy, ecology, and biocultural conservation program—represent more than research in a remote area. Rather than writing or developing models about a specific case study, we are building a partnership coordinated by UNT and IEB, which offers alternatives to current global cultural and biological homogenization, by addressing multiple scales, from global to local, favoring the expression of diverse forms of ecological knowledge, languages, and practices.

What "Wilderness" in Frontier Ecosystems?

J. Baird Callicott*

Wilderness, for seventeenth-century Puritan colonists in America, was hideous and howling. In the eighteenth century, Puritan preacher and theologian, Jonathan Edwards, began the process of transforming the American wilderness into an aesthetic and spiritual resource, a process completed in the nineteenth century by Ralph Waldo Emerson. Henry David. Thoreau was the first American to recommend wilderness preservation for purposes of transcendental recreation (solitude, and aesthetic and spiritual experience). In the twentieth century, Theodore Roosevelt and Aldo Leopold advocated wilderness preservation for a different kind of recreation (hunting, fishing, and primitive travel) in order to preserve the putatively unique American character and institutions. Of these three historic conceptions of wilderness preservation, the third is the best model for frontier ecosystems at the austral tip of the Americas.

INTRODUCTION

Some nouns are common names, having a simple word-object relationship. The word *table* unambiguously names a familiar artificial object that has an elevated horizontal surface used to support, among other things, dinner plates and drinking glasses. Many similar words name common features of the natural world: *river, mountain, lake, forest, cloud, sun,* and *moon.* Such words have unambiguous referents and exact counterparts in other languages. So too the English word *woman* simply names a female member of the human species and doubtless there is an equivalent word in most every other human language. For a long time, I assumed that *wilderness* was such a common name, a word with a simple, unambiguous relationship to a natural referent. But I don't think so any longer. For one thing, few languages have an equivalent word. Actually, *wilderness* is more analogous to *lady, chick, babe, broad,* or *battle axe* than to *woman*. It puts a spin on a natural object—a townless, roadless region consisting of forest, mountain, lake, and river; or desert, canyon, butte, and arroyo. It colors that region and makes it available for some uses and precludes others. Historically, the way *wilderness* colors a region of the world diametrically changed, then diverged into two clashing hues, and is presently undergoing yet another transformation in the midst of the sixth great extinction and the rise of the flux-of-nature paradigm in postmodern ecology. Furthermore, the term is currently hotly contested.

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THE NORTH AMERICAN PURITAN AND POST-PURITAN WILDERNESS IDEAS

Roderick Nash points out that the word *wilderness* occurs frequently in the English translation of the Holy Bible.[1] There *wilderness* refers to a desolate place of hardship and travail, usually desert (which of course derives from *deserted*), that functions symbolically as a place of both exile and refuge, of both moral temptation and spiritual rejuvenation. Thus, it seems no accident that when the English language gained a foothold in North America, it would be used by the bible-besotted Puritan colonists to describe the terrifying place in which they had set up shop. North America was, in the perfervid Puritan imagination, a "hideous and howling wilderness." The wilderness was full, in their estimation, of vicious animals and even more vicious human beings, who were all believed to be the minions of Satan.[2] That would make good Puritan sense: after all, there are but two Powers struggling to rule the world, God and Lucifer; clearly, the Indians were not worshipping God; but they were worshipping something, if their diabolical rituals, dances, and ceremonies were any indication; so there was only one alternative remaining.

With their thrift and Protestant work ethic, the seventeenth-century Puritan colonists succeeded in building a "shining city upon a hill."[3] Indeed, more than one. They tamed the wilderness. That is, they built towns; they converted forests to open fields; they extirpated the large carnivores; and they sickened (albeit inadvertently), murdered, or drove away the Indians. Deprived of his brutal instruments of terror and his heathen acolytes, the Devil moved to town—and fanned the flames of urban sin: drinking, fornicating, gambling, and such. By 1692, the good people of Salem believed their witches still went into the woods to conjure and to be known, to serve and to be possessed by the Devil, but a new conception of wilderness was about to dawn, after that sordid watershed episode in American history. The biologically and

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[1] Roderick Nash, *Wilderness and the American Mind* (New Haven: Yale University Press, 1967).

[2] Ibid. See also, J. Baird Callicott, "That Good Old-Time Wilderness Religion," in J. Baird Callicott and Michael P. Nelson, eds., *The Great New Wilderness Debate* (Athens: University of Georgia Press, 1998), pp. 337–66; and J. Baird Callicott and Priscilla Solis Ybrarra, "The Puritan Origins of the American Wilderness Movement," at http://nationalhumanitiescenter.org/tserve/nattrans/ntwilderness/essays/puritan.htm.

[3] The phrase is adapted from John Winthrop, governor of the Massachusetts Bay Colony, in "A Modell of Christian Charity," written in 1630 on the *Arbella* en route to New England. See Robert C. Winthrop, *Life and Letters of John Winthrop* (1864; reprint ed., Whitefish, Mont: Kessinger Publishing, 2006), p. 19. Winthrop actually wrote " City upon a Hill." The phrase became a favorite of American presidential aspirants including John F. Kennedy and Walter Mondale, but especially Ronald Reagan, who added "shining." Most recently, I heard it used by John McCain following his victory in the 2008 New Hampshire Republican primary. Winthrop used it as a simile for the colonists themselves, who, like a city upon a hill, would be conspicuously visible as they conducted their errand into the wilderness. The well-educated and literate Kennedy's use of it was faithful to Winthrop's original meaning as well as phrasing. It was Reagan who, likely familiar with it only second hand, transmogrified the phrase in such a way that it became a symbol of his own imagined epitome of American social virtue and affluence.

ethnically cleansed margins of the New England towns, farmsteads, and fields were starting to look like Eden to one eighteenth-century Puritan theologian. Jonathan Edwards found "images or shadows of divine things" in God's creation, not in the now-tarnished cities on hills; and he was acutely sensitive to "the beauty of the world"—consisting of "colours of flowers" and "singing of birds," among many other earthly delights.[4] The man who found shadows and images of divine things in nature would also be the same man who raved about "sinners in the hands of an angry God."[5] Indeed, a cornerstone of Puritan doctrine was the "total depravity" of human nature, born in "original sin." After the Fall, after all, man was banished from Eden, as the Bible starkly attests. Any presence of fallen, depraved, sin-soaked humanity in Edenic nature would sully and soil its pristine, virginal character.

So, after about a century and a quarter, the idea of wilderness in the North American mind was poised to undergo a diametrical transformation, a polar reversal of valence—from a negative to a positive charge. In the early seventeenth century, the "wilderness" was the very manifestation and embodiment of evil. By the middle of the eighteenth century, a new wilderness idea was being adumbrated. That idea consists of two complementary conceptual elements: (1) Edenic nature is infused with an essence that is pure and divine and beautiful; (2) and it is violated by any lasting physical presence of essentially depraved and sinful man. A God-fearing and righteous man might venture into pristine and pure nature, but only as a solitary sojourner and only in a state of rapture. (I use the word *rapture* here carefully and deliberately intending to evoke both its secular and current evangelical sense.)

Edwards' eighteenth-century nature theology became a nature deology (to coin a word) in the ninteenth-century work of Ralph Waldo Emerson. Emerson was a Unitarian, not a Presbyterian, preacher; and he was a transcendentalist, not a Calvinist.[6] But there is, nevertheless, a migration of the new Puritan wilderness idea implicit in Edwards' thought into Emerson's, where it becomes explicit: "In the wilderness I find something more dear and connate than in the streets and villages."[7] But how can "man" be in the wilderness without thereby defiling it; indeed, how can it not be rendered, by man's very presence, no longer a wilderness? The answer is first via solitude, for if there were only one man in the wilderness, it could scarcely be overwhelmed with a human taint and stain. Moreover, solitude itself is a valuable thing which only wilderness can supply, according to Emerson: "To go into solitude a man needs to retire as much from his chamber as from society.

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[4] Jonathan Edwards, "Images and Shadows of Divine Things," "Christian Doctrine of Original Sin Defended," and "Sinners in the Hands of an Angry God," excerpted in Callicott and Nelson, eds, *The Great New Wilderness Debate,* pp. 23–27.

[5] Ibid., p. 25.

[6] More generally Perry Miller, *Errand into the Wilderness* (Cambridge, Mass.: Harvard University Press, 1956), traces the way Transcendentalism evolved from Putitanism.

[7] Ralph Waldo Emerson, *Nature*, excerpted in Callicott and Nelson, *The Great New Wilderness Debate*, p. 30.

I am not solitary whilst I read and write, though nobody is with me."[8] Second, a man can be in the wilderness without thereby defiling it via a kind of metaphysical vanishing act, which Emerson expresses quite rapturously: "Standing on the bare ground,—my head bathed by the blithe air, and uplifted [that is, raptured] into infinite space,—all mean egotism vanishes. I become a transparent eye-ball. I am nothing. I see all. The currents of Universal Being circulate through me. I am part or particle of God."[9] Val Plumwood notes, in terms reminiscent of Emerson's own, that this Emersonian vanishing act remains at the heart of the contemporary wilderness experience:

> The presence and impact of the modern adventure tourist is somehow "written out" of focus in much of the land called wilderness. "Hike the many trails through a virgin land," says a hotel brochure, not only propounding but profiting from this contradiction. The modern subject somehow manages to be both in and out of this virginal fantasy, appearing by wilderness convention as a disembodied observer (*perhaps as the camera eye*) in a landscape whose virginity is somehow forever magically renewed, despite the hotel, the campground, the comfort stations and the ever-widening trails which bear witness to the pounding feet.[10]

It was Emerson's younger friend, Henry David Thoreau, who first called for wilderness preservation:

> I think that each town should have a park, or rather a primitive forest, of five hundred or a thousand acres, either in one body or several—where a stick should never be cut for fuel—nor for the navy, nor to make wagons, but to stand and decay for higher uses—a common possession forever, for instruction *and recreation*.[11]

RECREATION: THE RECEIVED NORTH AMERICAN WILDERNESS IDEA

Yes, recreation was the higher use to which wilderness might principally be put. But what kind of recreation? That which Edwards and Emerson described. Not a vulgar kind of carnal recreation, but a solitary, unobtrusive, spiritual kind of recreation. John Muir took the art of what one might fairly characterize as transcendental wilderness recreation to an unprecedented pitch of perfection and commended it to the general public:

> Briskly venturing and roaming, . . . washing off sins and cobweb cares of the devil's spinning in all-day storms on mountains, sauntering in rosy pinewoods or in gentian meadows, brushing through chaparral, bending down and parting sweet flowery sprays;

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[8] Ibid., p. 28.

[9] Ibid., p. 29.

[10] Val Plumwood, "Wilderness Skepticism and Wilderness Dualism," in Callicott and Nelson, *The Great New Wilderness Debate,* pp. 684–85 (emphasis added).

[11] Henry David Thoreau, "Huckleberries," excerpted in Callicott and Nelson, *The Great New Wilderness Debate*, p. 45 (emphasis added).

> tracing rivers to their sources, getting in touch with the nerves or Mother Earth; jumping from rock to rock, feeling the life of them, learning the songs of them, panting in whole-souled exercise, and rejoicing in deep long-drawn breaths of pure wildness.[12]

To quote Emerson, one "impression made by" the wilderness idea on "manifold natural objects"—such as roadless, townless regions of forests, mountains, lakes, and rivers; or of desert, canyons, buttes, and arroyos—is to make of them places suitable for transcendental wilderness recreation.[13] With the closing of the North American frontier came another "impression made by" the wilderness idea on such "manifold natural objects." During the last quarter of the nineteenth century, the remaining free Indians were conquered and the great bison herds on the Great Plains were reduced to near extinction and the transcontinental railroads were completed, all making for one, big English-speaking North American nation, stretching from the Atlantic Ocean to the Pacific, lying between sub-Arctic Canada and subtropical Mexico. In 1893, Frederick Jackson Turner read a paper titled "The Significance of the Frontier in American History" at the meetings of the American Historical Association in Chicago. Beginning by citing the census of 1880, which pointed out that there was no longer a North-American frontier (between the borders of Canada and Mexico), Turner went on to argue that what made Americans Americans—what forged the unique American character—was the interaction, over many generations, of European peoples and cultures with the unfettered freedom and challenge of a progressively westward-advancing frontier.

Turner himself did not regard the frontier-forged American character as an unalloyed good thing. He thought that the frontier experience produced a democratic, individualistic, self-reliant, anti-government-control, even anti-social American. Turner did, however, roundly celebrate the "striking characteristics" of the "American intellect":

> That coarseness and strength combined with acuteness and inquisitiveness; that practical, inventive turn of mind, quick to find expedients; that masterful grasp of material things, lacking in the artistic but powerful to effect great ends; that restless, nervous energy; that dominant individualism, working for good and for evil, and withal that buoyancy and exuberance which comes with freedom—these are traits of the frontier, or traits called out elsewhere because of the existence of the frontier.[14]

Nor did Turner himself ask the question that was soon asked by others: once the (temperate) North American frontier irreversibly disappeared, how could the vaunted American character be perpetuated? Answer: by wilderness preservation. Thus, the untouched forested parks, envisioned by Thoreau, left to stand and decay forever, might be expanded in size and serve a different brand of recreational higher

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[12] John Muir, *Our National Parks*, excerpted in Callicott and Nelson, *The Great New Wilderness Debate*, p. 48.

[13] Emerson, *Nature*, p. 29.

[14] Frederick Jackson Turner, "The Frontier in American History" *Report of the American Historical Association for the Year 1893*, p. 225.

use. While perpetuating the American character would certainly seem to be a higher use—or at least it did, unquestionably, at the turn of the twentieth century—the kind of recreation that perpetuating the American character entailed was different from and incompatible with transcendental wilderness recreation. Perhaps it can best and least tendentiously be called woodcraft wilderness recreation, although hook-and-bullet wilderness recreation might be a more honest as well as more apt characterization.

Turner gave explicit, precise, sustained, and well-documented formulation to an idea that had already been in the air, so to speak, for more than a quarter century. In *Walking*, Thoreau, for example, treats movement toward the west as a national symbol: "We go eastward to realize history and study the works of art and literature, retracing the steps of the race; we go westward into the future, *with a sprit* of enterprise and adventure."[15] Not only the American spirit, but also American political institutions owe a debt to the frontier, according to Thoreau: "The Atlantic is a Lethan stream, in our passage over which we have had an opportunity to forget the Old World *and its institutions*. . . . In society, in the best institutions of men, it is easy to detect a certain precosity."[16]

Turner's so-called "frontier thesis" was received as a revelation by the intelligentsia of the United States and soon percolated into the early twentieth-century national zeitgeist. When that happens to a carefully crafted, nuanced, and complex historical theory, such as Turner's, simplified and personalized variations of it begin turning up in lots of different places. Especially foundational to the nascent twentieth-century wilderness movement in North America were variations on Turner's theme played by Theodore Roosevelt and Aldo Leopold.

In 1894, Turner sent a copy of his frontier thesis to Roosevelt, who was at the time known as a historian—author of the massive, four-volume *The Winning of the West*, (1889–1896)—and rising Republican politician.[17] (Roosevelt would not become President until 1901.) In that study, Roosevelt had arrived at conclusions similar to Turner's, but his conception of the frontier-forged American character was more openly racist, masculinist, bellicose, and imperialistic. As to openly racist, Roosevelt frequently compares the industry and thrift of the "Nordic" and "Teutonic" pioneers and settlers to the indolence and squalor of the "savages" they replaced.[18] As to the rest, Nash's summary is hard to beat:

> The study of American history and personal experience combined to convince Roosevelt that living in wilderness promoted "that vigorous manliness for the lack of which in a nation, as in an individual, the possession of no other qualities can atone." Conversely, he felt, the modern American was in danger of becoming an "overcivilized

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[15] Henry David Thoreau, *Walking* excerpted in Callicott and Nelson, *The Great New Wilderness Debate,* p. 34.

[16] Ibid., pp. 34, 40 (emphasis added).

[17] See Nash, *Wilderness and the American Mind*; Theodore Roosevelt, *The Winning of the West*, 4 vols. (New York: G. P. Putnam's Sons, 1889–1896).

[18] Roosevelt, The *Winning of the West*.

> man, who has lost the great fighting, masterful virtues." To counter this trend toward "flabbiness" and "slothful ease" Roosevelt in 1899 called upon his countrymen to lead a "life of strenuous endeavor." This included keeping in contact with wilderness: pioneering was an important antidote to dull mediocrity. "As our civilization grows older and more complex," Roosevelt explained, "we need a greater, not less development of the fundamental frontier virtues." . . . The wilderness preserves would serve this purpose by providing a perpetual frontier and keeping Americans in contact with primitive conditions.[19]

Leopold's conception of the frontier-forged American character was closer to that developed by Turner; and his style of expressing it so rings of Turner's that it seems obvious that Leopold too was familiar with the essay itself:

> There is little question that many of the attributes most distinctive of America and Americans are the impress of the wilderness and the life that accompanied it. If we have such a thing as an American culture (and I think we have), its distinguishing marks are a certain vigorous individualism combined with an ability to organize, a certain intellectual curiosity bent to practical ends, a lack of subservience to stiff social forms, and an intolerance of drones, all of which are the distinctive characteristics of successful pioneers. These, if anything, are the indigenous part of our Americanism, the qualities that set it apart as a new, rather than imitative contribution to civilization.[20]

Leopold virtually alludes to Turner in going on to his next point: that the frontier experience—confrontation with wilderness—shaped not only the American character, but also American political institutions. Like Roosevelt, Leopold proposes wilderness preservation as the means of preserving those institutions:

> Many observers see these qualities not only bred into our people, but built into our institutions. Is it not a bit beside the point for us to be so solicitous about preserving those institutions without giving so much as a thought to preserving the environment which produced them and which may now be one of our effective means of keeping them alive.[21]

Leopold was also very clear that the means of keeping them alive was a form of recreation. The frontier experience would be reprised in his proposed "wilderness playgrounds" not for real, but as a kind of play or sport.[22] Wilderness recreation would be to real pioneering what football is to war; and the bourgeois wilderness adventurer would be to "Hanno, or Lewis and Clark" what the bourgeois sport hunter "with his setter-dog in pursuit of partridges" is to "his Neolithic ancestor in

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[19] Nash, *Wilderness*, pp. 150–51.

[20] Aldo Leopold, "Wilderness as a Form of Land Use," reprinted in Callicott and Nelson, *The Great New Wilderness Debate,* p. 79.

[21] Ibid., pp. 79–80.

[22] Aldo Leopold, "The River of the Mother of God," in Susan L. Flader and J. Baird Callicott, eds., *The River of the Mother of God and Other Essays by Aldo Leopold* (Madison: University of Wisconsin Press, 1991), p. 126.

single combat with the Auroch bull."[23] Leopold even specified the size of a suitable wilderness area in terms of recreation, not in terms of acreage: "The term *wilderness,* as here used, means a wild, roadless area where those who are so inclined may enjoy primitive modes of travel and subsistence."[24] The primitive modes of travel that Leopold envisioned were pack train and canoe. By subsistence, Leopold had in mind hunting and fishing. In his first paper advocating wilderness preservation, Leopold was even more specific: "By 'wilderness' I mean a continuous stretch of country preserved in its natural state, open to lawful hunting and fishing, big enough to absorb two weeks pack trip, and kept devoid of roads, artificial trails, cottages, or other works of man."[25]

Combined with the art of woodcraft, which was at the core of the early-twentieth-century Boy Scout movement, the kind of recreation that Leopold lionized was hard on wilderness areas.[26] Woodcraft is the art of living off the land, equipped only with simple tools, such as knives and hatchets—gathering fruits and vegetables, catching fish and shooting game, gathering firewood and starting fires with flint and steel, cutting down saplings and building rude shelters.[27] Obviously, this woodcraft-hook-and-bullet form of wilderness recreation that Roosevelt and Leopold espoused is very different from and incompatible with the transcendental wilderness recreation espoused by Thoreau and Muir. Those playing at being pioneers and enjoying primitive modes of travel and subsistence are not transparent eyeballs rapturing up into infinite space, feeling the currents of Universal Being flowing through them, and becoming a particle of God. They manhandle nature. That's one of the reasons that Leopold was so keen on getting wilderness set-asides in the national forests. Hunting was not lawful in the national parks (nor is it now). These two incompatible forms of wilderness recreation could thus be segregated from one another. Transcendental wilderness recreation could be pursued in the national parks—which were selected, in part, because of the transcendental values they embodied.[28] The woodcraft-hook-and-bullet form of wilderness recreation could be pursued in the areas of the national forests dedicated to that purpose.

The common element, however, of transcendental wilderness recreation and the woodcraft-hook-and-bullet form of wilderness recreation is wilderness recreation. Recreation, in short, is what, in the American mind, wilderness is mainly good for. The early-twentieth-century woodcraft tradition of wilderness recreation has given way to the high-tech, take-only-photographs-leave-only-footprints late-twentieth-

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[23] Ibid., p. 125. The football and war comparison is found in "Wilderness as a Form of Land Use."

[24] Leopold, "Wilderness as a Form of Land Use," p. 135.

[25] Aldo Leopold, "The Wilderness and Its Place in Forest Recreational Policy," in Flader and Callicott, *River of the Mother of God,* p. 79.

[26] See James Morton Turner, "From Woodcraft to 'Leave No Trace': Wilderness, Consumerism, and Environmentalism in Twentieth-Century America," *Environmental History* 7 (2002): 462–84.

[27] See Edward Breck, *The Way of the Woods: a Manuel for Sportsmen in Northeastern United States and Canada* (New York: Putnam, 1908), and Horace Kephart, *The Book of Camping and Woodcraft* (New York: Outing, 1906).

[28] See Richard West Sellars, *Preserving Nature in the National Parks* (New Haven: Yale University Press, 1997).

century tradition. But recreation remains the hard core of the "received wilderness idea"—the idea of wilderness that coalesced in colonial and post-colonial North America. Leopold was one of eight founding members of the Wilderness Society, formed in 1935 to promote wilderness preservation. Their anthropocentric, recreational idea of wilderness was institutionalized in the U.S. Wilderness Act of 1964.[29] As a result, most designated wilderness areas have been selected because they are fit for one or the other or both kinds of recreation. An area must be either a place of spiritually inspiring scenic beauty or a place through which one may travel with the right balance between encountering a physical challenge, but a challenge that can be overcome without too much hardship or danger. They are, after all, "wilderness playgrounds" in Leopold's candid characterization. Thus, some biomes are severely underrepresented in the U.S. wilderness system—especially grasslands, wetlands, and scrublands.

THE ALTERNATIVE ECOLOGICAL WILDERNESS IDEA

During the first half of the twentieth century, a new and very different wilderness idea was conceived by ecologists. At that time, ecology was dominated by an essentially Clementsian paradigm. Clements thought that the objects of ecological study were what might be called third-order organisms, organisms of the third kind, or superorganisms.[30] The first organisms—first-order organisms—were single-celled. Through close symbiotic association, single-celled organisms evolved into multi-celled organisms—second-order organisms. Likewise, through close symbiotic association, multi-celled organisms evolved into third-order organisms—superorganisms. Until the invention of the microscope, we could not perceive single-celled organisms—because they are too small—nor did we even know that they existed. Neither do we perceive superorganisms, as organisms, because they are too big. The invention of ecology, however, provides a conceptual, if not a physical, lens by means of which they may be discovered and studied. By this conceptual device—this paradigm—Clements was able to organize and subdivide the science ecology by analogy with organismal biology. Taxonomic ecology would identify types of superorganisms, such as piñon-juniper and post-oak cross timber forests, long- and short-grass prairies, sphagnum-tamarack bogs and tupelo-cypress swamps. Ecological ontogeny would trace how—after catastrophic, usually anthropogenic disturbance—such superorganisms return to their "mature" or "climax" condition through the process of succession, Clements's own speciality.[31] Physiological ecology would study the functions of the various components of such superorganisms—how tree roots

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[29] See "The Wilderness Act of 1964," in Callicott and Nelson, *The Great New Wilderness Debate,* pp.120–30.

[30] Frederic E. Clements, *Research Methods in Ecology* (Lincoln, Nebr.: University Publishing Company, 1905).

[31] Frederic E. Clements, *Plant Succession: An Analysis of the Development of Vegetation*. Publication no. 242 (Washington, D.C.: Carnegie Institution, 1916).

hold soil, how bacteria and fungi reduce detritus to minerals ready to be taken up again by plants, how predators prevent the irruption of prey populations, and so on. As all organisms, superorganisms were conceived to be closed, homeostatic, and self-regulating. Human beings were regarded as external to them and the principal source of disturbance to them.

In 1935, Arthur Tansley criticized and rejected the superorganism paradigm in ecology and introduced the ecosystem concept to replace it, but he too thought that ecosystems were at least "quasi-organisms" and that those that exhibited the greatest degree of stability and dynamic equilibrium had evolved by natural selection.[32] In the 1960s, Eugene P. Odum returned ecology to its Clementsian roots by attributing even more sophisticated and subtle equilbria to "mature" ecosystems, such as a ratio of 1 between biomass production and respiration and between nutrient uptake and release.[33]

Accordingly, some ecologists wanted to preserve representative ecosystems, free from exogenous human disturbance, as objects of ecological study. Just as art historians, because they have a professional interest in antiquities, might lament the decay of marble sculptures caused by anthropogenic air pollution and advocate various means of preserving them, some ecologists lamented the destruction of pristine ecosystems due to anthropogenic causes—hunting, lumbering, mining, plowing, paving, and the like—and advocated a means of preserving them: designated wilderness areas (although they didn't call them that). Chaired by Victor Shelford, the Ecological Society of America (ESA) established the Committee for the Preservation of Natural Conditions (CPNC) in 1917. Shelford was a thoroughgoing Clementsian organicist, who collaborated with Clements to write a book that integrated plant ecology, Clements's orientation, with animal ecology, Shelford's.[34] In 1926, the CPNC published *The Naturalist's Guide to the Americas*, which attempted to identify all the pristine areas left in North America and other parts of the Western Hemisphere.[35] Of particular and professional concern to some zoologists was the precipitous loss of wildlife at the end of the nineteenth century, due mainly to unregulated commercial hunting. Joseph Grinnel and Tracy Storer, followed by George Wright and others, suggested that the national parks could serve as habitat for endangered wildlife, especially for those species that do not well coexist with human settlement and activity.[36]

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[32] A. G. Tansley, "The Use and Abuse of Vegetational Concepts and Terms," *Ecology* 16 (1935): 284–307.

[33] Eugene P. Odum, "The Strategy of Ecosystem Development," *Science* 164 (1969): 262–70.

[34] See F. E. Clements and V. E. Shelford, *Bio-Ecology* (New York: Wiley, 1939).

[35] Victor E. Shelford, ed., *The Naturalist's Guide to the Americas* (Baltimore: Williams and Wilkins, 1926).

[36] Joseph Grinnel and Tracy I. Storer, "Animal Life as an Asset of the National Parks," *Science* 44 (1916): 375–80; George Wright, Ben Thompson, Joseph Dixon, *Fauna of the National Parks of the United States: A Preliminary Survey of Faunal Relations in the National Parks* (Washington, D.C.: Government Printing Office, 1933).

Here then, in the early twentieth century, was conceived the germ of a new wilderness idea. Wilderness areas should be selected not for their recreational attributes—either the transcendental wilderness recreation attributes or woodcraft-hook-and-bullet form of wilderness recreation attributes—but for two other attributes: (1) representative ecosystem type and/or (2) habitat for threatened species of wildlife.

By the 1940s, the logical-positivist membership of the ESA increasingly worried that if the society officially sanctioned an advocacy group, the CPNC, the disinterested scientific objectivity of ecology—already a suspect and marginalized science struggling for legitimacy and credibility—would be questioned. Positivist pressure caused the ESA to disown the CPNC. In 1946, the erstwhile members of the CPNC formed their own independent organization, the Ecologists' Union, resolving to take "direct action" to preserve natural areas. In 1950, the union changed its name to The Nature Conservancy, one of the largest, most successful, and well-respected environmental NGOs, which still exists for the purpose of preserving natural areas, representative ecosystems, and habitat for threatened species.[37]

Leopold had a master's degree in forestry from the Yale School of Forestry, but in 1933 he assumed a professorship in game management at the University of Wisconsin (without benefit of a Ph. D.).[38] He became, in effect, a self-educated applied ecologist; and, indeed, he was even elected, much to his own surprise, president of the ESA in 1946.[39] Thus, Leopold was aware of an organization other than the Wilderness Society advocating wilderness preservation, the ESA's CPNC, albeit motivated by a completely different set of values and ideas. Leopold attempted to effect an alliance of the Wilderness Society with the CPNC, but was rebuffed by Shelford.[40] It is not clear why Shelford was unreceptive to Leopold's overtures, but I am inclined to think that it was because he, if not Leopold, was aware of the incompatible goals of the two organizations. Doubtless influenced by the new, thoroughly twentieth-century wilderness idea that was then current among ecologists, Leopold himself formulated a novel scientific argument on behalf of wilderness preservation in 1941:

> The recreational value of wilderness has been often and ably presented, but its scientific value is as yet but dimly understood. This is an attempt to set forth the need for wilderness as a base-datum for problems of land health. . . .
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> A science of land health needs, first of all, a base-datum of normality, a picture of how healthy land maintains itself as an organism.

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[37] See Bill Birchard, *Nature's Keepers: The Remarkable Story of How the Nature Conservancy Became the Largest Environmental Organization in the World* (San Francisco: Jossey-Bass, 2005)

[38] See Curt Meine, *Aldo Leopold: His Life and Work* (Madison: University of Wisconsin Press, 1988).

[39] Ibid.

[40] See Julianne Lutz Warren, "Science, Recreation, and Leopold's Quest for a Durable Scale," in Michael P. Nelson and J. Baird Callicott, editors, *The Wilderness Debate Rages On* (Athens: University of Georgia Press, 2008), pp. 97–118.

> We have two available norms. One is found where land physiology remains largely normal despite centuries of human occupation. I know of only one such place: Northern Europe. It is not likely we shall fail to study it.
>
> The other and most perfect norm is wilderness.[41]

The explicit organicism that Leopold evinces in this essay, "Wilderness as a Land Laboratory," is striking. It might be explained, at least in part, as a direct appeal to the Shelford's own ecological commitments. Leopold's scientific argument for wilderness preservation is, however, ultimately anthropocentric and management-oriented. Good forestry and other forms of resource extraction and good agriculture should maintain land health—stable and fertile soil, well-modulated movement of water, diversity and stability of plant and animal populations. Wilderness serves as a control area—a base-datum of normality—in reference to which land managers can measure the ecological functioning of humanly inhabited and exploited land. Nevertheless, the practical upshot of this conception of wilderness was perfectly aligned with the goals of the CPNC: preserving representative ecosystems—whether or not they are suitable for either transcendental wilderness recreation or the woodcraft-hook-and-bullet form of wilderness recreation—for the purposes of scientific study. As Leopold expressly noted, "One cannot study the physiology of Montana in the Amazon; each biotic province needs its own wilderness for comparative studies of used and unused land."[42] Half a decade earlier, furthermore, Leopold had publicly registered a plea for preserving wild habitat for threatened species, especially large carnivores, thus aligning himself with the other main goal of the ecological advocates of wilderness preservation.[43]

After the passage of the Wilderness Act of 1964, the North American wilderness movement stood at a crossroads. Would it follow the path blazed by Grinell and Shelford and blessed by the later Leopold or would it take the path blazed by Roosevelt and the early Leopold and later blessed by the Wilderness Society and the Sierra Club? According to James Morton Turner,

> In one direction lay a wilderness system protected by strict visitation limits, dedicated largely as a biological reserve, and demanding a great deal of self-restraint on the part of the wilderness community. In the other direction lay a wilderness system that compromised the biological integrity of wilderness, prioritized human recreation, and promised to command political popularity. By the mid-1970s, it became clear that the wilderness advocacy community, along with a number of hikers, had chosen the latter path.[44]

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[41] See Aldo Leopold, "Wilderness as a Land Laboratory," in Flader and Callicott, *River of the Mother of God,* pp. 287, 288; originally published in *Living Wilderness* 6 (1941): 3. *Living Wilderness*, now just *Wilderness* is a publication of the Wilderness Society.

[42] Ibid., p. 289.

[43] Aldo Leopold, "Threatened Species," in Flader and Callicott, *River of the Mother of God,* pp. 230–34.

[44] Turner, "From Woodcraft to 'Leave No Trace,'" pp. 472–73.

IMPLICATIONS FOR TWENTY-FIRST CENTURY INTERNATIONAL CONSERVATION OF FRONTIER ECOSYSTEMS

By the end of the twentieth century, the ecological wilderness idea had been virtually forgotten. Should it be revived and used to guide the conservation of frontier ecosystems in the twenty-first century, such as those at the austral tip of the Americas? In my opinion the answer is a resounding, clear, and unambiguous "yes" and "no."

Yes, twenty-first-century frontier ecosystems should be conceived as candidates for "biological reserves," to borrow Turner's felicitous phrase, or as "biodiversity reserves," as I have elsewhere suggested.[45] Over the last quarter of the twentieth century and into the twenty-first, we have become more fully and acutely aware of the enormity of the current episode of abrupt mass species extinction—an event of such pace and magnitude that it ranks with the five other major mass extinction events in the whole past history of life on Earth.[46] We are in the midst of the sixth great extinction; and biodiversity reserves are the most important and effective means of mitigating it. Transcendental wilderness recreation and the kind of high-tech, low-impact, leave-no-trace, form of adventure recreation, into which the woodcraft-hook-and-bullet form of wilderness recreation has morphed, might be permitted in biodiversity reserves—or frontier wilderness ecosystems—but only to the extent compatible with the primary purpose of such reserves. As Turner suggests, in such wilderness areas we must get our priorities right and put first things first: biodiversity conservation. As he succinctly puts it, such wilderness areas must be "protected by strict visitation limits"—not only in terms of numbers of visitors per units of time, but also where exactly recreating visitors may go and what exactly they may do. Of lowest priority is preserving the American national character, which, in any case, is meaningless outside the United States, and even there, now, a century after its heyday (if it were not also then), is an obnoxiously racist and nationalistic notion.

No, frontier wilderness ecosystems should not be thought of as ecologists thought of them during the first half of the twentieth century—as superorganisms or as "quasi-organisms." Organisms are "closed systems" that have permeable but selective barriers between inside and outside, like skin, to regulate the ingress and egress of fluxes of external material, energy, and other organisms. Organisms are self-organizing, homeostatic, and self-regulating. They are robust entities subject to natural selection. Ecologists from Clements to Odum thought that ecosystems had similar characteristics. Further, as noted, *Homo sapiens* were conceived to be external to such systems and a source of exogenous disturbance or perturbation. According to Odum, for example, the strategy of ecosystem development is

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[45] J. Baird Callicott, "Should Wilderness Areas Become Biodiversity Reserves?" in Callicott and Nelson, *The Great New Wilderness Debate,* pp. 585–94.

[46] See Terry Glavin, *The Sixth Extinction: Journeys among the Lost and Left Behind* (New York: St. Martin's Press, 2007).

> Increased control of or homeostasis with the physical environment in the sense of achieving maximum protection from its perturbations. . . . An important trend in successional development is the *closing* or tightening of the biogeochemical cycling of major nutrients, such as nitrogen, phosphorous, or calcium.[47]

A new paradigm in ecology was consolidated in the last quarter of the twentieth century and is firmly entrenched in twenty-first-century ecology. Ecosystems have no developmental strategy or aim; they are not biological objects subject to natural selection (indeed, that they are robust biological entities at all is the subject of much dispute); they are open to fluxes of invasive organisms and ambient materials; they are subject to periodically recurring natural disturbances (disturbance regimes); they may be affected for better or worse by distant forces and processes; and nearly all have been subject to human influence or disturbance for many hundreds of years.[48] Thus, to preserve and protect frontier wilderness ecosystems, "strict visitation limits" are not enough. Local and regional efforts must be made to control invasive species, such as the North American beaver in Patagonia. International efforts must also be undertaken to reduce air- and water-borne pollutants. And—the greatest challenge of all—global efforts must be undertaken to mitigate global climate change, which is having the greatest impact on the high latitudes that are among the last frontiers on the planet.[49] Frontier ecosystems must also be understood to be home to the peoples and cultures that helped shape and sustain them by means of gathering, hunting, fishing, burning, and cultivation. Finally, such ecosystems must be actively managed, in consultation with their indigenous inhabitants, to prevent untoward change by the invasive species and pollutants from near and far that evade our best efforts to exclude them.

These last aspects of the new paradigm in ecology—the incorporation of human as well as natural disturbance and the concomitant concept of community-based ecosystem management—warrants emphasis by way of conclusion. In the post-colonial United States and Australia, the wilderness idea enabled non-indigenous Americans and Australians, self-deceptively, to erase from memory a genocidal heritage.[50] Robert Marshall, for example—with Leopold and others, one of the founders of the Wilderness Society—claimed that "When Columbus effected his immortal debarkation, he touched upon a wilderness which embraced virtually a hemisphere."[51] He also declared himself to "use the word *wilderness* to denote a

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[47] Odum, "The Strategy of Ecosystem Development," pp. 262, 265 (emphasis added).

[48] See, Steward T. A. Picket and Richard S. Ostfeld, "The Shifting Paradigm in Ecology," in Richard L. Knight and Sara F. Bates, eds., *A New Century for Resources Management* (Washington, D.C.: Island Press, 1995).

[49] See Kurt Jax and Ricardo Rozzi, "Ecological Theory and Values in the Determination of Conservation Goals: Examples from Temperate Regions of Germany, the United States of America, and Chile, reprinted in Nelson and Callicott, *The Wilderness Debate Rages On,* pp. 664–91.

[50] See Gary Nabhan, "Cultural Parallax in Viewing North American Habitats" reprinted in Callicott and Nelson, *The Great New Wilderness Debate,* pp. 628–41; and Plumwood, "Wilderness Skepticism."

[51] Robert Marshall, "The Problem with the Wilderness," reprinted in Callicott and Nelson, *The Great New Wilderness Debate,* p. 86.

region which contains no permanent inhabitants" among other characteristics.[52] So, putting these two statements together, if Columbus touched upon a wilderness that embraced virtually a hemisphere, it was a region that contained no permanent inhabitants. Thus, it should be free for the taking. (Marshall did, of course, acknowledge the presence of American Indians in the Western Hemisphere, but he believed that they were so few in number, so technologically backward, and so environmentally ethical that they did not compromise the hemisphere's total wilderness condition. We now know that these beliefs are all so false![53]) Further, one of the most pernicious effects of the exportation of twentieth-century American wilderness thinking to other regions of the world, both recreational and ecological, has been the eviction from their homelands and dispossession of indigenous peoples. Especially in Africa and South Asia, national-government authorities created national parks by simply coming in and clearing out indigenous peoples.[54] As a result, a global class of conservation refugees has been created.[55] In twenty-first-century international wilderness thinking, wilderness preservation is not only compatible with the presence of indigenous peoples and their cultures, it *requires* either the continuation of such presence or the simulation thereof by professional wilderness managers—if and when the indigenous inhabitants freely decide, on their own, that they want to live somewhere else or do something other than what their ancestors did to make a living.

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[52] Ibid., p. 85.

[53] As to numbers, see William Denevan, "The Pristine Myth: The Landscape of the Americas in 1492," in Callicott and Nelson, *The Great New Wilderness Debate,* pp. 414–42; as to the technologically backward and environmentally ethical, see Nabhan, "Cultural Parallax." For a summary, see Charles C. Mann, *1491: New Revelations of the Americas before Columbus* (New York: Vintage, 2006).

[54] See part two in both Callicott and Nelson, *The Great New Wilderness Debate,* and Nelson and Callicott, *The Wilderness Debate Rages On,* for extensive documentation.

[55] Mark Dowie, "Conservation Refugees," *Orion,* November-December 2005, pp. 16–27.

The Landscape Approach: Designing New Reserves for Protection of Biological and Cultural Diversity in Latin America

Sergio Guevara and Javier Laborde*

One of the greatest challenges for Latin America and the Caribbean, the most biologically and culturally diverse region in the world, is to halt the loss of species caused by habitat destruction and land degradation. Up to now, setting aside protected natural areas is considered the most effective alternative to conserve biodiversity. Protected areas, however, are under increasing assault by agricultural, silvicultural, and industrial development that surround and isolate them, reducing their habitat quality at the landscape scale. Among the different types of protected areas that have been proposed, biosphere reserves stand out for their attempt to compatibilize social development and conservation. Their management is the most amenable to integration of natural and human disturbance, inclusion of traditional management techniques, and participation by social and economic sectors in the administration. Biosphere reserves have proliferated all over the world, and today there are 531 of them located in 105 countries, where they protect vast ecological and cultural diversity. Even though the design of biosphere reserves is based on the landscape concept, it has yet to take into account ecosystem scales, possible long-term effects of disturbances, and better integrate and give higher consideration to the knowledge and experience of numerous ethnic groups that live within them. However, doing so requires a transformation of the function of the core, buffer, and transition areas. The current design of biosphere reserves is centripetal because the main function of the buffer zone is to protect biodiversity in the core. We propose a centrifugal model, where biodiversity of the core spreads freely toward the area of greater human influence with the buffer zone functioning as a connector. This connectivity can promote land-use practices that are in alignment with both ecosystems functioning and biodiversity conservation in natural, semi-natural, urban and industrial landscapes.

INTRODUCTION

Establishing protected areas is the most widely used instrument for dealing with the decline of biodiversity associated with agricultural, urban, and industrial activity. In the last fifty years, biodiversity conservation has predominantly relied on protected areas, but recently there have been signs of burnout, due to insufficient wilderness area remaining for new reserves and the isolation and limited (or nonexistent) connection among existing protected areas. In general, the design of nature reserves disregards the biodiversity of surrounding agricultural and urban

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areas, and with respect to their management, it is often blind to the benefits of social participation, especially that of indigenous groups, in spite of their broad range of knowledge and long experience with the land.

The Latin American and Caribbean region, i.e., the Neotropics, harbor the greatest biological and cultural diversity in the world.[1] At the same time, this region suffers one of the highest deforestation rates, the latter being prompted by disordered land use resulting from the creation of extensive, short-term productive systems.[2] In the next one hundred years, terrestrial ecosystems of Latin America are expected to be transformed principally by changes in land use, as well as by significant climate change, increased nitrogen deposition, as well as decreases in the numbers of plant and animal species.[3] These changes will affect both ecosystem resilience and the sustainable flow of goods and services from ecosystems to society.[4]

Latin America is also bearing increased poverty and social marginalization, which are in consequence of the loss of natural resources and a decrease in the services provided by ecosystems.[5] For this reason, stopping the loss of biodiversity in Latin America can also help address questions of social and environmental justice.[6] Under such current conditions, the protection and conservation of biodiversity are of the highest priority.[7] In this essay, we propose a connectivity model for biosphere reserves as one that could improve the protection of the system in the long term; at the same time we point out that this model deserves further discussion for its successful application.

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[1] UNESCO (2008), http://portal.unesco.org/education/en/ev.php-URL_ID=18391&URL_DO=DO_TOPIC&URL_SECTION=201.html.

[2] V. M. Toledo, "Metabolismos Rurales: Hacia una Teoría Económico-Ecológica de la Apropiación de la Naturaleza," *Revista Iberoamericana de Economía Ecológica* 7 (2008): 1–26; R. Primack, R. Rozzi, P. Feinsinger, R. Dirzo, and F. Massardo, *Fundamentos de Conservación Biológica: Perspectivas Latinoamericanas,* 2d ed. (México City: Fondo de Cultura Económica, 2006).

[3] O. A. Sala, F. S. Chapin III, J. J. Armesto, E. Berlow, J. Blooomfield, R. Dirzo, E. Huber-Sanwald, L. F. Huenneke, R. B. Jackson, A. Kinzig, R. Leemans, D. M. Lodge, H. A, Money, M. Oesterheld, N. L. Poff, M. T. Skyes, B. H. Walker, M. Walker, and D. H. Wall, "Global Biodiversity Scenarios for the Year 2100," *Science* 287 (2000): 1770–74; J. J. Armesto, R. Rozzi, and J. Caspersen, "Past, Present, and Future Scenarios for Biological Diversity in South American Temperate Forests," *Biodiversity in a Changing Environment: Scenarios for the Twenty-First Century,* ed. F. S. Chapin, O. E. Sala, and E. Huber-Sannwald (New York: Springer Verlag, 2001), pp. 223–49.

[4] See Bengtsson, J., P. Angelstam, T. Elmqvist, U. Emanuelsson, C. Folke, M. Ihse, F. Moberg, and M. Nyström, "Reserves, Resilience, and Dynamic Landscapes," *Ambio* 32, no. 6 (2003): 389–96.

[5] The large-scale initiative of the Millennium Ecosystem Assessment (MA), carried out between 2001 and 2005 assessed the consequences of ecosystem change for human well-being and demonstrated a variety of linkages between ecosystems and human well-being. See R. Hassan, R. Scholes, and N. Ash, eds., *Ecosystems and Human Well-being: Current State and Trends,* vol. 1 (Washington D.C.: Island Press, 2005).

[6] V. M. Toledo, "La Diversidad Biológica de Latinoamérica: Un Patrimonio Amenazado," *Ambiente y Desarrollo* 4 (1988): 13–24; H. J. Geist and E. F. Lambin, "Proximate Causes and Underlying Driving Forces of Tropical Deforestation," *BioScience* 52, no. 2 (2002): 143–50.

[7] Ibid.

THE CAUSES OF DIMINISHING BIOLOGICAL AND CULTURAL DIVERSITY

The main factors responsible for the global loss of species are landscape changes and habitat fragmentation.[8] Their effects can be detected both on individual species and on landscape patterns, resulting in changing species assemblages.[9] The most obvious causes of landscape changes in Latin America are monocultures of crop and tree species, along with extensive and intensive cattle ranching. Both activities extract products and exploit ecosystem services in a non-renewable way.[10] In Latin America the relationship between humans and nature began at least 20,000 years ago, but a major change in predominant patterns of land use and natural resource management began with the arrival of Columbus to the New World.[11] Tropical crops, as well as small and large livestock, were introduced from other parts of the world. These introductions were tantamount to an invasion of exotic species and land use practices that were markedly different from traditional Amerindian practices. These changes unleashed the greatest environmental globalization that ever occurred; on a scale unlike any other since the massive transformations of the Pleistocene.

Today, Latin America plays a strategic role in the conservation of the world's biodiversity. Brazil, Colombia, Ecuador, Venezuela, Peru, and Mexico are six of the fourteen megadiversity countries, containing sixty to seventy percent of the world's biodiversity.[12] Biological diversity in Latin America overlaps with the highest indigenous cultural diversity. One of the main indicators of cultural diversity is the number of languages spoken in a given country or territory.[13] The links between language, culture and the environment suggest that biological, cultural and linguistic diversity should be considered together.[14] They form a systemic unit that contains and expresses a total "pool of ideas," nurtured over time through heritage,

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[8] Primack et al., *Fundamentos de Conservación Biológica.*

[9] J. Fischer, and D. B. Lindenmayer, "Landscape Modification and Habitat Fragmentation: A Synthesis," *Global Ecology and Biogeography* 16, no. 3 (2007): 265–80.

[10] L. Fahrig, "Effects of Habitat Fragmentation on Biodiversity," *Annual Review of Ecology, Evolution and Systematics* 34 (2003): 487–515.

[11] A. W. Crosby, "Globalization as Boon or Curse," *International History Review* 25, no. 2 (2003): 375–79; A. W. Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900–1900* (Cambridge and New York: Cambridge University Press, 1993).

[12] N. Myers, "Threatened Biotas: 'Hotspots' in Tropical Forests," *Environmentalist* 8 (1988): 1-20; N. Myers, "The Biodiversity Challenge: Expanded "Hotspot' Analysis," *Environmentalist* 10 (1991): 243–56; Víctor M. Toledo and Alicia Castillo, "La Ecología en Latinoamérica: Siete Tesis para una Ciencia Pertinente en una Región en Crisis," *Interciencia* 24, no. 3 (1999): 157–68.

[13] See http://www.cdi.gob.mx.

[14] See R. Rozzi, and A. Poole, "Biocultural and Linguistic Diversity," in J. B. Callicott and R. Frodeman, eds., *Encyclopedia of Environmental Ethics and Philosophy* (Farmington Hills, Mich.: Gale, Cengage Learning, 2008).

local traditions and customs communicated through local languages. The diversity of ideas derived from different languages and sustained by different cultures is as necessary as the diversity of species and ecosystems for the survival of humanity and all life in our planet.[15] The loss of languages is linked to the loss of irreplaceable knowledge about the environment.[16]

Today more than fifty-five percent of industrialized agriculture in Latin America is devoted to production of two introduced species: sugar cane (30.4 percent), and coffee (25.7 percent). Almost seventy percent of the cultivated land in the region is sown with crops that are non-native to the Americas: sugar cane, coffee, banana, rice, and wheat.[17] The gravest environmental consequence of this ecological globalization, occurred over the past five centuries, is that the centers of genetic diversity of these crop species are no longer their main production centers.[18] Concomitantly, the economic and production model most extensively used nowadays, includes a minimal part of the biological diversity and does not take into account the cultural diversity native to the continent.[19] Current production patterns are largely based on the simplification of landscapes and the exploitation of ecosystems without considering their natural rates of regeneration.[20]

PRISTINE, RURAL, AND INDUSTRIALIZED LANDSCAPES

During the twentieth century, in tropical America there was concern about preserving and conserving the diversity of landscapes, ecosystems, communities and species threatened by expanding agriculture, cattle raising, industry and urbanization. Since, then, reserves and national parks have been central to the preservation of species and natural areas.[21] The greatest efforts focused on setting aside pristine areas, ignoring the effect of both natural and anthropogenic disturbances.[22] This approach has managed to protect approximately 6.4 percent of the Earth's land; an insufficient sample of the biodiversity and ecosystems in the world. Furthermore, the availability of pristine areas declines daily due to land use changes.[23]

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[15] See http://portal.unesco.org/education/en/ev.php-URL_ID=18391&URL_DO=DO_TOPIC&URL_SECTION=201.html.

[16] Tove Skutnabb-Kangas, Luisa Maffi, and David Harmon, *Sharing a World of Difference: The Earth's Linguistic, Cultural, and Biological Diversity* (Venice: UNESCO Publishing, 2003).

[17] P. Bifani, *La Globalización: Otra Caja de Pandora?* (Granada: Universidad de Granada, 2002), p. 297.

[18] Ibid.

[19] Toledo, "La Diversidad Biológica"; and Geist and Lambin, "Proximate Causes."

[20] Ibid.

[21] Bengtsson et al., "Reserves, Resilience, and Dynamic Landscapes."

[22] Toledo, "La Diversidad Biológica"; and Geist and Lambin, "Proximate Causes."

[23] A. Gomez-Pompa and A. Kaus, "Taming the Wilderness Myth," *BioScience* 424 (1992): 271–79; Primack et al., *Fundamentos de Conservación Biológica.*

When we speak of landscapes, we need to differentiate the rural landscape from the industrial landscape.[24] The former implies uses that are adapted to the climate, soil conditions, and resilience of the regional ecosystems, while the latter is based on the exploitation of soil fertility and water, with the use of fertilizers and agrochemicals. The two landscape types require entirely different environmental scenarios. On rural landscapes, traditional management practices maintain the highest availability and mobility of species across the landscape mosaic, a mechanism that ecologist Janne Bengtsson referrs to as an internal ecological memory. There is an ecological memory that takes the form of the availability of species that are allowed to interact with the other components of the landscape.[25] Ecological memory has almost completely disappeared from industrial landscapes, which function mainly as a species sink, depending on the constant consumption of energy and resources that are not regenerated by the ecosystem.

Human society and nature are two forces that shape landscapes and ecosystems.[26] Historically, pristine and human-disturbed areas have coexisted, leaving an area where the original vegetation persists, in the form of fragments of varying shapes and sizes. The result is a mosaic of succesional stages of natural vegetation. This idea of the landscape formed by expanses of natural areas, crop fields, traditional husbandry, pasture management, and human settlements encompasses a broader biological and cultural diversity than pristine areas by themselves.[27] This landscape perspective offers important lessons about the conservation of species, ecological processes, and the resilience of ecosystems.

Landscape ecology offers new insights about processes that act on different spatial and temporal scales. This information can be useful to planners who are involved in optimizing the use of space or improving environmental conditions. While important advances have been made in the study and characterization of landscape patterns and change, landscape function is still poorly understood. Flows of biota, water, nutrients, and other materials across the landscape are determined, to a large extent, by landscape patterns, but an appreciation of the functional links between patterns and processes has been slow in coming. If landscape ecology is to make a useful contribution to land use and conservation issues, greater effort needs to be invested in understanding the functional aspects of landscapes.[28]

The focus on pristine areas for conservation ignores the biodiversity that occurs

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[24] G. Halffter, "Towards a Culture of Biodiversity Conservation," *Acta Zoológica Mexicana* 21, no. 2 (2005): 133–53.

[25] Bengtsson et al., "Reserves, Resilience, and Dynamic Landscapes."

[26] See A. Farina, "The Cultural Landscape as a Model for the Integration of Ecology and Economics,"*BioScience* 50, no. 4 (2000): 313–20.

[27] See C. Mann, *1491: New Revelations of the Americas before Columbus* (New York: Alfred Knopf, 2005).

[28] See M. G. Turner, "Landscape Ecology in North America: Past, Present, and Future," *Ecology* 86 (2005): 1967–74.

outside protected areas. Agro-ecosystems found outside the conserved areas are a valuable resource, which should be considered for creating an alternative model of conservation and sustainable land use.[29] We should understand landscapes as a dynamic mosaic fashioned by sets of species that are temporally associated with successional stages of vegetation formations created by disturbance and abandonment of agricultural land. Landscapes change because of the dynamic interaction between natural and cultural forces. Cultural landscapes are the result of the successive reorganization of the land to better adapt to changing demands of society. Today, such changes are seen as a threat because they reduce biodiversity, coherence, and identity of the ecosystem. These aspects were not only characteristic of, but also enriched by the traditional cultural landscapes, which today are rapidly disappearing.

BIOSPHERE RESERVES: A LANDSCAPE APPROACH TO CONSERVATION

Protected natural areas fall into a broad range of categories. In general, they coincide in their goals, which are to prevent ecosystem degradation, conserve biodiversity, and develop harmony between bio-cultural diversity and sustainable development.[30] Of all the categories of protected natural areas, the biosphere reserve model conceived by UNESCO at the beginning of the 1970s stands out because it takes into account the structure and dynamics of regional landscapes, integrates the concept of ecosystem, and incorporates the presence of human settlements and productive activities.

The UNESCO biosphere reserve program is a very successful international agreement. This reserve model has proven to be versatile and adaptable to a variety of ecological, cultural, and social conditions. It has been accepted by many countries to protect their biodiversity; to date, 531 biosphere reserves have been created in 105 countries (fig. 1). In Ibero-America and the Caribbean, 143 biosphere reserves have been decreed in twenty-one countries, covering 255,147,598 hectares of land (fig. 2).

The biosphere reserve model has three zones. The first, the core zone, justifies the creation of the reserve; it is the best conserved, and contains most of the biodiversity. Around the core area is the buffer zone, which allows low impact activities, and has the function of protecting the core zone from high human impact. The buffer zone is externally surrounded by the transition zone, where land-use practices by local inhabitants are permitted, in ways that are amenable to biodiversity conservation goals (fig. 3a).This model acknowledges the presence of both the rural landscape in the buffer zone, as well as more intensive, sustainable industrial uses in the

[29] See J. F. Franklin, "Preserving Biodiversity: Species, Ecosystems or Landscapes," *Ecological Applications* 3, no. 2 (1993): 202–05.

[30] See B. S. Orlove, and S. B. Brush, "Anthropology and the Conservation of Biodiversity," *Annual Review of Anthropology* 25 (1996): 329–52.

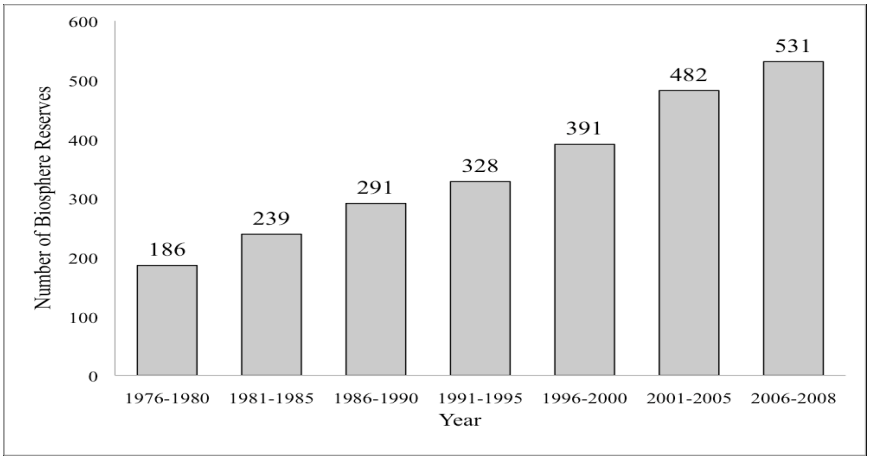


Figure 1. Number of reserves in the UNESCO World Network of Biosphere Reserves in five-year increments, since the creation of the Man and Biosphere Program.

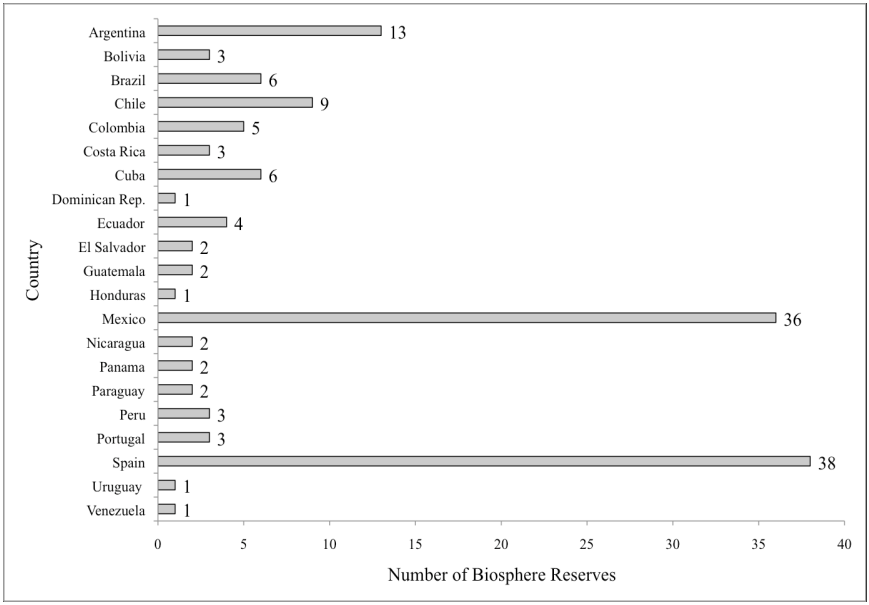
transition zone. From the landscape perspective, the biosphere reserve is a visionary category of protected natural area that includes humans. To date, it is the only type of reserve that explicitly takes into account in its conservation strategy the biodiversity of the surrounding agro-ecosystems and urban areas.

At the Third World Biosphere Reserve Congress, held in February 2008 in Madrid, it was recognized that biosphere reserves have made a huge contribution to research, biodiversity inventories and conservation biology. Since their origin, biosphere reserves have been tightly linked to research institutions and thanks to this, some of the most important studies on biodiversity have been produced. However, studies have not fully examined the fact that the reserves fall short on the spatial and temporal scales of ecosystem dynamics.[31] Nor has the effect of large-scale disturbances on the structure and functioning of ecosystems and the landscape been considered. This lack of knowledge can produce ecological surprises and interfere with conservation goals.[32] An additional, critical shortcoming of the current application of the biosphere reserve model is that the relationship between biodiversity and indigenous populations settled in the reserve has been frequently overlooked. The geographic distribution of indigenous groups is related to the sites with the greatest biological diversity; this could be a consequence of the way in which biodiversity is used.[33] The type of land ownership, and traditional management practices of species and ecosystems have also been frequently disregarded. This disregard has

[31] Bengtsson et al., "Reserves, Resilience, and Dynamic Landscapes."

[32] See R. T. Paine, M. J. Tegner, and E. A. Johnson, "Compounded Perturbations Yield Ecological Surprises," *Ecosystems* 1 (1998): 535–45.

[33] V. M. Toledo, "Biodiversity and Indigenous Peoples," in S. A. Levin, ed., *Encyclopedia of Biodiversity* (San Diego: Academic Press, 2001), pp. 330–40.



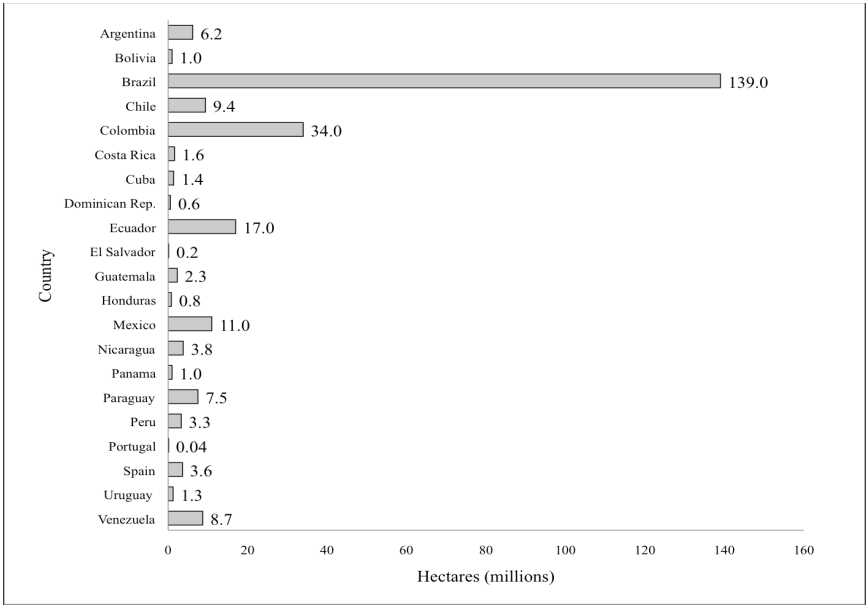


Figure 2. Biosphere Reserves in Ibero-America and the Caribbean: (a) number of IberoMAB-UNESCO biosphere reserves per country; (b) area protected by biosphere reserves per country.

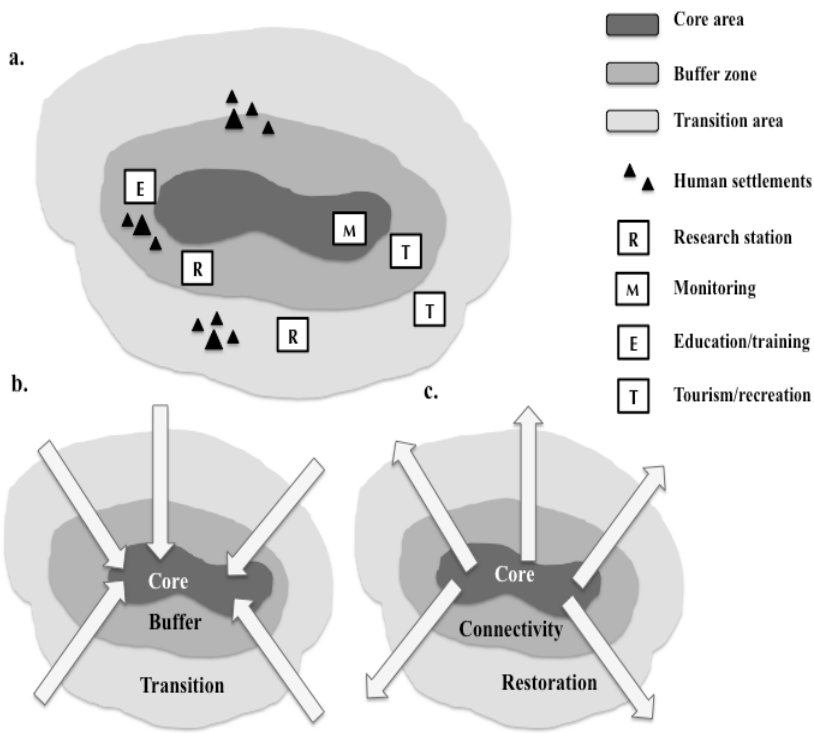


Figure 3. Biosphere Reserve Zoning Models. (a) Three essential, concentric zones: strictly protected core zones at the center (dark gray), surrounded by buffer zones admitting low impact human activities (medium gray), which are in turn surrounded by transition zones where more intensive development can take place (light gray). (b) Conventional centripetal model: the main function of buffer and transition zones is to protect the biodiversity found in the core area. (c) Centrifugal model: buffer and transition zones function as connectivity and restoration areas. This model facilitates the movement of native plants and animals from the strictly protected core zones into transition zones of the reserves, and even outside protected areas into anthropogenic landscapes. Figure 3c illustrates a model that has been analyzed for the management of Manantlan Biosphere Reserve in Mexico, where a forestry landscape restoration strategy is being implemented immediately outside the reserve. Management of native forests in the buffer zone, combined with restoration and reintroduction of tree native plant species, functions as a nurse crop for reintroducing a set of native species in the transition zone, and outside the biosphere reserve. These scarce tree species would otherwise not be available because they need native ecosystems in order to grow. Therefore, restoration is conducted for the protection and management of natural regrowth and active reintroduction of key species. An initial fast-growing nurse crop supplying commercially useful timbers or other goods can facilitate the subsequent establishment of more species-rich forests.

resulted in cultural erosion, the loss of experience and knowledge about landscape management. In addition, this omission has generated frictions between researchers, managers, large-scale producers and the local and federal authorities. As the area of land modified by agricultural, urban, and industrial activities continues to grow, and so does the disparity between the spatial scale of the protected areas and the scale of their ecosystem dynamics.[34]

RETHINKING BIOSPHERE RESERVES

Until now, biosphere reserves have had a limited effect on the regional scale, even though this was one of the main objectives of their creation. Practically all of the reserves in Ibero-America and the Caribbean are pressured by ecologically aggressive land-use practices in their immediate surroundings. As a result, biosphere reserves are being isolated and endangered.

At present, the transition zone of the biosphere reserves is the most critical. This situation is a consequence of their limited size, the absence of consideration for the type of land use outside the reserve, and the lack of capacity to communicate available knowledge and information about sustainable-use practices. Two additional disadvantages are that many reserves were created on marginal lands[35] and that they were conceived as static entities that stay essentially the same for centuries.[36] If this situation does not change, biosphere reserves will soon become ecological islands, degraded by human impact in their surroundings, and suffering from an ever-increasing edge effect. Increasing loss of species and clandestine extraction of flora and fauna are expressions of these effects.[37] The conservation strategy for natural areas implemented to date is not producing the results we had initially hoped for.

Disturbance produced by both natural forces and human activity is the motor of landscape heterogeneity and diversity. Disturbance is related to two relevant attributes of the landscape, its fragility and resilience.[38] If the dynamics of ecosystems and landscapes are to be taken into account, we must reconsider the way in which

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[34] S. T. A. Pickett and J. N. Thompson, "Patch Dynamics and the Design of Nature Reserves," *Biological Conservation* 13 (1978): 27–37; C. S. Holling, D. W. Schindler, B. W. Walker, and J. Roughgarden, "Biodiversity and the Functioning of Ecosystems: An Ecological Synthesis," in C. A. Perrings, K. G. Mäler, C. Folke, C. S. Holling, and B. O. Jansson, eds., *Biodiversity Loss: Economic and Ecological Issues* (Cambridge: Cambridge University Press, 1995), pp. 44–83; and P. M. Vitousek, H. A. Money, J. Lubchenco, and J. M. Melillo, "Human Domination of Earth Ecosystems," *Science* 277 (1997): 494–99.

[35] Gomez-Pompa and Kaus, "Taming the Wilderness Myth"; and Primack et al., *Fundamentos de Conservación Biológica.*

[36] J. Caldecott, *Designing Conservation Projects* (Cambridge: Cambridge University Press, 1996), p. 312.

[37] D. Janzen, "No Park is an Island," *Oikos* 41 (1983): 402–10.

[38] Farina, "The Cultural Landscape as a Model."

the reserves are designed and managed. Reserves should be part of a landscape mosaic increasingly controlled by human activities.[39]

The main purpose of the original landscape pattern for biosphere reserves is to conserve the biodiversity of the core area, like a sanctuary. The two surrounding zones (buffer and transition) protect the core area from the effect of land management in the surroundings. This model is centripetal in its character, as its main function is to isolate and to protect the core from the "negative effects" of regional land uses (fig. 3b).

We propose that the biosphere reserve model has the potential to adapt to the spatial scale of ecosystem processes and human interference. For this to happen, the landscape pattern for biosphere reserves should be reversed. Instead of isolating the core area, fluxes should be facilitated, and biodiversity should have free access to transition zones. Doing so requires changing the function of the buffer zone from that of protection to that of facilitating the movement of species toward the transition zone, thus, converting buffer zones into areas of ecological connectivity. This model of biosphere reserves then becomes centrifugal in character (fig. 3c).

Reversing the function of the buffer zone from one that mitigates the damaging effects of anthropogenic change in the surroundings to a zone in which the main function is facilitating the spread of biodiversity toward the area of influence and eventually to the surroundings of the reserve links the reserve with its local and regional environs. This reversal could restore the ecological connectivity of the landscape around the core area, and allow the reserve to become an integral part of the landscape. The self-regeneration capacity of the ecosystem would also be restored (fig. 3c).

The core—thought of as an untouchable area—needs to be reconceived as the most important repository of biodiversity capital of the biosphere reserve and its surroundings. This landscape perspective will allow us to proceed with environmental restoration at the scale of the ecosystem and to respond to both natural and human disturbances in a more proactive manner. Facilitating the movement of biodiversity from core to transition zones enhances the connectivity between zones with different degrees and types of human uses; i.e, an integrated landscape, one that is structured and functional, and which becomes a coherent sustainable ecosphere. Ultimately, the goal is to establish a sustainable balance between attractive, healthy, liveable, productive, and industrial landscapes for future generations.[40] More important than the conservation of intact areas is the conservation,

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[39] Bengtsson et al., "Reserves, Resilience, and Dynamic Landscapes."

[40] Z. Naveh, "Ecological and Cultural Landscape Restoration and the Cultural Evolution towards a Post-Industrial Symbiosis between Human Society and Nature," *Restoration Ecology* 6 (1998): 135–43; Z. Naveh, "What is Holistic Landscape Ecology? A Conceptual Introduction," *Landscape and Urban Planning* 50, no. 1–3 (2000): 7–26.

on a regional scale, of strategies of resource use that do not interrupt the ecological processes that maintain the resilience of the landscape.[41]

Biodiversity is crucial for recovering ecosystem function and, above all, its resilience. The most powerful instrument for conserving biodiversity is not a fence that isolates, but rather policies and reforms that turn conservation into a matter of both private and social concern.[42] We should focus our attention on active efforts to produce a truly integrated science, the development of sound landscape design principles and increased interaction with policy planners and managers.

[41] B. Walker, "Conserving Biological Diversity through Ecosystem Resilience," *Conservation Biology* 9, no. 4 (1995): 747–52.

[42] C. Folke, C. S. Holling, and C. Perrings, "Biological Diversity, Ecosystems, and the Human Scale," *Ecological Applications* 6, no. 4 (1996): 1018–24.

A Traditional and Multicultural Approach to Environmental Ethics at Primary and Secondary School Levels

Eugene C. Hargrove*

Translating environmental ethics into something that can be taught at the primary and secondary school levels may never be feasible. In addition, what needs to be taught may vary in different cultures around the world. A good noncontroversial starting point may be to begin with the values that are often listed in the purpose statements of environmental laws. Teachers could teach the history of ideas behind those values and their relationship to environmental concern. This approach is needed as a counter to the value approach of modern economics which treats noneconomic values as meaningless expressions of personal emotion. Comparative value discussion can be used to clarify traditional values and in countries with indigenous populations with values originating in different histories of ideas, such as the values of the First Nation peoples in Canada and the Mapuche in Chile, which can be used to promote better understanding between major social groups.

Because environmental ethics is not yet a part of primary and secondary education even in the United States, any comments about it must remain speculative. As a word of warning, it is also important to note that it is possible that what may work in the United States may work less well or not at all in other parts of the world. For an environmental ethic to be effective in a particular society, it must be based firmly on the cultural attitudes and values that have historically evolved in that society. In borrowing from perspectives from other parts of the world, educators must be careful not to use elements that conflict with their own societal norms. For example, the national park idea as it has evolved in the United States is considered imperialistic and colonial in Asian countries, where its application frequently leads to social disruption and discontent as local people are removed from lands that they and their ancestors have inhabited or used for centuries.[1]

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[1] Famous examples include David Harmon, "Cultural Diversity, Human Subsistence, and the

There is also a very large gap between theory and practice. Environmental ethics literature tends to be theoretically oriented and just how it blends with practical matters is something that neither theorists nor environmental professionals have yet figured out. The number of theories available has increased significantly over the past decade and as a result, concerned citizens looking for guidance can easily be overwhelmed by the plethora of conflicting positions to choose from.

Finally, there are the special problems inherent in trying to teach ethics to children. These range from worries from parents that the children might be taught something inappropriate to the practical realities that the mental development of the child limits what can be done at various ages.[2] As Aristotle put it centuries ago, it is not possible to teach ethics to small children and by the time they are old enough it is often too late.[3] Because of these difficulties, it is best, I believe, to concentrate not on converting current theory in environmental ethics into curricula material but rather on general environmental values that are widely accepted and consistent with the history of ideas that actually formed environmental perceptions in specific countries.

Such an approach would be based on character development, in terms of values and virtues, rather than on the teaching of specific ethical principles. As such, it would not be aimed at the making of particular decisions but rather on the development of a general context for the making of ethical decisions.

In deciding which values to teach, I recommend that educators work backward from what is needed to facilitate environmental decisions by the citizen and the environmental professional to what is needed to prepare them educationally for these adult decisions. Look first at your environmental laws and your environmental policies to see what specific values might be most appropriate for environmental decision making. In the United States, for example, values are frequently listed in the preambles of environmental laws: "esthetic, ecological, educational, historical, recreational, and scientific value" in the Endangered Species Act, "scientific, educational, scenic, or historical value" in the Wilderness Act, and "historic, cultural, and natural aspects of our national heritage" in the National Environmental Policy Act."[4] In all cases, economic value is intentionally omitted so that the values to be promoted are supposed to inhibit or restrain the untempered promotion of economic value. In Canada, economic value is included in the list of values, but it remains

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National Park Ideal," *Environmental Ethics* 9 (1987): 147–58, and Ramachandra Guha, "Radical American Environmentalism and Wilderness Preservation: A Third World Critique," *Environmental Ethics* 11 (1989): 71–83.

[2] See, for example, James Davison Hunter, *The Death of Character in an Age without Good or Evil* (New York: Basic Books, 2000) and James Davison Hunter, *Culture Wars: The Struggle to Define America* (New York: Basic Books, 1991).

[3] Aristotle, *Nichomachean Ethics,* bk. 1, chap. 3. See also bk. 10, chap. 9.

[4] *Wilderness Act*, Public Law 88–577 (3 September 1964), sec. 2; *Environmental Policy Act of 1969*, Public Law 91–190 (1 January 1970), sec. 101; *Endangered Species Act of 1973*, Public Law 93–205 (28 December 1973), sec. 2.

one among many. For example, the Yukon Environment Act is supposed to promote "an economic, cultural, aesthetic and spiritual relationship to the environment."[5] If the Yukoners can find a way to promote all four values equally, economic value will be restrained. If not, it will be carried out simply as an economic law.

The primary challenge for environmental educators in the United States and Canada is to find a way to prepare future citizens for dealing with the various values listed in these laws in such a way that they are not overwhelmed by economic values. Currently, these values are treated as "non-economic" values that do not fit properly into cost-benefit analysis. They are therefore converted into economic values in terms of travel costs and willingness to pay that do not fare well against standard economic considerations. These conversions take place because environmental professionals have not been trained to be able to think in terms of environmental values. Indeed, in most cases, they have been encouraged to make decisions that are "objective"—that are supposedly factual, "value-free," entirely free of philosophical context. This objectivity is usually achieved by using scientific studies or by quantifying consumer preferences and applying cost-benefit analysis.

The belief that such decision making can be totally objective in this sense, however, is of very recent origin. It has arisen out of three relatively new philosophical positions: utilitarianism from the middle of the nineteenth century, pragmatism from the turn of the century, and logical positivism from the period just before and after World War II. From utilitarianism comes the idea that good is pleasure, from pragmatism the idea that all value is instrumental (based on use, specifically, human use), and from logical positivism the idea that ethical statements are arbitrary, subjective, and irrational personal expressions of emotion. Blended together as modern economics, these three ideas turn decision into nothing more than the rational, but selfish (self-interested) satisfaction of personal preferences (cravings) in a world of moderate scarcity.

Although the presuppositions of modern economics would have repulsed educated people of the nineteenth century, it is now so fundamental to the thinking of ordinary people today that children pick it up without formal training at a very young age, usually before entering school. Because economic thinking is such a dominant mode of thinking in our century, it is probably not possible to get rid of it. However, it should be possible to put it within a larger context where it will do less harm in the future than it does today. To counter the utilitarian perspective, teachers could emphasize that, as Aristotle noted, good is not actually the same thing as pleasure, given that people frequently take pleasure in bad things. If good really were defined as pleasure, then no ethical standards would be possible. To counter the pragmatism in economic thinking, teachers should stress that we commonly value things for their own sake, not simply for their use. It is because of the conversion of all value into instrumental terms, thereby writing intrinsic value out of our value systems, that environmentalists have begun calling for rights for

[5] Yukon Environment Act, Yukon Territory, 1991, first paragraph.

nature. Since such rights have proven to be unsupportable, the only way out is the reinstatement of intrinsic values, which are created when humans choose to value things for their own sake.[6]

To counter the emotivism of logical positivism, teachers should stress that values are not individually created in isolation, but rather are social ideals that have evolved over the centuries and are picked up by the members of society without much formal training. While there may be considerable disagreement how these values will be applied in particular cases, there is almost never disagreement about what the basic values are in a particular society. For example, at a political hearing in the United States about the establishment of a wilderness area, while there might be considerable disagreement about whether a specific place has wilderness value or should be protected for its wilderness value, there would be no disagreement what wilderness value is or that it is the context in which the political decision should take place. In contrast, for example, in India, most people at such a hearing would neither understand nor recognize the legitimacy of wilderness value. They would in all likelihood protest against any application of this value on the grounds that it is an imperialistic and colonial invention that is incompatible with the social norms of their country.

Environmental education should not be an imposition of new values, but a strengthening of existing values. In most Western countries, for example, there is a three-century-old nature tradition in landscape painting, in nature poetry, in landscape gardening, and in natural history science.[7] This tradition is so strong that tourists spend almost all of their time taking pictures, carefully composed on the model of nineteenth-century landscape paintings. Because of this tradition, most

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[6] Rights developed historically as a protection of the interests of individuals in the nation-states created in Europe in the late Middle Ages. Although such rights can easily be extended to individual organisms, an extension to ecosystems and species is more difficult. The interests of individual organisms as members of an ecosystem or species are not necessarily compatible with the good of that ecosystem or species. In a natural system, ecosystem health depends upon animals eating other animals and plants and predators keeping prey populations under control so that they do not destroy the carrying capacity of the system. Likewise, the death of individual members of a species is generally believed to promote the good of that species through evolution. Even the idea that ecosystems and species have interests is problematic since ecosystems and species are not individuals. How such interests might be determined and how they might relate to the interests of individual animals, plants, and nonliving natural objects remains unclear. Most likely, rights if developed for ecosystems and species would consciously or unconsciously reflect the anthropocentric interests, aesthetic or commercial, of those authorized to determine the interests of particular ecosystems or species. Environmentalists continue to call for the rights of nature because of the emotive force of rights talk and because it reflects their intuitions that nature should be valued for its own sake and not simply for human use, but they have no idea how they would operationalize such rights if they ever came to be accepted legally or morally. For a glimpse of the struggle of environmental philosophers to deal with the rights issue and incorporate it into an environmental ethic, see Eugene C. Hargrove, ed., *The Animal Rights/Environmental Ethics Debate: The Environmental Perspective* (Albany: State University of New York Press, 1992).

[7] See Eugene C. Hargrove, "Scientific and Aesthetic Attitudes," *Foundations of Environmental Ethics* (Denton, Tex.: Environmental Ethics Books, 1996), and Eugene C. Hargrove, "Why We Think Nature is Beautiful," http://www.cep.unt.edu/show.

Westerners are more than willing, within reason, to protect natural beauty. However, because of their educational experiences, in which they have been taught that their sense of beauty is an arbitrary, subjective, irrational expression of emotion, rather than an evolved social ideal, in place of aesthetic arguments, based on intrinsic value, they usually rely on instrumental arguments—that there might be something out there that we don't know about that might be a cure for cancer—or mystical assertions—that there is a mystical relationship between humans and nature—or political analogies—that nature ought to have rights.

Environmentally concerned people have been reduced to such arguments because they have been trained to think in a narrow economic way that is counterintuitive. Because of this training, they have literally had the words they need to express their thoughts stolen from them. In George Orwell's *1984,* a totalitarian government was developing a new language, "Newspeak," in which the moral vocabulary would eventually be reduced to two words, *good* and *ungood,* thereby preventing citizens of that country from thinking in moral terms.[8] The teaching of modern economics, which reduces value terminology to economic and non-economic value, and translates the non-economic values into economic terms before dealing with them, is producing an analogous effect in environmental thinking. In a recent draft of a Yukon wolf management plan, for example, the intrinsic value of wolves was dealt with in a section titled the "Non-consumptive Use of Wolves."[9] This non-consumptive use is not only a non-economic use, but also a "non-use," unless we also want to say that we go to museums to "use" art objects and to concerts to use music. When we routinely refer to our basic societal values as vague negatives of some other values, those values are eventually reduced to the inarticulate emotivism of logical positivism.

A return to a balanced traditional value system does not mean the end of economics or economic thinking. Such thinking can still play an important role through contemporary cost-benefit analysis by helping us make sure that we don't waste our money. The basis of a decision, however, would not necessarily be what is economically efficient, the most for the least amount of money, but rather what a given society desires as best for itself. In short, it would be a move from economics to politics.

According to Aristotle, ethics and politics are the same thing viewed from different perspectives, the first from the perspective of the individual, the second from the perspective of the group.[10] Aldo Leopold had this type of relationship in mind when he wrote his famous essay, "The Land Ethic." Leopold concluded that political action was frequently ineffective because ordinary citizens did not yet have the value orientation needed to support it. It is for this reason that Leopold

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[8] George Orwell, *George Orwell's Nineteen Eighty-Four: Texts, Sources, Criticism,* ed. Irving Howe (New York and Burlingame: Harcourt, Brace and World, 1963), p. 24.

[9] Yukon Wolf Management Team, *The Yukon Wolf Conservation and Management Plan* (Yukon: Government of Yukon, 1992).

[10] Aristotle, *Nichomachean Ethics,* bk. 1, chap. 2.

speaks of "love, respect, and admiration for land, and high regard for its value," and proposes beauty, integrity, and stability as key ethical and aesthetic values.[11]

In his book, *The Economy of the Earth,* Mark Sagoff points out that every person today is both a consumer and a citizen who has both consumer and citizen preferences.[12] The consumer preferences have to do with how we want to spend our personal income. The citizen preferences have to do collectively with what kind of society we want to live in. Although economists routinely sum up our consumer preferences and present them as citizen preferences, they are not the same thing. It is perfectly possible that we might as citizens vote against something which we crave as consumers. For example, we might ban most fast-food packaging, even though we prefer its convenience, in order to help solve solid-waste disposal problems.

If people throughout the world are to respond effectively to our environmental problems, they must do so not simply as consumers but also as environmentally informed citizens. Such citizens, however, will not exist if they are not taught the values needed to be citizens as well as consumers. Such education need not be controversial. Much that is taught about the environment can still be taught in much the same way that it is now. It merely needs to be organized so that students know that they are learning not only facts, but also their societal values. The result will not be new values, but old ones that can be positively expressed once again. Only when this task is complete, when language is once again available to express our environmental concerns fully, with regard both to factual and evaluation matters, will it be possible at long last to convert environmental ethics theory into practice—essentially, to fine-tune a practice that will already be flourishing.

With regard to Chile, specifically, the subject of this special issue, there may be some opportunities for crosscultural moral education. As you may recall, the Yukon Environment Act is supposed to promote "an economic, cultural, aesthetic and spiritual relationship to the environment." The first of these is obviously for the business community. The other three are more problematic. Euro-Canadians are not intuitively very prepared to promote the environment culturally and spiritually. They do, however, have considerable experience promoting it aesthetically. This tradition began in Europe in the late 1600s, first with an appreciation of the sublime in the Alps and then more generally an appreciation of nature as picturesque, "pretty enough to be a picture" (or more specifically a picture by Claude Lorrain. This picturesque travel tradition is now called tourism. Because of this tradition, natural beauty is one of the most important reasons given at public hearing for the protection of natural places. Clearly, the reference to an aesthetic relationship to the environment in the Yukon Environment Act is intended for the Euro-Canadians and they have no difficulty promoting this relationship.

The aesthetic relationship, however, does not make a lot of sense to the indig-

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[11] Aldo Leopold, *A Sand County Almanac, and Sketches Here and There* (New York: Oxford University Press, 1949), pp. 223–25.

[12] Mark Sagoff, *The Economy of the Earth: Philosophy, Law, and the Environment,* 1st ed. (Cambridge: Cambridge University Press, 1988).

enous people of the Yukon, who do not share the picturesque travel tradition, and yet make up about half of the population of the province. During my second visit to the Yukon in 1995, I discovered that all of the First Nation peoples of the Yukon I spoke with were reluctant to speak of natural beauty. When I pushed the issue I got such responses as "What is the big deal? It is just our home" and "Nature is boringly beautiful. Who cares?" The members of the tribes prefer to speak rather in terms of cultural and spiritual values, and these values are centered on their relationship to the environment as "home." When they speak at a public hearing, they will talk in terms of cultural and spiritual values, which are included in the list of values to be promoted in the Yukon act, but which mean must less to the Euro-Canadians.[13]

Because the Euro-Canadians and the First Nation Peoples are interested in and more comfortable with promoting different values from within the Yukon act, and each approach to doing so is derived from a cultural tradition little understood by the other half of provincial population, the two groups are often speaking past each other. The cultural and spiritual values of the First Nation peoples are as little understood by the Euro-Canadians as the natural beauty of the Euro-Canadians is by the First Nation peoples. The easiest way to resolve this problem is through environmental education at the elementary school level that makes the children familiar comparatively with both cultural and spiritual values and with aesthetic values, so that when they become adults, the debate about environmental issues will become more intelligible to all sides.

In Chile, there are also indigenous peoples who most likely have different value perspectives from those Chileans more influenced by European tradition, though these perspectives may be quite different from those of the indigenous peoples of Canada and the United States. Many of these peoples have dwindled to the point that they may no longer have much political influence as a group. However, one tribe, the Mapuche, might be a group comparable to the tribes of the Yukon, who can play a role in the political arena and who could perhaps be better understood if their values were incorporated into basic value education in the elementary schools. Likewise, the value perspectives of other tribes—to the degree that their views can still be identified—would be useful additions. The point is not indoctrination but the promotion of greater understanding. Learning about the perspectives of the Mapuche might have value in resolving future political disputes. Learning about the perspectives of other tribes might help promote tolerance toward the values of others by teaching that the primary social values, though the most important in any given society, are nevertheless one alternative among many.

Useful examples in Chile in this direction, that I know of personally, include *The Multi-Ethnic Bird Guide of the Austral Temperate Forests of South America,* by

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[13] See Eugene C. Hargrove, "The Role of Socially Evolved Ideals in Environmental Ethics Education in Canada and the Yukon: A Historical Approach involving the Humanities," in Bob Jickling, ed., *A Colloquium on Environment, Ethics, and Education* (Whitehorse, Yukon: Yukon College, 1996), pp. 20–31.

Ricardo Rozzi and others, which deals with both Mapuche and Yahgan perspectives by including in their stories about each species of bird narratives from both traditions. The book is accompanied by CDs with recordings of the bird calls, names and stories about these birds in indigenous, English, and Spanish language, exploring intercultural and interspecific ethics. Similarly, *The World's Southernmost Ethnoecology: Yahgan Craftsmanship and Traditional Ecological Knowledge,* by Francisca Massardo and Ricardo Rozzi, is filled with traditional stories, narratives, and myths. To prepare this book, the authors worked with members of the Yahgan community. They focused on today's indigenous handicraft, aware of the implications of this activity for biocultural conservation and environmental ethics in southern South America. With the goal of re-integrating Yahgan language into formal and informal education, Massardo and Rozzi prepared with Cristina Zarraga, a young writer of the indigenous community, a book and workshop, specifically at the elementary school level. The book, *Learning, Listening, the Yahgan World,* by Cristina Zárraga, Francisca Massardo, and Ricardo Rozzi, offers an illustrated dictionary of seventy Yahgan words for children.[14]

Regarding the Mapuche ecological knowledge, an excellent example of a cross-cultural educational tool, currently being used in schools in Chile, is a multilingual compact disc set, *Twenty Winged Poems from the Native Forests of Southern Chile,* which presents poems written by Lorenzo Aillapan, a Mapuche poet and Mapuche Birdman, combined with bird calls and a transcription of the poems into three languages, Spanish, English, and Mapuche.[15] These CDs are currently being used in schools in southern Chile and Argentina for environmental ethics education. Spanish-language discussions of this effort can be found in Francisca Massardo and Ricardo Rozzi's *Yahgan and Lafkenche Ethno-Ornithology in the Temperate Forests of Austral South America,* Lorenzo Aillapan and Ricardo Rozzi's *A Contemporary Mapuche Ethno-Ornithology: Twenty Winged Poems from the Native Forests of Chile,* and especially *Ethical Implications of Yahgan and Mapuche Indigenous Narratives about the Birds of the Austral Temporate Forests of South America*.[16]

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[14] Kurt Heidinger and Ricardo Rozzi, Francisca Massardo, Christopher Anderson, Steven McGehee, George Clark, Guillermo Egli, Eduardo Ramilo, Úrsula Calderón, Cristina Calderón, Lorenzo Aillapan, and Cristina Zárraga., eds., *Multi-Ethnic Bird Guide of the Austral Temperate Forests of South America,* trans. Christopher Anderson (Punta Arenas, Chile: Fantático Sur and Universidad de Magallanes, 2003); Francisca Massardo and Ricardo Rozzi, *The World's Southernmost Ethnoecology: Yahgan Craftsmanship and Traditional Ecological Knowledge* (Punta Arenas, Chile: Fantático Sur and Universidad de Magallenes, 2006); and Cristina Zárraga, Francisca Massardo, and Ricardo Rozzi, *Learning, Listening, the Yahgan World* (Punta Arenas, Chile: La Prensa Austral Impresos Ediciones and Universidad de Magallanes, 2006).

[15] *Twenty Winged Poems from the Native Forests of Southern Chile,* ed. Ricardo Rozzi, two compact-disc set (Plaza y Valdés, 2001).

[16] Francisca Massardo and Ricardo Rozzi, "Etno-ornitología Yagán y Lafkensche en los Bosques Templados de Subamerica Austral," supplementary volume, *Ornitolgia Neotropical* 15 (2004): 395–407; Lorenzo Aillapan and Ricardo Rozzi, "Una Etno-ornitología Mapuche Contemporánea: Poemas Alados de los Bosques Nativois de Chile," supp. vol., *Ornitolgia Neotropical* 15 (2004): 419–34; and Ricardo Rozzi, "Implicaciones Éticas de Narrativas Yaganes y Mapuches Sobres las Aves de los Bosques Templados de Sudamerica Austral," supp. vol., *Ornitolgia Neotropica*l 15 (2004): 435–44.

My point in this essay has been that for the environment to be properly protected, value perspectives other than economic value perspectives must play a leading role. By promoting understanding among all the voices speaking for the environment politically from so-called non-economic perspectives, the chance that the management of a society's environment will eventually be in terms of a balanced value system reflecting the views of society as a whole, and not just the business and industrial communities, will be greatly improved. The alternative is simply an environment managed for private economic gain.

Local versus Global Knowledge: Diverse Perspectives on Nature in the Cape Horn Biosphere Reserve

Uta Berghöfer, Ricardo Rozzi, and Kurt Jax*

A case study of socio-ecological research conducted in Puerto Williams, Chile reveals that persons belonging to different sociocultural groups in Cape Horn have a diversity of perspectives and relationships with nature. For example, a strong sense of home and belonging was expressed by the indigenous Yahgan community and by old residents, mostly descendents of early twentieth-century colonizers. However, people identified with resource use did not include positive answers for a sense of home. The concept of common land presented marked contrasts among respondents. Those identified with a cultivating type of relationship favored private property over public land. For respondents identified with an embedded type of relationship, freedom of movement was one of their most essential values. Some respondents identified with resource use and those identified with intellectual and aesthetic relationships with nature also valued common land. The approach used in this study transforms polarized and dichotomous notions into gradients of perspectives related to different degrees of local and global ecological and cultural environments. The resulting hybrid vision of perspectives on nature may be helpful in times of global change, where both local and global scales contribute to identify specific problematic asymmetries as well as opportunities for communication among different sociocultural groups.

INTRODUCTION

During the past decade, research on human's perceptions on and relations with nature, values, visions, and images of nature held by the general public has attracted growing interest.[1] The multiple meanings ascribed to nature have been analyzed

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[1] See H. J. Van der Windt, J. A. A. Swart, and J. Keulartz, "Nature and Landscape Planning: Exploring the Dynamics of Valuation, the Case of the Netherlands," *Landscape and Urban Planning* 79 (2007): 218–28; J. Keulartz, H. Van der Windt, and J. Swart, "Concepts of Nature as Communicative Devices: The Case of Dutch Nature Policy," *Environmental Values* 13 (2004) : 81–99; P. H. Gobster, "Visions of Nature—Conflict and Compatibility in Urban Park Restoration," *Landscape and Urban Planning* 56 (2001): 35–51; R. J. G. Van den Born, R. H. J. Lenders, W. T. De Groot, and E. Huijsman, "The New Biophilia: An Exploration of Visions of Nature in Western Countries," *Environmental Conservation* 28 (2001): 65–75.

and discussed with regard to their relevance for conservation. As sociologist Anke Fisher and ecologist Julliette Young have argued, communication and open debate about the values implicit in biodiversity policies help gain public acceptance and reduce conflicts.[2] "Nature" and "biodiversity" are concepts not simply defined by biological and physical realities, but they are also formed, shared and applied in ways that become strongly social and political in the course of negotiations about land use, tenure, management, and conservation.[3] Therefore, consideration for different perceptions is critical to understanding and developing the processes of conservation for both biological and cultural diversity.

British conservation biologists Paul Jepson and Susan Canney have asserted that the scientific practice of conservation has been dominated by an "overemphasis on expert-led science and economic rationalism" since its beginnings in the 1980s.[4] Regarding Latin American conservation, Ricardo Rozzi has pointed out that it is necessary to consider broader arrays of perspectives, images, and types of relationships with nature, such as those held by distinct Amerindian communities in the high Andes, Amazon basin or the subantarctic forests of southern South America, in order to advance both biological and cultural conservation.[5] The United Nations Declaration on the Rights of Indigenous Peoples, signed on 13 September 2007, affirmed "that respect for indigenous knowledge, cultures and traditional practices contributes to sustainable and equitable development, and proper management of the environment."[6] During the last decade, several other international declarations and agreements, such as the Convention on Biological Diversity (1992) and the Seville Strategy for Biosphere Reserves (1996), have emphatically called for more adequate consideration of local knowledge and perspectives on the environment.[7] The importance of cultural values for conservation has been also recognized in academia.[8] In answer to these calls, approaches to elucidate and integrate differ-

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[2] A. Fischer and J. C. Young, "Understanding Mental Constructs of Biodiversity: Implications for Biodiversity Management and Conservation," *Biological Conservation* 136 (2007): 271–82.

[3] See A. Escobar, ."Whose Knowledge? Whose Nature? Biodiversity, Conservation and the Political Ecology of Social Movements," *Journal of Political Ecology* 5 (1998): 53–82. W. Adams and J. Hutton. "People, Parks and Poverty: Political Ecology and Biodiversity Conservation," *Conservation and Society* 5, no. 2 (2007): 147–83.

[4] P. Jepson and S. Canney, "Values-Led Conservation," *Global Ecology and Biogeography* 12 (2003): 271.

[5] Ricardo Rozzi, "Éticas Ambientales Latinoamericanas: Raíces y Ramas," in *Fundamentos de Conservación Biológica: Perspectivas Latinoamericanas,* ed. R. Primack, R. Rozzi, P. Feinsinger, R. Dirzo, and F. Massardo (Mexico City: Fondo de Cultura Económica), pp. 311–62. México. See also Ricardo Rozzi, Future Environmental Philosophies and their Biocultural Conservation Interfaces," *Ethics and the Environment* 12 (2007): 142–45.

[6] "United Nations Declaration on the Rights of Indigenous Peoples" (2008) at http://www.un.org/esa/socdev/unpfii/documents/DRIPS_en.pdf, p. 2.

[7] See "Convention on Biological Diversity" at http://www.cbd.int/convention/articles.shtml?a=cbd-00; "Seville Strategy for Biosphere Reserves" at http://www.unesco.org/mab/doc/Strategy.pdf.

[8] The field of ethnobiology has played a valuable role for integrating cultural and biological diversity. See UN Environmental Programme, *Cultural and Spiritual Values of Biodiversity,* ed. D. A. Posey

ent types of knowledge have recently been developed. However, these approaches have failed because they have reduced the diversity of types of knowledge into the dicotomous categories of local and global knowledge, or indigenous and non-indigenous knowledge.[9] These dichotomies simplify and overlook the richness of perspectives embedded either in the labels of "global knowledge" or "local ecological knowledge" (also "traditional ecological knowledge"), which are too broad and vague for capturing differences in how people perceive and relate to biodiversity and their ecosystems.

The result of overlooking the whole spectrum of diversity of perspectives and relationships with nature is the suppression of valuable forms of ecological knowledge, practices, and values which have coevolved within specific ecosystem and sociocultural contexts. Linguist-ecologist Peter Mühlhäusler has warned that the suppression of local knowledge and the convergence toward a single global cultural model increase the likelihood that more and more people will encounter the same "cultural blind spots," undetected instances in which the prevailing cultural model fails to provide adequate solutions to societal and environmental problems.[10] Complementarily, linguist Michael Krauss has proposed that cultural-linguistic diversity constitutes an intellectual web of life, or "logosphere," that envelops the planet. This "logosphere" is as essential to human survival as is the biosphere.[11] In turn, Mühlhäusler proposes that "it is by pooling the resources of many understandings that more reliable knowledge can arise."[12]

Krauss has researched and documented Alaska's native languages for more than four decades and in 1972 created the Alaska Native Language Center. While working at these Northern Hemisphere high latitudes in the sub-Arctic ecoregion, Krauss has raised awareness of the global problem of endangered languages. In a mirrored situation, at the Southern Hemisphere high latitudes in the Magellanic sub-Antarctic ecoregion, we participated in the creation of the Omora Ethnobotanical Park, which in 1999 launched a biocultural conservation and field environmental philosophy program that has called attention to threatened indigenous languages,

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(London: Intermediate Technology, 1999); L. Maffi, ed., *On Biocultural Diversity: Linking Language, Knowledge, and the Environment* (Washington, D.C.: Smithsonian Institution Press, 2001).

[9] See G. Mohan and K. Stokke, "Participatory Development and Empowerment: The Danger of Localism," *Third World Quarterly* 21, no, 2 (2000): 247–68; A. Agrawal and C. C. Gibson, "Enchantment and Disenchantment: The Role of Community in Natural Resource Conservation," *World Development* 27, no. 4 (1999): 629–49; A. Agrawal, "Dismantling the Divide between Indigenous and Scientific Knowledge," *Development and Change* 26, no. 3 (1995): 413–39.

[10] P. Mühlhäusler, "The Interdependence of Linguistic and Biological Diversity," in *The Politics of Multiculturalism in the Asia/Pacific,* ed. D. Myers (Darwin, Australia: North Territory University Press. 1995), pp. 152–61.

[11] M. Krauss, "Mass Language Extinction and Documentation: The Race against Time," in *The Vanishing Languages of the Pacific Rim,* ed. Osahito Miyaoka, Osamu Sakiyama, and Michael E. Krauss (Oxford and New York: Oxford University Press, 2007), pp. 3–24.

[12] Mühlhäusler, "The Interdependence of Linguistic and Biological Diversity," p. 160.

and the richness of traditional ecological knowledge held by indigenous and other local communities in southern South America.[13]

THE CAPE HORN BIOSPHERE RESERVE

Today the austral region of Cape Horn represents a last frontier, where a global cultural-economic model is taking over for a set of local cultural traditions, subsistence economies, native biota, and landscapes. Global culture has almost completely replaced Yahgan indigenous, as well as nineteenth and twentieth-century European colonizer cultural traditions.[14] The market economy has almost completely replaced non-monetary economies. Spanish and English have nearly totally supplanted the indigenous Yahgan language.[15] Introduced exotic species of economic interest (for example, Atlantic salmon, North American beaver, and mink) are rapidly spreading, transforming regional ecosystems, and impacting native marine as well as terrestrial biota.[16]

In this global-local borderland context, a new UNESCO biosphere reserve was established at the extreme south of the Americas in the Cape Horn region of Chile. Its creation in 2005 was the result of a five-year collaborative effort between the regional government and an interdisciplinary team of researchers based at the Omora Ethnobotanical Park, which functions as a center for biocultural research, education, and conservation in the Cape Horn Biosphere Reserve.[17] From the point of view of the Chilean Government,

> The Cape Horn Biosphere Reserve signifies a shift in the State's vision of development in the extreme southern tip of Chile, moving from a policy based on short-term extraction towards an outlook of long-term sustainable development, which takes into account the ecological and cultural singularities of the territory. The implementation of the new reserve promotes the valuing of ecosystem services that contribute to the

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[13] See Ricardo Rozzi, Christopher Anderson, Francisca Massardo, and John Silander, Jr., "Diversidad Biocultural Subantártica: Una Mirada desde el Parque Etnobotánico Omora," *Chloris Chilensis* 4, no. 2 (2001) at http://www.chlorischile.cl/rozzi/rozzi.htm.

[14] The Yahgan people are the original inhabitants of the Cape Horn region. See C. McEvan, L. Borero, and A. Prieto, *Patagonia: Natural History and Ethnography at Uttermost End of the Earth* (London: British Museum Press, 1998); A. Chapman, "Más Allá de la Etnología," *Austro Universitaria* 14 (2003): 60-69; M. Martinic, *Crónica de las Tierras del sur del Canal Beagle* (Punta Arenas, Chile: Ediciones Lakutaia, 2006).

[15] See R. Rozzi, F. Massardo, J. Silander, Jr., C. Anderson, and A. Marin, "Conservación Biocultural y Ética Ambiental en el Extremo Austral de América: Oportunidades y Dificultades para el Bienestar Ecosocial," in *Biodiversidad y Globalización,* ed. E. Figueroa and J. Simonetti (Santiago, Chile: Editorial Universitaria, 2003), pp. 51–85.

[16] C. Anderson, R. Rozzi, J. C. Torres-Mura, S. McGehee, M. Sherriffs, E. Schuettler, and A. Rosemond, "Exotic Vertebrate Fauna of the Remote and Pristine Sub-Antarctic Cape Horn Archipelago, Chile," *Biodiversity and Conservation* 15 (2006): 3295–3313.

[17] See Rozzi, R. F. Massardo, C. Anderson, K. Heidinger, and J. Silander, Jr., "Ten Principles for Biocultural Conservation at the Southern Tip of the Americas: The Approach of the Omora Ethnobotanical Park," *Ecology and Society* 11, no. 1 (2006): 43, at http://www.ecologyandsociety.org/vol11/iss1/art43.

> well being of communities and highlights the importance of conserving the territory for science, artisanal fishing and sustainable tourism.
>
> The challenge presented by the biosphere reserve acquires international relevance given that the archipelagic territory of Cape Horn constitutes one of the few places remaining on the planet that is still free of stark human transformations. It is a remote region where myriads of living beings (which are unusual regarding their taxonomic composition and ecosystem processes) still live entangled in uncommon and diverse ecological and human dynamics. In this sense the southern summit of the Americas emerges at the beginning of the twenty-first century as a space where distinct "ethos" (diverse ways of inhabiting the world by humans and other living beings) express themselves, provoking and inspiring global society in its current search for environmental, economic and social sustainability.[18]

In order to fulfill these goals, it is critical to pay close attention to the diversity of perspectives and relationships with nature held by persons belonging to different sociocultural groups in Cape Horn.[19] In this article, we present a case study of socio-ecological research conducted in Puerto Williams, capital of the Chilean Antarctic Province and the world's southernmost town. Puerto Williams is located south of Tierra del Fuego on Navarino Island, and has a small population of 2,200 inhabitants. We offer this empirical study as a step toward proposing an approach that contributes to overcoming the prevalence of the dichotomous labels of global and local ecological knowledge. Our empirical approach can provide insights for disclosing heterogeneous environmental perspectives, values, and forms of relationships with nature, which can be found within small and remote "local communities" around the world.

ASSESSING PERSPECTIVES AND RELATIONSHIPS WITH NATURE IN CAPE HORN

To characterize and analyze the diversity of perspectives on nature held by inhabitants of the Cape Horn Region, we based our empirical work on Anselm Strauss' "Grounded Theory."[20] This approach is not intended to demonstrate the relationship

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[18] R. Rozzi, F. Massardo, C. Anderson, A. Berghoefer, A. Mansilla, M. Mansilla, J. Plana, U. Berghoefer, E. Barros, and P. Araya, *The Cape Horn Biosphere Reserve* (Punta Arenas, Chile: Ediciones Universidad de Magallanes, 2006), pp. 31–35.

[19] The long-term goals of social well-being, sustainability, and conservation of biological and cultural diversity for the creation of Cape Horn Biosphere Reserve, represents a new approach in Chilean conservation policy. As compared to the seven biosphere reserves previously created in Chile, the new one at Cape Horn raised new challenges by including both marine and terrestrial ecosystems, as well as human settlements, within a protected area for the first time in Chile. Encompassing 48,842.7 square kilometers, the Cape Horn Biosphere Reserve is the largest one in southern South America (Argentina, Uruguay, and Chile). However, this vast territory includes a very small human population of 2,300 people, of whom more than ninety-six percent lives in the town of Puerto Williams. See R. Rozzi, F. Massardo, and C. Anderson, eds., *The Cape Horn Biosphere Reserve: A Proposal for Conservation and Tourism to Achieve Sustainable Development at the Southern End of the Americas,* Bilingual English-Spanish ed. (Punta Arenas, Chile: Ediciones Universidad de Magallanes. 2004).

[20] A. Strauss and J. Corbin, *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory* (Thousand Oaks: Sage Publications, 1998).

with nature in a statistical way but to ground it by interpreting and arguing on the basis of empirical data, through iterative processes of data collection done jointly with data analysis.

Among the inhabitants of the Cape Horn Biosphere Reserve we identified five different sociocultural groups, which include: (1) members of the indigenous Yahgan community living in Puerto Williams, (2) old-established residents who are descendants of European colonizers, (3) more recently settled residents (e.g., fishermen, soldiers), (4) families of the Chilean navy living temporarily on Navarino Island (mostly for two or three years), and (5) temporary government authorities and residents working for public services.[21] At least ten persons of each sociocultural group were interviewed in Spanish. Semi-structured questionnaires included more than thirty specific questions, but the general questions that guided the analysis of the interviews were: how do people perceive, value, and live with nature and biodiversity in the Cape Horn region? What types of perspectives and relationships with nature can be identified among people living in Puerto Williams?

In the first step of the iterative process defined by the grounded theory approach, the first interviews were analyzed using line by line coding (open coding) to generate and find substantive codes. Memos and theoretical notes were written during the coding process. The categories found in the first phase of analysis guided the next steps of data collecting. After having identified the set of main types of perspectives and relationships with nature, the next step was to return to the interviews and to analyze the prevalence of these types of perspectives and relations (selective coding) again in every interview (and thus individual respondents).

Our study was mostly conducted in the context of an interdisciplinary research project that included three research areas—ecology, economy, and ethics—in order to investigate, evaluate, and contribute to conservation of biological and cultural diversity in the Cape Horn region.[22] To explore societal relationships with nature, we conducted both biological investigations as well as research on people's perceptions about biodiversity. For the latter, we used qualitative research methods including participant observation, focus groups, and non-structured and semi-structured interviews. Between August 2003 and August 2006, we interviewed sixty-seven persons belonging to different sociocultural groups living in Puerto Williams and conducted four focus group discussions. Participant observation by Uta Berghoefer and Ricardo Rozzi since 1998, as well as ethnoecology research and biocultural conservation projects conducted in Cape Horn at Omora Ethnobotanical Park during the last decade, complemented our methods. We chose a qualitative approach

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[21] See Rozzi et al., "Diversidad Biocultural Subantártica"; U. Berghöfer, *Zur Partizipation der Lokalen Bevölkereung bei der Implementierung der Biodiversitätskonvention—Das Beispiel des Gesplanten Biosphrärenreservates Cabo de Hornos (Südchile)* (Diploma Thesis, Institute of Geography, University of Bonn, Germany, 2002); X. Arango, R. Rozzi, F. Massardo, C. B. Anderson, and J. T. Ibarra, "Descubrimiento e Implementación del Pájaro Carpintero Gigante (*Campephilus magellanicus*) Como Especie Carismática: Una Aproximación Biocultural para la Conservación en la Reserva de Biosfera Cabo de Hornos," *Magallania* 35, no. 2 (2007): 71–88.

[22] See the BIOKONCHIL project at http://www.ufz.de/index.php?en=1894.

as we assumed that our conceptualization of "nature" may differ from those of our respondents. Therefore, an explorative methodology left more space for the expression of diverse perceptions and perspectives, which could not be defined a priori by the researcher.

DEFINING PERSPECTIVES AND RELATIONSHIPS WITH NATURE IN CAPE HORN

Based on the analysis of the interviews, we identified four main dimensions of ecological understanding, attitudes and practices that defined the types of perspectives and relations with nature in Cape Horn: "knowledgescapes," "material interactions," "non-material interactions," and "identification and relatedness."

By knowledgescapes (following Matthiesen) we refer to the dimension that combines forms of knowledge, processes of transfer of knowledge, and content or information itself.[23] Environmental knowledge does not only encompass "facts" or "information." It also involves the processes of acquiring, choosing and integrating new information about biodiversity and the ecosystems, especially in terms of its relevance. Knowledge is a dynamic process in which environmental exploration and interpretation play central roles to develop adaptive ways of living and inhabiting local and regional environments.[24] Noticeably, regarding the species of plants and animals that respondents identified on Navarino Island, the analysis revealed that formal education at school did not play a major role. This knowledge was almost exclusively acquired through personal experiences and contact with family members, mostly parents and grandparents. Therefore, the relationship to the community and family members who act as "knowledge facilitators" play a substantive role for acquiring knowledge about local biota and ecosystems. In addition, respondents expressed that activities involving "direct encounters" with animals and plants in their habitats in Cape Horn also played a major role in their knowledge, values, and relationships with nature.[25]

The second dimension, material interactions, refers to the respondents' activities involving direct consumption or transformation of local environments, such as cultivating (horticulture, agriculture, farming, and livestock), fishery, forestry, hunting, and gathering plants for medicine and handicraft. Among material interactions, we made distinctions between commercial and/or subsistence activities (following Barbier).[26]

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[23] U. Matthiesen, "KnowledgeScapes: Pleading for Knowledge Turn in Socio-Spatial Research," Working Paper, Leibniz-Institute for Regional Development and Structural Planning (IRS), Erkner, Germany, 2005.

[24] Ibid.

[25] R. Rozzi, F. Massardo, J. Silander, Jr., C. B. Anderson, O. Dollenzand, and A. Marin., "El Parque Etnobotánico Omora: Una Alianza Público-Privada para la Conservación Biocultural en el Confín del Mundo," *Revista Ambiente y Desarrollo* 19, no. 1 (2003): 43–55.

[26] E. B. Barbier, J. C. Burgués, and C. Folke, *Paradise Lost? The Ecological Economics of Biodiversity* (London: Earthscan Publication, 1994).

Non-material interactions refer to the respondents' activities in direct contact with Cape Horn's biodiversity, habitats, and landscapes, without involving consumption use or major material modifications of the local environments. In their answers, respondents included activities such as leisure, walking, hiking, photography, painting, scientific fieldwork, and observation. Many of these non-material activities took place only after material interactions had previously been conducted. For example, hiking was most frequently performed on trails that were previously built. Interestingly, this type of previous material interactions was often not perceived by the respondents, who seldom consciously related their spiritual enjoyment of hiking and encountering wild landscapes to the previous process of building trails. In other cases, respondents referred to non-material interactions that took place together with material interactions. For example, a fisherman described his admiration for a sunrise, at the same time he described the work associated with setting king crab traps during a winter morning.

The fourth dimension, identification and relatedness, refers to those aspects of a relationship with nature that are characterized by feelings of home ("Heimat" in German), cultural identity, and emotional attachment.[27] Nearly every respondent gave a statement about his or her personal bonding feelings for Navarino Island. The specific animals, plants, places, or landscapes to which respondents related to, provided essential reference-frameworks for their environmental judgments and decision making.

TYPES OF PERSPECTIVES AND RELATIONSHIPS WITH NATURE IN CAPE HORN

The interviews exhibited different combinations of the four dimensions discussed above. Based on the analysis of these combinations, we identified seven major types of perspectives and relationships with nature in the Cape Horn Biosphere Reserve, which are described below.

(1) Embedded Relationship with Nature

"I have been working . . . well, in nearly all the places [of the Cape Horn Archipelago] I have been working in Windhond, Yendegaia, Navarino, Douglas and Lennox, Nueva, Picton, everywhere. . . . I really like everything here; everything, everything. Because I think that in other places I could not be. . . . I would not feel well in another place."

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[27] S. Körner S. 2004. "Naturbilder und Heimatideale in Naturschutz and Freiraumplanung." in L. Fisher, ed., *Projektionsfläche Natur: Zum Zusammenhang von Naturbildern und Gesellschaftlichen Verhätnissen* (Hamburg, Germany University Press, 2004), pp. 77–103. See also T. Greider and L. Garkovich, "Landscapes: The Social Construction of Nature and the Environment," *Rural Sociology* 59, no. 1 (1994): 1–24.

This type of relationship with nature was grounded on strong local perspectives, cultural embeddedness, and identification, and included ten of the sixty-seven respondents. They referred to actual events and specific places, such as Windhond Bay and Yendegaia Bay, or Navarino Island and Picton Island, instead of merely referring to general categories, such as "bays" or "islands."

This type of embedded relationship with nature involved multiple material interactions, including work in direct contact with natural resources, and natural or rural landscapes. Native animals, such as limpets (*Fisurella spp.*) for food, and native plants, such as austral rushes (*Marsippospermum grandiflorum*) for basketry, played a significant economic and subsistence role.[28] Non-material interactions with nature were also relevant, especially, in terms of cultural symbolic meanings, places of their ancestors, and the cultural meanings of certain plants and animals. For example, birds like the buff-necked ibis (*Theristicus melanopis*) must be treated with respect, and cannot be imitated. The arrival of these birds to the archipelago indicates the arrival of spring and good weather.[29] Respondents did not refer to a separation between humans and nature. The concept of wilderness did not seem to have a place under this perspective because respondents having an embedded type of relationship with nature have long inhabited the Cape Horn ecosystems, co-habitating with native animals and plants.

Regarding learning processes, respondents stated clearly that their knowledge about natural elements and ecological interactions was mostly acquired through personal experiences and/or learned from their parents and grandparents. Formal school education did not seem to play a role in the acquisition of knowledge about the biota and landscapes of the Cape Horn region. On the contrary, one respondent enviously stated that he had less knowledge about native biota than his cousin who had spent less time in school, and consequently had more opportunities to share and learn from his family.

In this type of relationship with nature, respondents understood the territory to be a common good, where people can freely navigate, walk, fish, camp, gather berries, or hunt. Private property had no place under this embedded relationship with nature. Moreover, the freedom of movement and the possibility "to go and work wherever you want" was one of their most essential values. These concepts are coherent with the current prevalence of public land within the Cape Horn Biosphere Reserve.

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[28] See F. Massardo and R. Rozzi, *The World's Southernmost Ethnoecology: Yahgan Craftmanship and Traditional Ecological Knowledge,* English-Spanish ed. (Punta Arenas, Chile: Ediciones Universidad de Magallanes, 2006).

[29] R. Alvarez, F. Massardo, R. Rozzi, U. Berghöfer, A. Berghöfer, and J. Fredes, "Cultural Heritage of the Proposed Cape Horn Biosphere Reserve," in R. Rozzi, F. Massardo, and C. B. Anderson, eds., *The Cape Horn Biosphere Reserve: A Proposal of Conservation and Tourism to Achieve Sustainable Development at the Southern End of Americas* (Punta Arenas, Chile: Ediciones Universidad de Magallanes, 2004), pp. 155–204.

(2) A Cultivating Relationship with Nature

"For me it is important: I look after the land, I'm making my living out of it, I take care of it. I do not abuse it and I do not overexploit it in any way."

The material interaction in combination with a strong identification with the land was the most important aspect of this type of relationship with nature, which was expressed by twelve of the sixty-seven interviewed persons. The notion of home was an important associated value; people had a strong feeling of living and working in the place. This notion of home was, in turn, related to four other essential characteristics present in the answers of the respondents: (1) cultivated land was their prevailing image of nature; (2) dependency on local natural resources was an important component of subsistence economy or income; (3) the long-term perspective was caring for the land and avoiding overexploitation; and (4) private property was the preferred form of ownership and involved access to the land in this relationship with nature.

Cultivated land meant mostly cultivation or husbandry of exotic species, including sheep, cattle, and horses.[30] Their "knowledgescapes" were not embedded in the Fuegian indigenous cultural traditions of the Cape Horn region. Most of the holders of this relationship with nature (or their families) came from other parts of Chile. They belonged to colonizer families, where family and personal experience with the land was the most important source of their acquisition of knowledge about nature.

"How did you learn about the plants and animals, about nature in Cape Horn?"

"With my dad; he taught me everything I know today."

"Did he tell you?"

"No, I worked with him; I always accompanied him during his work."

Being in contact with nature and the family primarily meant being in the countryside, farming, living and working with domestic animals. In addition to these material relationships, respondents also placed a high value on non-material relationships, such as being quiet and taking serene walks, as well as exploring a wild or beautiful nature. Noticeably, they often expressed discontent with current policies for nature protection. They complained that their ways of living were being devalued by new conservation policies: *"[The Government] should not 'cut off the hands' of those who raise cattle, of those who cultivate the land and of those who work cutting firewood."* They felt powerless in the face of the state: *"These laws and all that [regulations] always come from outside. [Laws and regulations are] made by people who do not know what it means to live here."* The respondents made a clear distinction between "taking care of" and "protecting" the land; as one person stated, *"I cannot protect what I'm working on."*

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[30] R. Rozzi, F. Massardo, C. B. Anderson, S. McGehee, G. Clark, G. Egli, E. Ramilo, U. Calderón, C. Calderón, L. Aillapan, and C. *Zárraga, Multi-Ethnic Bird Guide of the Austral Forests of South America* (Punta Arenas, Chile: Editorial Fantástico Sur and Universidad de Magallanes, 2003).

(3) Changing Relationship with Nature

"Before, when I owned a mini-market, I spent the whole day in the store, the store, the store. Zero contact with nature. When I went outside, I walked a bit and nothing else. Now I have another vision. Importantly, now that I'm more into tourism I appreciate more."

Six of the sixty-seven respondents stated that they had had a recent change in their perceptions and type of relationship with nature. A primary factor in this change was experiencing direct contact with the habitats, animals, and plants of Cape Horn. Five respondents said that prior to the change they were living and working mostly indoors. For reasons related to educational and/or economic activities, they began visiting and exploring natural areas, and came to appreciate the beauty of Cape Horn's nature, as well as the importance of learning and the enjoyment of these outdoor experiences.

One respondent said that she was recently taught that children learn better about nature in the outdoors: *"I will not tell them about a tree. . . . it is better that they observe it, that they draw it. . . . For example, I will not tell the children that trees have green leaves, so that they memorize that. The ideal situation is that they observe, and maybe they will find other colors. . . . So, the idea is to go out with the children and explain to them all things in the field."* This person learned about the importance of direct encounters with birds and plants in their habitats, and started to transmit this experience to the children at school, promoting a connection with nature, which was absent to her way of teaching and living prior to her own experience of participating in ecologically guided field activities. Another person said that she changed due to economic reasons associated with ecotourism. *"We started with a hostel, . . . and for business reasons one observes the demands made by tourists and which of those activities are profitable. Then, foreign tourists started to arrive, and a stronger tourist orientation began. We tried offering tourism and . . . all that involves working outdoors, enjoying, and knowing different types of persons."*

A single respondent said that her relationship with nature changed drastically because she spends most of the day at school. This girl said that prior to this change, she was living mostly in contact with nature. She remembered when she was a little girl and spent most of her time outdoors; today, she must spend most of the day inside the classroom. Regarding the possibility of working as a tourism-guide, she said, *"It would be fun . . . to guide tours going outdoors . . . like I did when I was little . . . and to have walks with 'gringos,' . . . sharing with them, and showing them Puerto Williams."*

In summary, new educational approaches promoted by Omora park, and growing ecotourism activity in Puerto Williams stimulated in several of the interviewed persons a significant change in their appreciation of Cape Horn's biodiversity and relationship with nature. On the other hand, for students born in Cape Horn, formal education changed the relationship with nature in the opposite direction because they became isolated from the local environments by having to stay at school.

(4) Resource-Use Relationship with Nature

"I'm not interested in getting to know the island ashore because there are only putrid trunks, bogs and things that don't even resemble a forest; well, there is only mud. This is what I think of the island," said a fisherman. Only two of the sixty-seven respondent referred to nature primarily in terms of the use of natural resources. Characteristic of this type of relationship was an emphasis on material interactions, with little or no interest for non-material interactions with nature. In contrast to the type of cultivating relationship with nature, symbolic interactions such as aesthetics were not present at all.

Respondents having this resource-use relationship with nature did not identify with the place. A sense of home was absent in this type of relationship. However, a strong economic dependency on natural resources was present, and it even involved native species, such as king crab (*Lithodes santolla*). Nevertheless, the relationship with these natural resources was mostly established in terms of a sharp distinction between humans and nature, leading to exploitation, even overexploitation. Consideration for future generations, long-term relations, appreciation for the place and conservation of nature were not relevant.

(5) Intellectual Relationship with Nature

"To rediscover, to reorientate, to renourish your [our] perspective with new dynamics, with new aesthetic dispositions. . . . [Nature] is not a human cultural creation; it is there and we have to share it; there's no reason to dominate it, nor to correct it, nor to do anything with it. You [we] are called to live it, to enjoy it," affirmed one of the respondents who emphasized that nature serves to educate human beings. Six of the sixty-seven respondents were identified with this type of intellectual relationship with nature. It involved familiarity with environmental discourses (habitat destruction, urbanization, etc.), which can be characterized as "knowledgescapes" focused on global perspectives and scientific knowledge.

One prominent characteristic of this intellectual relationship was the lack of need or interest in controlling or exploiting nature. These people held a preservationist perspective, and had no economic needs regarding consuming local natural resources. Non-material interactions predominated in their relations with nature. Activities such as recreation, exploring, and taking pictures were frequently mentioned. Interestingly, among the six respondents identified with this intellectual relationship, we noticed a type of separation between human activities and nature at the level of personal everyday life, because for them work and leisure were clearly separated activities. Moreover, the bond with the Cape Horn region as a place of home or "Heimat" was low. The prevailing image of nature was that of a "wild and untouched nature," which was highly valued, but also highly idealized and described with universal concepts. Persons holding this type of intellectual

relationship were not born in the area. They had an appreciation for native biota and landscapes. However, their relationship with nature was strongly influenced by knowledge brought from outside of the region, including formal education and practices such as reading about ecology, and comparing different regions of the world. Moreover, they often expressed interest for continuing formal education, and seeking advanced degrees in natural or social sciences.

(6) No Direct Relationship with Nature

"Personally, I'm here because I just have to be here. I could not say 'how nice Puerto Williams is, I like it.' No, I'm here because, well, my husband was sent down here and that is all. And I haven't dedicated any time to getting acquainted." Two of the interviewees had no direct contact or interaction with the natural environments of Navarino Island and Cape Horn. They did not explore the island, and were not interested in the material value or the beauty of the place. They lived a "100 percent city life" in Puerto Williams, and would have preferred to be back as soon as possible in another place in Chile; mostly those places from which they came. These two respondents lived in strong isolation with respect to Cape Horn's cultural and ecological environment.

(7) Aesthetic Relationship with Nature

"It is incredible to sit down and look at the mountains in front of you! Before you [I] looked at them on a postcard, and they were really far away. To have them here is wonderful! You enjoy it day to day as you know that later you [I] will be gone. . . . I remember [before coming to Cape Horn] when I was sitting at the table in the dining room of my mum and you didn't see anything [natural]. You [I only] could watch TV, and look at houses and [see] only electric cables and everything [artificial]."

Aesthetic appreciation was the most common type of relationship with nature among people in Puerto Williams, and included forty-two percent of the respondents in Cape Horn. This type of relation also focused on non-material interactions, but the "knowledgescapes" were different from that of the "intellectual relationship." Knowledge about specific biological species or ecological interactions was not important; aesthetic appreciation predominated.

The aesthetic pleasure of living in wilderness areas was frequently contrasted to life in cities. One of the respondents said that she highly valued *"the possibility of enjoying beauty here; you go outdoors, and outside the village, you meet with a virgin and natural beauty."* In these outdoor aesthetic experiences in the "virgin landscapes" of Cape Horn, animals were more frequently mentioned than plants; moreover, knowledge about plants was very low. Holders of this relationship to nature often alluded to charismatic species such as the Magellanic woodpecker

(*Campephilus magellanicus*), and spoke in favor of nature protection.[31] The prevailing image of nature was, however, the "beautiful landscape."

SOCIOCULTURAL GROUPS AND RELATIONSHIPS WITH NATURE IN CAPE HORN

As a first result derived from the analyses of the interviews, at least seven distinct types of relationships with nature co-exist in the small and remote town of Puerto Williams, with only 2,200 inhabitants. Therefore, "local ecological knowledge" is not a homogenous concept but it includes a variety of perspectives on nature, even at the southernmost town of the world.

A second finding is that one of the perspectives, the aesthetic one, was identified in all sociocultural groups (fig. 1). Therefore, some dimensions of ecological knowledge and types of relationships with nature are shared by contrasting sociocultural groups.

The aesthetic type of relationship with nature exhibited different degrees of dominance among sociocultural groups: we identified fifteen percent of the Yahgans, twenty-seven percent of old residents, forty-percent of the new residents, fifty-five percent of public service officials, and eighty-one percent of navy family members with this type of relationship with nature. Therefore, the aesthetic perspective tended to prevail more among recently arrived persons and/or people who live only transitorily in the territory, and have no material interactions with nature. This finding suggests that the aesthetic perspective is a fundamental aspect of nature perception that remains present among diverse sociocultural groups that have different degrees of connection with nature. Hence, the aesthetic perspective might serve as a "meta-perspective" on nature, which might provide a useful communicative bridge among different sociocultural groups and/or stakeholders.

A third finding was the association between sociocultural groups and the types of relationships with nature. Among members of the Yahgan community, an embedded type of relationship with nature prevailed; it was identified in sixty-two perent of the respondents (fig. 1a). A smaller proportion of the Yahgan people (fifteen percent) identified themselves with a cultivating type of relationship with nature, which was the prevailing type of relationship among old residents (forty-five percent; fig. 1b). A smaller proportion of old residents (eighteen percent) were identified with a changing type of relationship with nature. Interestingly, this type of changing relationship was found only among Yahgan people, old residents, and a few professionals working in public services (those responsible for environmental issues); it was not present among recently arrived residents or navy family members. This finding suggests that to experience changes in ones perspectives on nature and/or in the type of relationship established with nature, it is necessary to hold some degree of connection with nature that provides the baseline and stimulus for changes.

[31] Arango et al., "Descubrimiento e Implementación."

A resource-use relationship with nature was the prevailing type of relationship among recently arrived residents (forty percent; fig. 1c). A smaller proportion of new residents (twenty percent) had an intellectual relationship with nature, which was the prevailing type of relationship among public service officials and government authorities (thirty-six percent; fig.1d). An intellectual type of relationship was also present among navy family members (six percent), but more frequently navy family members had a no-direct type of relationship with nature (thirteen percent; fig. 1e). However, among the three last sociocultural groups—new residents, public service officials, and navy family members—the aesthetic perspective on nature was clearly dominant.

Consequently, in addition to the diversity of ecological perspectives, a pattern of association between the types of perspectives on nature and the sociocultural groups was discovered in Cape Horn. This pattern shows two trends: (1) specific types of relationships with nature are characteristic of specific sociocultural groups; and, (2) there is a sequence of perspectives which links sociocultural groups through shared types of relationships with nature. For example, embedded and cultivating types of relationships with nature were identified only among Yahgan people and old residents; an intellectual type of relationship was identified only among new residents, public services officials, and navy family members.

ROOTEDNESS IN THE LOCAL ENVIRONMENT AND DIVERSITY OF RELATIONSHIPS WITH NATURE IN CAPE HORN

This case study in Cape Horn offers a reticulate picture of the concepts of local and global knowledges. Both notions, local and global ecological knowledge, involve a rich diversity of perspectives on nature. This reticulate understanding helps us move from universal–abstract perspectives toward local-actual perspectives and types of relationships with nature, which are regularly excluded from general analyses, and consequently from decision making. Placed at a borderline situation, where global and local perspectives on nature encounter each other under an asymmetrical power scenario focused on global ones, our reticulate biocultural picture of Cape Horn opens questions about how to achieve a more balanced coexistence between different sociocultural groups and their diverse types of relationships with nature.

In order to translate our research findings into a format that facilitates their incorporation into decision-making processes in the Cape Horn Biosphere Reserve, we offer a semi-quantitative analysis based on thirteen attributes that we recognized as essential characteristics of the interviewed persons, and their perspectives on and types of relationships with nature. On the one hand, this semi-quantitative approach presents results in a format that is more familiar to decision-makers. On the other hand, it affords greater resolution to define each type of perspective on nature than that provided by the four main dimensions of ecological understanding identified at the beginning of our study: "knowledgescapes," "material interactions,"

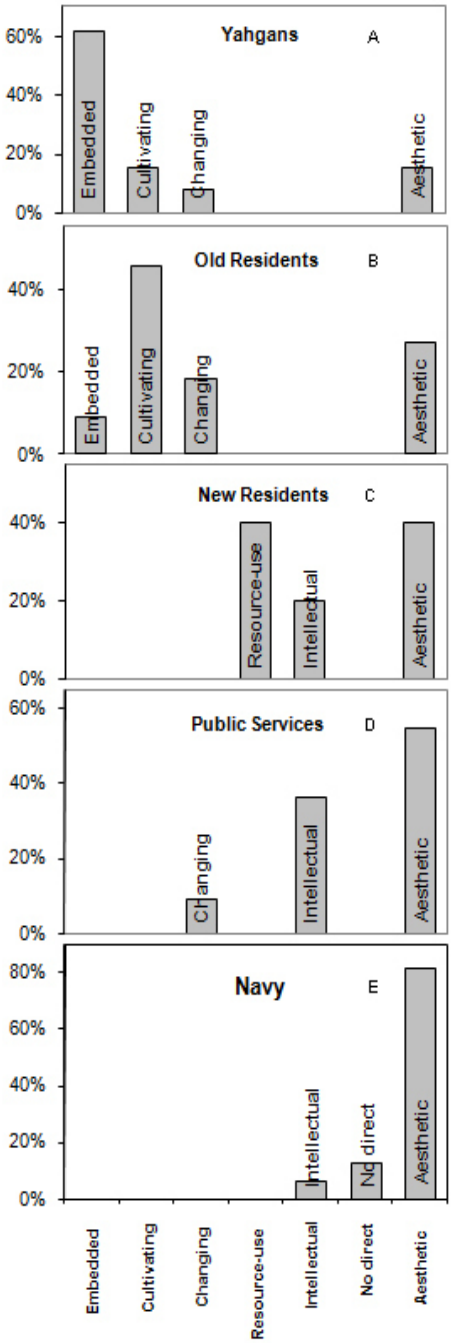

Figure 1 (left). Frequency (%) of each type of relationship with nature expressed by members of each of the sociocultural groups interviewed in Puerto Williams, within the Cape Horn Biosphere Reserve at the southern end of the Americas.

Table 1 (right). Attributes identified in the answers of the respondents that were helpful to assess the degree to which their perspectives and types of relationships with nature were rooted in their local environment. A semi-quantitative analysis was developed by assigning values of 1, 0.5, or 0, if most, some, or none of the respondents identified themselves with the attribute, respectively. Attributes are grouped into four main dimensions of ecological understanding, attitudes and practices that defined the types of perspectives and relations with nature in Cape Horn: "knowledgescape," "material interactions," "non-material interactions," and "identification and relatedness."

Dimension	Attribute	Embedded	Cultivating	Changing	Resource use	Intellectual	No direct relationship	Aesthetic	Mean	No of +
Knowledgescapes	**1)** *Language* : Interviewee speaks native indigenous language (=1) or speaks only Spanish or other European language	0.5	0	0	0	0	0	0	**0.07**	**1**
	2) *Learning facilitator or mentors* : family or community members are more important (1) than school teachers (0)	1	1	0.5	0.5	0	0	0.5	**0.50**	**5**
	3) *Source of knowledge about nature* : local experience and examples are more important (=1) than formal education and universal concepts (=0)	1	1	0.5	0.5	0	0	0.5	**0.50**	**5**
Material interactions	**4)** Respondent provides examples of *personal involvement in material interactions* (=1)	1	1	0.5	1	0	0	0	**0.50**	**4**
	5) *Economic dependency on natural resources* (=1)	1	1	0.5	1	0	0	0	**0.50**	**4**
	6) *Economic reliance on native species* (=1) rather than on exotic species (=0)	1	0	0.5	1	0	0	0	**0.29**	**3**
Non-material interactions	**7)** Respondent provides examples of Non-material interactions (=1)	1	0.5	0.5	0	1	0	1	**0.58**	**5**
	8) Native animals. plants or places have cultural meaning (=1)	1	0	0.5	0	0.5	0	0.5	**0.36**	**4**
Identification and relatedness to place	**9)** Sense of home ["Heimat"] (=1)	1	1	0.5	0	0	0	0.5	**0.43**	**4**
	10) Land conceived as common good (=1) more than as private property (=0)	1	0	0	0.5	0.5	0	0.5	**0.43**	**4**
	11) Relationship with nature included family and/or community (=1) more frequently than individual persons (=0)	1	1	0.5	0	0	0	0.5	**0.43**	**4**
	12) Interviewee born in place (=1)	1	1	0.5	0	0	0	0.5	**0.43**	**4**
	13) Answers given in 1st person (= 1) more frequently than in 3rd person (= 0)	1	1	0.5	0.5	0	0.5	0.5	**0.57**	**6**
Degree of rootedness in the local environment	**Mean**	**0.96**	**0.67**	**0.46**	**0.35**	**0.15**	**0.04**	**0.38**	**0.43**	
	Number of positive cases (>0)	**13**	**9**	**11**	**7**	**3**	**1**	**9**		

"non-material interactions," and "identification and relatedness." Accordingly, the thirteen attributes were organized in four subsets, each of them associated with one of the four main dimensions of ecological understanding (table 1). Finally, the set of thirteen attributes was also defined to assess the degree of rootedness in the local environment of each of the identified types of relationships with nature. In this way, this semi-quantitative approach overcomes the dichotomous reduction and simplification of the labels "global" and "local" ecological perspectives, transforming this duality into a matter of degree.

For this semi-quantitative analysis, we assessed the degree of rootedness to the local environment of each of the seven types of relationship with nature by assigning values of 1, 0.5, or 0 to each of the thirteen attributes. A value of 1 indicates "mostly rooted in local-Cape Horn ecological and cultural environments," while a value of 0 indicates "mostly rooted in foreign-global ecological and cultural environments." For each combination of attribute and type of relationship with nature, each cell in table 1, a value of 1 was assigned if most of the interviewed persons (more than seventy-five percent) responded positively; a value of 0.5 was assigned if only approximately half of the interviewed persons (more than twenty-five percent and and less than seventy-percent) responded positively and/or if respondent's statements could only partially fulfill the attribute; a value of 0 was assigned if almost none or none of the interviewed persons (less than twenty-five percent) responded positively to the stated attribute.

The first three attributes assessing the degree of rootedness in the local environment addressed three aspects of the dimension of ecological understanding defined as "knowledgescapes:" (1) language, (2) learning facilitator, and (3) source of knowledge about nature (table 1). Language assessed whether the interviewed person spoke the native indigenous language (=1) or spoke only Spanish or some other European language (=0). Learning facilitator (or mentor) assessed whether the interviewed persons, family, or community members have been more important (=1) than school teachers (=0) in learning about nature. Source of knowledge about nature assesses whether for the interviewed person, local experience, and examples have been more important (=1) than formal education and universal concepts (=0) in learning about the local environment, material and non-material interactions with it. Yahgan language was spoken (or at least Yahgan names of plants and animals were known) only by a few members of the indigenous community, who held an embedded type of relationship with nature. Local mentors and local experiences in learning about nature prevailed in the types of embedded and cultivating relationships with nature, including only members of the Yahgan indigenous community and old residents. Persons identified with changing, resource-use, and aesthetic types of relationships with nature had a combination of family or local mentors and school teachers, as well as personal direct experiences in nature and formal education. Persons identified with intellectual and no-direct types of relationships with nature relied exclusively on formal education received from other places in Chile or the world.

The next three attributes assessing the degree of rootedness in the local environment addressed three aspects of "material interactions" with nature: (4) personal involvement in material interactions, (5) economic dependency on natural resources, and (6) economic reliance on native species. Personal involvement in material interactions assessed whether the interviewed person had any type of economic extractive or cultivating relationship with nature. Economic dependency on natural resources assessed whether subsistence and/or economic income of the interviewed person depended significantly on natural resources, involving either native or exotic species. Economic reliance on native species assessed whether native species such as king crab, fishes, limpets, guanaco, wild geese, mushrooms, berries, or rush leaves were important for subsistence and/or economic income. Material interactions with nature were central to embedded, cultivating, and resource-use types of relationships, and were partially present in the changing types of relationship with nature. Material interactions fully correlated with economic dependency on natural resources. However, regarding the relevance of native and exotic species the cultivating and resource-use types of relationships with nature contrasted markedly. The first one relied mostly on exotic species (such as sheep, cows, and horses), while the second one involved mostly fishing for king crab, fishes and shellfish, or the cutting of native trees for firewood and lumber. It is also interesting that material interactions were not involved at all in intellectual and no-direct types of relationships with nature. These types of relationships were held mostly by navy family members or public services officials, who live in the Cape Horn region for short periods, of about two years.

The next two attributes assessing the degree of rootedness in the local environment, addressed two aspects of "non-material interactions" with nature: (7) personal involvement in non-material interactions, and (8) cultural meaning of native species. The first assessed aesthetic, spiritual and recreation enjoyment. The second assessed symbolic values, relationships of taboo, sense of kinship with some animals, and knowledge about traditional stories about plants, animals or places in Cape Horn. Most types of relationships had non-materials relationships with nature, and it was the most important attribute of aesthetic and intellectual relationships, which had a value of 1 only for this attribute (table 1).

Regarding cultural meaning of species and places, however, only the embedded type of relationship (mostly held by Yahgan people) presented a value of 1. Intellectual, changing, and aesthetic types of relationships partially addressed the cultural meaning of species. Birds represented an interesting group of organisms in this regard. Birds are the most diverse group of vertebrates in Cape Horn,[32] and many of them have cultural significance for Yahgan people, and are attractive for birdwatchers today. Among birds, the Magellanic woodpecker (*Campephilus magellanicus*) was particularly attractive for aesthetic reasons.[33] It is the largest

[32] Anderson et al., "Exotic Vertebrate Fauna."
[33] Arango et al., "Descubrimiento e Implementación."

woodpecker in South America, and the male has a conspicuous red crest. *Campephilus magellanicus* is also a sister species of the almost extinct ivory-billed woodpecker (*C. principalis*), and the extinct imperial woodpecker (*C. imperialis*) that inhabited old-growth forests in North America. For these reasons, the Magellanic woodpecker was an appealing species for respondents of the intellectual type of relationship with nature. Additionally, for Yahgan people the Magellanic woodpecker is a conspicuous bird species inhabiting the sub-Antarctic forests, where indigenous women gather berries and mushrooms.[34]

The last five attributes assessing the degree of rootedness in the local environment, addressed five aspects of the dimension of ecological understanding defined as "identification and relatedness:" (9) sense of home, (10) land conceived as common property, (11) sense of community and family, (12) respondent was born in Cape Horn, and (13) answers given in first person. "Sense of home" assessed whether respondents identified themselves with the region of Cape Horn either as their native land and environment, or as a place where they just worked or visited, and had no major significance for their sense of belonging to the place. "Land conceived as common property" assessed whether the interviewed persons related more to either the traditional indigenous way of open access to terrestrial and marine habitats, or whether respondents related more to a notion of private property that prevails in the rest of the country. "Sense of community and family" assessed whether experiences and relationships with nature involved either other community and/or family members, or whether respondents referred to these experiences mostly in individual terms. "Respondent was born in Cape Horn" assessed whether the interviewed person was born in place or arrived from another region. Finally, "answers given in first person" assessed whether respondents talked mostly in personal terms, evoking memories or experiences, or spoke rather in general, impersonal terms.

A strong sense of home and belonging to the place was expressed only by respondents of the embedded, and cultivating types of relationship with nature, which include only members of the indigenous Yahgan community or old residents (mostly descendents from early twentieth-century colonizers). Some respondents identified with the changing or aesthetic relationships with nature also affirmed some sense of belonging to the Cape Horn environment. In contrast, people identified with resource-use, intellectual, and no-direct types of relationships did not include positive answers for a sense of home. The pattern of answers found for the attribute "sense of home" fully matched the answers recorded for the attributes of birth place, and a sense of family or community. People born in Cape Horn and with a sense of family or community experience of nature also had a sense of belonging to the region.

The conception of Cape Horn's territory as common land presented marked contrasts among respondents. Those identified with a cultivating type of relationship with nature strongly favored private property over public land. This emphasis on

[34] Rozzi et al., *Multi-Ethnic Bird Guide.*

private property contrasted with respondents of the embedded type of relationship, for whom the freedom of movement in Cape Horn lands and waters was one of their most essential values. Common land was also valued by some respondents of resource-use, intellectual, and aesthetic types of relationships with nature. The notion of common land is coherent with the current design and goals of the Cape Horn Biosphere Reserve: ninty-nine percent of its territory is public land, administrated by the Forestry Service (seventy-one percent), or the Ministry of Land (twenty-eight percent). In addition, there are no private marine concessions.[35] However, this scenario might change under the pressure of salmon farming and tourism development.[36] With respect to answers given in the first person, it is interesting that respondents of all types of relationship with nature, except the intellectual one, talked to a significant extent in terms of personal experiences, preferences or memories.

In table 1, values of 1 signify a complete dominance of local eco-cultural environments while values of 0 signify a complete dominance of global eco-cultural environments. Overall, the weakest attributes in terms of their local/global relation were language (0.07), economic reliance on native species (0.29), and awareness of the cultural meaning of native animals, plants, or places (0.36). The Yahgan language was spoken fluently only by one member of the indigenous community and partially by three other members; hence, the Spanish language fully dominated perspectives on nature. Indeed, interviews were conducted in Spanish. Only members of three types of relationship with nature (embedded, resource-use, and changing) relied on native species; hence, cosmopolitan species (such as sheep and chicken) are taking over from native species (such as guanaco and wild geese) in importance. Cultural meanings of native species were incorporated in the answers of four types of relationships with nature (embedded, changing, intellectual, and aesthetic). However, they included only some of the respondents or only addressed cultural meaning partially. Language, local economy based on native species, and cultural meaning of native animals, plants, and places seem to be the most threatened attributes, at risk of losing their ecological and cultural roots in Cape Horn.

Table 1 also suggests a gradient regarding the degree of rootedness in the local environment that each of the types of relationships with nature has. A mean value close to 1 means strongly rooted in Cape Horn's eco-cultural environments. A mean value close to 0 indicates a strong prevalence of national modern or global eco-cultural environments. A mean value close to 0.5 means that local and global influences are approximately balanced (whether both are strong, or both are weak). Two of the types of relationships with nature identified in Cape Horn, embedded and cultivating, are strongly rooted in the local environments, with mean values

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[35] Rozzi et al., *The Cape Horn Biosphere Reserve.*

[36] E. Barros and J. Harcha, "The Cape Horn Biosphere Reserve Initiative: Analysis of a Challenge for Sustainable Development in the Chilean Antarctic Province," in R. Rozzi, F. Massardo, and C. B. Anderson, eds., *The Cape Horn Biosphere Reserve: A Proposal of Conservation and Tourism to Achieve Sustainable Development at the Southern End of Americas* (Punta Arenas, Chile: Ediciones Universidad de Magallanes, 2004), pp. 45–61.

of 0.96 and 0.67, respectively. Three types of relationships, changing, aesthetic, and resource-use, have quite balanced values of 0.46, 0.38, and 0.35, respectively. Finally, intellectual and no-direct relationships have almost no roots in Cape Horn's eco-cultural environments. These two types of relationships were found only among people that include the main decision makers (navy people, recently arrived residents, government authorities, and professionals working in public services). Therefore, as demanded by respondents belonging to the cultivating type of relationship with nature, participation of representatives of each of the diverse perspectives on nature and sociocultural groups of Cape Horn would contribute to keep a local/global balance.

Our methodology is not designed for statistical analyses. Instead, its aim is to provide an empirical characterization and analysis that paint with a variety of colors (rooted in specific places, people, and biota) notions such as wilderness, local, and global ecological knowledge. This approach transforms polarized and dichotomous notions into gradients of perspectives rooted to different degrees in local and global ecological and cultural environments. This hybrid vision about perspectives on nature might be particularly helpful in times of global change, where both local and global scales contribute to identify specific problematic asymmetries (for example, elimination of indigenous languages), as well as opportunities for communication (for example, aesthetic perspectives on nature) among different sociocultural groups and types of relationships with nature.

Integrating Science and Society through Long-Term Socio-Ecological Research

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Long-term ecological research (LTER), addressing problems that encompass decadal or longer time frames, began as a formal term and program in the United States in 1980. While long-term ecological studies and observation began as early as the 1400s and 1800s in Asia and Europe, respectively, the long-term approach was not formalized until the establishment of the U.S. long-term ecological research programs. These programs permitted ecosystem-level experiments and cross-site comparisons that led to insights into the biosphere's structure and function. The holistic ecosystem approach of this initiative also allowed the incorporation of the human-dimension of ecology and recently has given rise to a new concept of long-term socio-ecological research (LTSER). Today, long-term ecological research programs exist in at least thirty-two countries (i.e., members of the International Long-Term Ecological Research Network, ILTER). However, consolidation of the international network within the long-term socio-ecological research paradigm still requires: (1) inclusion of certain remote regions of the world, such as southwestern South America, that are still poorly represented; (2) modifications of the type of research conducted, such as integrating social and natural sciences with the humanities and ethics; and (3) the incorporation of findings and results into broader social and political processes. In this context, a nascent long-term socio-ecological research network in Chile, which extends over the longest latitudinal range of temperate forest in the Southern Hemisphere, adds a new remote region to international long-term ecological research previously overlooked. In addition, collaboration with the University of North Texas and other international partners helps to further develop an interdisciplinary approach for the integration of the ecological sciences and environmental philosophy together with traditional ecological knowledge, informal and formal education, policy, the humanities, socio-political processes, and biocultural conservation.

INTRODUCTION

Long-term ecological research encompasses ecosystem, community, and population or species studies aimed at understanding processes that take place over decadal, or longer time frames. Such questions are not addressed by traditional

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scientific projects, which are commonly limited to two to three years due to funding and logistical constraints. Such technical restrictions hamper our understanding of essential environmental processes affecting the functioning of the biosphere, including multi-decadal climate trends, slow ecological processes and subtle human impacts on ecosystems.[1] Approaches to long-term research in ecology include "paleo" research, and cross-system comparisons.[2] For example, by using paleoecological studies of fossil pollen found in ancient lake sediments, it is possible to record changes in vegetation cover and determine whether current trends are anthropogenic or part of natural cycles.

Efforts to document and understand long-term environmental trends were in place even before modern ecology. In Europe, agricultural experiments at Rothemsted Farm in England began in 1843, and a continuous observational record of ice cover has been conducted since 1443 on Suwa Lake in Japan.[3] During the twentieth century, formal long-term ecological research (LTER) sites were implemented, starting in the United States, and as of May 2006, similar initiatives have been recognized in thirty-two countries by the International Long-term Ecological Research (ILTER) Network.[4] Based on a holistic approach to understanding ecosystem functions, the long-term ecological research perspective also has facilitated the incorporation of human-dimensions to modern ecology.[5]

However, the understanding of coupled human and natural systems, even in the context of long-term initiatives, proves difficult on conceptual and practical levels for both conducting research as well as implementing subsequent policy. Integrating social variables into ecology has advanced rapidly in disciplines such as ecological economics, which offers a framework and protocols to assess the monetary value of a wide range of ecosystem services including carbon sequestration, pollination, and hydrological control.[6] This approach has been criticized because of the insuf-

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[1] G. E. Likens, "Toxic Winds, Whose Responsibility?" in F. H. Bormann and S. R. Kellert, eds., *Ecology, Economics, and Ethics* (New Haven:Yale University Press, 1991), pp. 136–52, and J. J. Armesto, "Estudios a Largo Plazo: Una Prioridad para la Investigación Ecológica de Hoy," *Revista Chilena de Historia Natural* 63 (1990): 7–9.

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[3] J. J. Magnuson, D. M. Robertson, B. J. Benson, R. H. Wynne, D. M. Livingston, T. Arai, R. A. Assel, R. G. Barry, V. Card, E. Kuusisto, N. G. Granin, T. D. Prowse, K. M. Steward, and V. S. Vuglinski, "Historical Trends in Lake and River Ice Cover in the Northern Hemisphere," *Science* 289 (2000): 1743–46.

[4] International Long-term Ecological Research Network at http://www.ilternet.edu.

[5] F. B. Golley, *A History of the Ecosystem Concept* (New Haven: Yale University Press, 1993).

[6] R. Costanza, R. d'Arge, R. de Groot, S. Farber, M. Grasso, B. Hannon, K. Limburg, S. Ñame, R.V. O'Neill, J. Paruelo, R. G. Raskin, P. Sutton, and M. van den Belt, "The Value of the World's Ecosystem Services and Natural Capital," *Nature* 387 (1997): 253–60.

ficiency of placing strictly monetary values on natural processes and biodiversity, and because of the need to understand a broader suite of ecosystems values requires cultural, communal, ethical, aesthetic, and more generally philosophic perspectives as well.[7] This question was addressed during the workshop on integrating environmental philosophy and ecology, to which this special issue of *Environmental Ethics* is dedicated.

In March 2007, scientists, philosophers, and policy analysts that participated in the workshop in southern Chile came to the conclusion that the long-term ecological research approach can facilitate the analysis of the human dimensions of the biosphere, but to achieve this potential, the following aspects must be considered: (1) long-term research must extend to understudied regions of the world, particularly "frontier" ecosystems, such as southern Chile's archipelago region identified as one of the world's last twenty-four remaining wilderness areas,[8] and (2) while many formal long-term ecological research programs are currently striving to include socio-ecological dimensions into their conceptual and practical frameworks,[9] integrating the humanities and other related disciplines into long-term initiatives can be better achieved under a new paradigm of long-term socio-ecological research (LTSER).[10]

To achieve the goal of implementing long-term research in remote areas requires overcoming significant practical, conceptual and institutional challenges, such as logistical and technical challenges related to the cost of operation, difficulty of access and communication, as well as operating field sites and hiring qualified personnel, or building infrastructure that is not harmful to the local environment, biota and cultures.[11] In addition, new more effective academic and administrative structures are needed to manage such programs, which imply not only collaboration across disciplines, but also an ability to integrate different institutions, government authorities, decision makers, business managers, information technology administrators, and public communicators.[12] Finally, long-term research programs must

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[10] H. Haberl, V. Winiwarter, K. Andersson, R. U. Ayres, C. Boone, A. Castillo, G. Cunfer, M. Fischer-Kowalski, W. R. Freudenburg, E. Furman, R. Kaufmann, F. Krausmann, E. Langthaler, H. Lotze-Campen, M. Mirtl, C. L. Redman, A. Reenberg, A. Wardell, B. Warr, and H. Zechmeister, "From LTER to LTSER: Conceptualizing the Socioeconomic Dimension of Long-Term Socioecological Research," *Ecology and Society* 11 (2006): 13.

[11] R. Rozzi, F. Massardo, C. B. Anderson, K. Heidinger, and J. A. Silander, Jr., "Ten Principles for Biocultural Conservation at the Southern Tip of the Americas: The Approach of the Omora Ethnobotanical Park," *Ecology and Society* 11 (2006): 43, at http://www.ecologyandsociety.org/vol11/iss1/art43.

[12] Ibid.

be capable of articulating with broader regional, national, and international efforts to have greater relevance and support.[13]

Here, we describe and reflect on the process of creation and implementation of a nascent long-term socio-ecological research network in Chile that seeks to promote the integration of interdisciplinary ecological research, biocultural conservation, and society. We review the genesis and paths of similar programs in other parts of the world to evaluate their limitations and benefits. We also assess how long-term ecological research, and more recently long-term socio-ecological research, have been able adapt to changing societal demands and decision-making needs. We end by presenting and offering a vision for Chile's long-term socio-ecological research network, which covers a unique remote area of the world[14] and includes participant sites that began integrating ecological sciences and environmental ethics into conservation more than a decade ago.[15]

THE GENESIS OF LONG-TERM ECOLOGICAL RESEARCH PROGRAMS

In the United States, precursors to a formal long-term ecological research program included the established activities of national laboratories associated with the Department of Energy, as well as the national park and reserve systems.[16] As a formal term and research strategy, long-term ecological research was consolidated in 1980 through a program office in the United States National Science Foundation (NSF).[17] U.S. long-term ecological research was in part the institutionalization of a disciplinary movement within the field of ecology that arose in the 1950s, based on an ecosystem perspective.[18] Ecosystem ecology concomitantly required new methods and appropriate study units. Research sites were needed that permitted cross-site comparisons and large-scale field experiments to test theories and models of system properties, which extended the reach of geographically limited and temporally restricted studies.[19]

Beginning in the 1950s and growing out of such seminal programs as Coweeta Hydrological Laboratory and Hubbard Brook Ecosystem Study, intensive multidisciplinary research was pioneered at sites where studies were conducted systematically over several decades to disentangle "the invisible present" and link long-term lags

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[13] E.g., International Long-term Ecological Research Network, at http://www.ilternet.edu; World Biosphere Reserve Network, at http://www.unesco.org/mab.

[14] J. J. Armesto, R. Rozzi, C. Smith-Ramírez, M. T. K. Arroyo, "Conservation Targets in South American Temperate Forests, *Science* 282 (1998): 1271–72.

[15] R. Rozzi, J. J. Armesto, F. Massardo, S. T. A. Pickett, and S. Lehmann, "Recuperando el Vínculo entre la Ciencia y la Ética: Hacia una Unidad entre Ecólogos y Ambientalistas," *Ambiente y Desarrollo* 12, no. 4 (1996): 81–86; R. Rozzi, "The Reciprocal Links between Evolutionary-Ecological Sciences and Environmental Ethics, *BioScience* 49 (1999): 911–21.

[16] J. T. Callahan, "Long-Term Ecological Research," *BioScience* 34 (1984): 363–67.

[17] Ibid.

[18] Golley, *A History of the Ecosystem Concept.*

[19] Likens, "Toxic Winds."

between cause and effect.[20] The value of such projects to broader society became increasingly evident over time, as their ability to enhance understanding of environmental problems began to influence and shape social and political discourse, appearing in major media outlets such as the *New York Times* addressing controversial issues (e.g.,forestry practices and acid rain).[21] Reviewing the role of the Hubbard Brook long-term ecological research site in these major national policy deliberations, we can learn another important lesson: it is evident that scientific information alone did not foster consensus in socio-political processes; rather, the role of the scientists themselves in the discourse was crucial.

Another characteristic recognized early on for long-term research programs was their multi-institutional nature.[22] Combining the agendas of various agencies, however, is not a simple task. For instance, Coweeta and Hubbard Brook are long-term ecological research sites of the National Science Foundation, but they are located in experimental forests operated by the U.S. Forest Service. To establish of these long-term ecological research programs, scientists from nearby universities started both personal and institutional collaborations with the forest service, which expanded the impact and relevance of these studies and broadened the suite of experiments, disciplines, scientists and students working at the site. The Coweeta long-term ecological research program eventually went a step further to integrate efforts with the Great Smoky Mountains National Park (National Park Service) and the Oak Ridge National Laboratory (Department of Energy) to create the Southern Appalachian Biosphere Reserve (UNESCO). At the same time, Strayer and colleagues[23] noted that the commitment of a few dedicated individuals was essential to provide the foundation for the continuity of such long-term initiatives.

While ecology was developing as a field from the 1950s onward, a parallel political movement was modifying and creating national legislation that integrated some of this ecological understanding into policy. For example, the National Environmental Policy Act (NEPA) was promulgated in 1969.[24] Its effect on science was not immediate, but over time, this and other legislation, such as the Clean Water Act (1972) the Clean Air Act (1963) and the creation of the Environmental Protection Agency (1970), made it necessary to accumulate baseline environmental data for policy making and in turn helped to legitimize federal funding of long-term ecological research.

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[20] J. J. Magnuson, "Long-Term Ecological Research and the Invisible Present," *BioScience* 40 (1990): 495–502.

[21] Likens, "Toxic Winds," pp. 136–42.

[22] J. F. Franklin, C. S. Bledsoe, and J. T Callahan, "Contributions of the Long-Term Ecological Research Program," *BioScience* 40 (1990): 509–23.

[23] D. L. Strayer, J. S. Glitzenstein, C. Jones, J. Kolasa, G. E. Likens, M. McDonnell, G. G. Parker, and S. T. A. Pickett, "Long-Term Ecological Studies: An Illustrated Account of their Design, Operation and Importance to Ecology," *Occasional Publication of the Institute of Ecosystem Studies* (1986), pp. 1–38.

[24] The National Environmental Policy Act of 1969, at http://www.nepa.gov/nepa/regs/nepa/nepaeqia.htm.

At the international level, scientific-political currents in the 1970s were also promoting the integration of human well-being and the environment. The UNESCO Man and the Biosphere Program (MaB), created in 1970, started the world network of biosphere reserves, and explicitly sought to use interdisciplinary research and capacity building to improve the relationship between people and their environment.[25] The International Biological Program (IBP) (1964–1974) arose in parallel as a coordinated, multidisciplinary effort to understand the Earth's systems by conducting comparative ecosystem studies across a range of biomes around the world to better manage and use protected areas to meet societal needs.[26] For example, the program statement of the U.S.-IBP's terrestrial productivity working group, chaired by E. P. Odum, stated that the "primary purpose of the IBP is understanding ecosystems, including man's own." In addition, the committee's objectives placed emphasis on collaborative research and the need to conduct investigation outside of pristine areas.[27]

While the U.S.-IBP program was relatively short-lived, the creation of a funding mechanism for this program allowed a subsequent transition to the pilot long-term ecological research program. Shortly after the end of the IBP, the NSF adopted a similar strategy, converting six former IBP sites into the first national long-term ecological research network in the early 1980s (as of 2008 there are twenty-six long-term ecological research sites in the U.S.). In the consultative process of workshops (1977–1979) leading up to the U.S. long-term ecological research program, consensus arose around the title of long-term "research" over long-term "monitoring," denoting the participants' rejection of simply collecting data and giving emphasis to the need to have guiding hypotheses and questions.[28] In this way, the long-term ecological research program has proven useful in implementing the multiple facets of ecosystem science: theory, experimentation, cross-site comparison and long-term monitoring.[29] Today, however, the emphasis on adding a greater social dimension to ecology requires a new dialogue among researchers to agree on appropriate strategies and priorities. In this process, long-term research programs provide a useful tool to achieve this goal. The fact that long-term ecological research programs are site-based and have a longer time frame than traditional research grants has the potential to facilitate a sustained dialogue between researchers and local communities, authorities, and educators.

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[25] Guevara and Laborde, "The Landscape Approach," pp. 251–62, this volume.

[26] Golley, *A History of the Ecosystem Concept.*

[27] Ibid.

[28] Callahan, "Long-Term Ecological Research."

[29] Quoted from Steven Carpenter; cited in M. L. Pace and P. M. Groffman, "Successes, Limitations, and Frontiers in Ecosystem Science: Reflections on the Seventh Cary Conference," *Ecosystems* 1 (1998): 137–42.

EXPANDING LONG-TERM ECOLOGICAL RESEARCH TO INCLUDE THE HUMAN DIMENSION OF ECOLOGY

The reawakening in science of the role of *Homo sapiens* in the planet's ecology was accompanied by extensive documentation of the increase in the rate, scale, and complexity of social alterations to the biosphere.[30] The relationship between social and natural systems is dramatically demonstrated by human accelerated environmental change.[31] Such phenomena as land-use change are now understood to yield a myriad of social, ethical and ecological consequences, including climate change, biodiversity loss, forest clearing, habitat fragmentation, acid rain, urbanization, marine dead zones, soil salinization, decreased water quality, atmospheric mercury deposition, and widespread infectious disease.

The accelerated role, scale, and magnitude of human influence in natural systems can be seen in more subtle ways, as well. The cumulative effects on land use by humans, for example, has increased the sediment transported by rivers on a global scale from a historic average (based on a 540 million year record) of 5 gigatons (1 gigaton = 1 million tons) per year (Gt y^{-1}) to a figure closer to 21 Gt y^{-1} today. Additionally, up to 75 Gt y^{-1} of rock and soil are moved by humans each year.[32] The consequences of such large-scale, complex and pervasive alterations led ecologists to acknowledge and scrutinize the inherent link between social and ecological variables, and a new body of literature is arising around the concept of dynamic coupled human-nature systems.[33]

Concomitantly, social and political structures are changing. New countries are rising in population and international influence, such as the recent emergence of China and India as global economic and political powers. Issues of wealth distribution have also modified the global social order with the ratio of rich to poor countries increasing in all regions of the world since 1800.[34] Consequently, relevant research questions now bridge social and ecological realms of inquiry, such as the ethical implications of bearing the responsibility versus the consequences involved in issues such as the trading of mercury emitted to the atmosphere or global warming-associated sea level rise. Indeed, it is often the case that the social groups and countries that act as drivers of ecological changes and environmental deterioration are not the ones who ultimately bear the consequences of such

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[30] P. M. Vitousek, H. A. Mooney, J. Lubchenco, and J. Melillo, "Human Domination of Earth's Ecosystem," *Science* 277 (1997): 494–99.

[31] Likens, "Toxic Winds, Whose Responsibility?"

[32] B. H. Wilinson and B. J. McElroy, "The Impact of Humans on Continental Erosion and Sedimentation," *Geological Society of America Bulletin*119 (2007): 140–56.

[33] J. Liu, T. Dietz, S. R. Carpenter, M. Alberti, C. Folke, E. Moran, A. N. Pell, P. Deadman, T. Kratz, J. Lubchenco, E. Ostrom, Z. Ouyang, W. Provencher, C. L. Redman, S. H. Schneider, and W. W. Taylor, "Complexity of Coupled Human and Natural Systems," *Science* 317 (2007): 1513–16.

[34] See Table 1, p. 54, in M. S. Alam, "Global Disparities since 1800: Trends and Regional Patterns," MPRA Paper No. 1289 (2006), http://www.mpra.ub.uni-muenchen.de/1289.

activities. For instance, the regions of Patagonia and the Antarctic Peninsula today receive the highest levels of UV radiation. Paradoxically, these regions are the farthest away from the centers of CFC emissions which generate the stratospheric ozone hole found over the austral portion of the Americas.[35] Clearly addressing these environmental and ethical questions requires not only quality baseline and rate of change data, but also insertion of research and researchers into the social process and cultural context, thus achieving an integration of ecological sciences, ethics and policy.[36] As has been shown in the debate over global climate change, data itself does not always improve the process of policy making and can in fact impede it, if both sides insist on the supremacy of their information.[37]

ABILITY OF LONG-TERM RESEARCH PROGRAMS TO ADAPT TO SOCIAL NEEDS

Long-term ecological research sites create and share databases, publish information on websites, give "value added" to both research and outreach, promote academic and extra-academic partnerships, foster international collaborations, link the site's work with education, and implement field laboratories and courses.[38] Long-term ecological research initiatives throughout the world have demonstrated that this research strategy can accommodate changing scientific and social contexts and modify itself to meet current needs. Since their creation, long-term ecological research sites have expanded their scope from a strong bias toward "pristine" natural sites, often found within protected areas, to entire regions, including rural-agricultural landscapes and urban centers. On a global scale, there is still a need, however, to re-enforce and extend the concept of long-term research by including poorly known geographical areas.[39]

Furthermore, while certain aspects of long-term ecological research programs are common throughout all sites, the missions and specific objectives of national networks respond to particular histories and needs. Therefore, not surprisingly, many long-term initiatives explicitly integrated social aspects of ecological research from their inception. The U.S. long-term ecological research program, described above, is largely the product of an academic tradition that sought to understand the patterns and processes of ecosystems at multiple spatial and temporal scales. On the other hand, while the U.S. International Long-term Ecological Research Committee was

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[35] K. Jax and R. Rozzi, "Ecological Theory and Values in the Determination of Conservation Goals: Examples from Temperate Regions of Germany, USA, and Chile," *Revista Chilena de Historia Natural* 77 (2004): 349–66.

[36] S. R. Carpenter and C. Folke, "Ecology for Transformation," *Trends in Ecology and Evolution* 21 (2006): 309–15.

[37] D. Sarewitz, "How Science Makes Environmental Controversies Worse," *Environmental Science and Policy* 7 (2004): 385–403.

[38] J. E. Hobbie, S. R. Carpenter, N. B. Grimm, J. R. Gosz, and T. R. Seastedt, "The U.S. Long-Term Ecological Research Program," *BioScience* 53 (2003): 21–32.

[39] See map at http://ilternet.edu.

helpful in assisting Brazil implement its national program, via visiting scientists, grants, and workshops, the Brazilian network was established with the vision of managing watersheds, improving human health, promoting conservation, providing information on biodiversity, and implementing the Agenda 21 of the Convention for Biodiversity. Thus, the Brazilian program was explicitly linked with decision making from its creation.[40] Likewise, the Southern Africa Ecological Observatory Network focuses largely on problem solving, acknowledging that most countries are challenged with meeting basic human needs.[41] In turn, the southern African example also makes it clear that the long-term ecological research network is a tool for governments to fulfill commitments to international environmental conventions and treaties.

In many regions of the world, national challenges such as those described above for the southern African network are also embodied in the problems faced by individual field stations, where less than half of operating budgets are stable from year to year.[42] Prioritizing long-term funding programs is one approach that may help overcome some of those hurdles for at least some, priority study sites. For instance, the long-term ecological research network in Costa Rica has partially surmounted this type of problem by partnering with the Organization for Tropical Studies (OTS), which has conducted research in three field stations since the 1960s. As a well-funded non-profit organization with headquarters in both the U.S. and Costa Rica, OTS has been uniquely positioned to coordinate the Costa Rican long-term ecological research network.

CHILE'S NASCENT LONG-TERM SOCIO-ECOLOGICAL RESEARCH NETWORK

Despite calls to create an long-term ecological research program in Chile since 1990,[43] little formal progress was made on this topic at the national level. However, the need and justification for such an initiative is greater than ever. Chile's participation in various international conventions (such as the Convention on Biological Biodiversity, the Ramsar Convention on Wetlands, the Montreal Protocol, and the Kyoto Protocol) necessitates better baseline information about Chilean ecosystems. Furthermore, the relatively recent formation of a Chilean National Environment Commission and the Chilean Environmental Base Law (Law 19.300, created in

[40] F.A.R. Barbosa, F.R. Scarano, M.G. Sabara, and F.A. Esteves, "Brazilian LTER: Ecosystem and Biodiversity Information in Support of Decision Making," *Environmental Monitoring and Assessmen*t 90 (2004): 121–33.

[41] J. Henschell, J. Pauw, F. Banyikwa, R. Brito, H. Cabwela, T. Palmer, S. Ringrose, L. Santos, A. Sitoe and A. van Jaarsveld, "Developing the Environmental Long-Term Observatories Network of Aouthern Africa (ELTOSA)," *South African Journal of Science* 99 (2003): 100–08.

[42] See the survey of tropical biological stations in S. Whitesell, R. J. Lilieholm, and T. L. Sharik, "A Global Survey of Tropical Biological Field Stations," *BioScience* 52 (2002): 55–64.

[43] Armesto, "Estudios a Largo Plazo."

1994) requires improved ecosystem assessment capabilities for decision making. Yet, systematic environmental data from major ecosystems are largely lacking, thus limiting our ability to assess the impact of development projects.

It is in this context that the Institute of Ecology and Biodiversity (IEB), created in 2005 with financing from the Millennium Scientific Initiative (ICM in Spanish) of the Ministry of Planning, is today equipped to begin a nascent Chilean long-term socio-ecological research network. The ICM's funding cycles are in five year increments, a structure similar to the U.S. long-term ecological research funding sequence, which is renewable every six years. Also, since its inception, IEB has been a multi-institutional initiative that has privileged collaboration and networking, including researchers at five national and regional universities and two academic, field-based NGOs.[44] Three of these research groups have pioneered long-term research at sites in Fray Jorge National Park (Fray Jorge), Senda Darwin Biological Station (SDBS), and Omora Ethnobotanical Park (Omora) (table 1). Researchers at these sites have systematically implemented continuous studies of population and ecosystem processes for up to nineteen years. By integrating these sites via a coordinated network, IEB is in practice creating the first comprehensive plan to implement long-term research in the longest latitudinal gradient in the Southern Hemisphere, going from semiarid Mediterranean to subantarctic latitudes (30-55ºS).

Accordingly, IEB has taken similar steps to those taken by the U.S. NSF in 1980, when former IBP sites were made into the first long-term ecological research network. However, the birth of the Chilean program comes at a time when the social dimension of ecology and conservation are widely recognized; hence, long-term socio-ecological research is considered a founding paradigm of the Chilean network. To further consolidate these efforts, IEB was awarded additional support by the Chilean National Science and Technology Commission (CONICYT) under the Basal Financing Program in March 2008. Significantly, these grants are explicitly part of a national strategy to promote high quality science linked to the social and economic development agenda of the country, including agriculture, aquaculture, mining and tourism, all of which are favored by the implementation of this long-term socio-ecological research network.[45]

While there are potential disadvantages for a national program being coordinated and initiated by a single institution, such as instability or inconsistency if problems arise within the institution, the fact that IEB is actually a network of researchers associated with several universities and organizations in the country may enhance the likelihood of persistence of the program. As shown in the example of OTS in Costa Rica, this structure is not without precedent, and when implementing long-term programs in the developing world and remote ecosystems, creative solutions are

[44] Institute of Ecology and Biodiversity at http://www.ieb-chile.cl.

[45] *Consejo Nacional de Innovación para la Competitividad, Hacia una Estrategia Nacional de Innovación,* vol. 2 (2008) at http://www.consejodeinnovacion.cl/cnic/cnic/web/portada.php.

Long-Term Socio-Ecological Research Sites

Study Site	Fray Jorge	Senda Darwin	Omora Park
Latitude	30ºS	42ºS	55ºS
Primary institutional Affiliations	Univ. de La Serena, Chilean Forestry Service (CONAF), IEB, Univ. of Northern Illinois, Univ. of California–Davis	Senda Darwin Foundation, CASEB, Pontificia Univ. Católica de Chile, IEB, Univ. de Chile	Omora Foundation, Univ. de Magallanes, IEB, Univ. of North Texas, Center for Environmental Philosophy, OSARA
Year Initiated	1989	1995	2000
Land Tenure	National Park Service	Private: Senda Darwin Foundation	Public Lease: Ministry of Land to Omora Foundation and Univ. of Magallanes
Conservation Status	National Park & UNESCO Biosphere Reserve	Private reserve	CONAMA National Priority Conservation Area, UNESCO Biosphere Reserve, Land Ministry "Conservation Zone"
Principal Ecosystems	Matorral and relict Valdivian forests	Valdivian and North Patagonian rain forests, peat bogs, riparian vegetation	Sub-Antarctic forests, bogs and marine channels, rivers, lakes
Current Funding	CEAZA (Conicyt) & IEB (Mideplan, Conicyt)	CASEB (Conicyt) & IEB (Mideplan, Conicyt)	Univ. of Magallanes, IEB (Mideplan, Conicyt), Univ. of North Texas, OSARA
Primary Research Lines	One of the world's longest vertebrate exclusion experiments; abiotic and biotic effects on small mammals, vertebrate predators and plants, and their trophic connections; El Niño Southern Oscillation (ENSO).	Population ecology of understory birds inhabiting rain forest fragments, forest dynamics, plant-disperser and pollinator interactions, biogeochemistry, ecosystem studies and education.	Ethnoecology, environmental philosophy, ecotourism, biocultural conservation, bird banding, exotic invasive species, nonvascular flora, lichens and algae, flagship species, environmental policy, education, and biocultural conservation
Existing Databases	Small mammal populations, vascular plant cover, seed banks, insect and bird inventories	Bird and insect inventories, vascular plant collection, permanent forest plots, ethnobotanical information	Forest bird censuses, vascular and non-vascular plant inventories, biological and cultural diversity assessment of CHBR, community perceptions of flora and fauna
Web Page	www.bios.niu.edu/frayjorge	www.sendadarwin.cl	www.omora.org

Table 1. Three existing study sites will be linked via the Institute of Ecology and Biodiversity (IEB)'s Long-Term Socio-Ecological Research Network. CASEB is the Center for Advanced Studies in Ecology and Biodiversity, CEAZA is the Center for Advanced Studies in Arid Zones, CHBR is the UNESCO Cape Horn Biosphere Reserve, CONICYT is the Chilean National Science and Technology Commission, Mideplan is the Millennium Science Initiative Program of the Ministry of Planning of Chile, and OSARA is the Omora Sub-Antartic Research Alliance.

fundamental to achieve success. IEB must now rapidly learn from other experiences and continue to innovate, strengthen, and broaden this long-term socio-ecological research network to institutionalize the concept in the administrative framework of science and policy in Chile.

Callahan provided an appropriate starting point, laying out the U.S. NSF's criteria in the original call for proposals to create the first long-term ecological research program.[46] To ensure continuity, proposals were required to demonstrate how leadership would be ensured in the project, how the site's integrity would be guaranteed, and how conflicts over site use would be resolved. Furthermore, it was necessary to determine information generation, storage and use, which today takes the form of data management systems. Finally, proposed sites were expected to meet the challenge of synthesizing and communicating scientific information to generally promote the site to broader audiences. These proposals were made on a site level, as each group would know the best ways to overcome these challenges. To assess the pilot program in Chile, as it relates to these factors, it is useful to take a more detailed look at the three initial sites, which have complementary experiences and as each site largely reflects the context of the time period in which it was founded.

The most northern study site (30ºS) is found in Fray Jorge National Park, a protected area created in 1943 to preserve semiarid ecosystems and the northernmost outposts of temperate rainforest, maintained by fog on coastal mountaintops. The area was declared a world biosphere reserve in 1977. The park's long-term ecological research program dates from 1989 and has focused principally around the question of determining the abiotic and biotic factors that regulate the abundance of small mammals, vertebrate predators, and plants and their trophic connections.[47] This goal has been accomplished by one of the world's longest and largest vertebrate exclusion experiments. Furthermore, given the longevity of the project, it has been possible to distinguish three complete cycles of El Niño Southern Oscillation, which have determined pronounced oscillations in rainfall, and consequently annual changes in plant cover and productivity of desert vegetation.[48]

The duration and impact of the Fray Jorge program has been enhanced by local scientists, based at the University of La Serena, having a productive and effective collaboration with colleagues from the United States (Northern Illinois University and University of California, Davis). These collaborations have allowed the leveraging of both national and international funding. Recently, this effort was supported with the creation of the Center of Advanced Studies in Arid Zones (CEAZA in Spanish), a regional research center funded by the Chilean National

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[46] Callahan, "Long-Term Ecological Research."

[47] P. L. Meserve, D. A. Kelt, W. B. Milstead, and J. R. Gutiérrez, "Thirteen Years of Shifting Top-Down and Bottom-Up Control," *BioScience* 53 (2003): 633–46.

[48] J. R. Gutiérrez, M. Holmgrend, R. Manriquea, and F. A. Squeo, "Reduced Herbivore Pressure under Rainy ENSO Conditions Could Facilitate Dryland Reforestation," *Journal of Arid Environments* 68 (2007): 322–30.

Science Foundation. CEAZA focuses on the study of the regional arid biome, and through its collaboration with IEB since 2005, an outreach component has been added to the Fray Jorge site to integrate science and local communities.

The second site in IEB's network is found on Chiloé Island (42ºS), where the Senda Darwin Biological Station was established in 1995 by Chilean and international researchers to provide a base camp for ongoing ecological studies of temperate rain forest ecosystems in fragmented rural-agricultural landscapes.[49] From its establishment, the Senda Darwin Biological Station has attempted to embody a multi-faceted approach that integrated research, education, and application, inspired by the Ecological Society of America's Sustainable Biosphere Initiative[50] Senda Darwin has excelled as a center for ecosystem research, linked with both the University of Chile, the Catholic University of Chile, and internationally with the Cary Institute of Ecosystem Studies in the U.S.

In contrast to Fray Jorge, the Senda Darwin site lacks a permanent cadre of locally based scientists and students living in the region. Consequently, research has been conducted by scientists and students based in central Chilean and international universities, causing an emphasis on summer studies. The Senda Darwin Biological Station's long-term research has been focused mainly on the population ecology and conservation of understory birds inhabiting rain forest fragments in the surrounding rural-agricultural landscape,[51] understanding long-term forest dynamics and processes,[52] and the variability of plant-disperser and pollinator interactions.[53] It also has a long-term collaboration with Chiloé National Park, where researchers have conducted landmark ecosystem studies on nutrient cycling and biogeochemistry in unpolluted old-growth temperate forests watersheds.[54] Since 1996, a continuous education program has developed and facilitated contact between scientists,

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[49] J. J. Armesto, R. Rozzi, and M. F. Willson, "Bridging Scientific Knowledge, Education and Application in Temperate Ecosystems of Southern South America," *Bulletin of the Ecological Society of America* 77 (1996): 120–22.

[50] R. Rozzi, J. Silander, Jr., J. J. Armesto, P. Feinsinger, and F. Massardo, "Three Levels of Integrating Ecology with Conservation of South American Temperate Forests: The Initiative of the Institute of Ecological Research Chiloé, Chile," *Biodiversity and Conservation* 9 (2000): 1199–1217.

[51] M. F. Willson, T. L. De Santo, C. Sabag, and J. J. Armesto, "Avian Communities of Fragmented South-Temperate Rain Forests in Chile," *Conservation Biology* 8 (1994): 508–20; and K. E. Sieving, M. F. Willson and T. L. De Santo, "Defining Corridor Functions for Endemic Birds in Fragmented South-Temperate Rain Forest," *Conservation Biology* 14 (2000): 1120–32.

[52] J. C. Aravena, M. R. Carmona, C. A. Pérez, and J. J. Armesto, "Changes in Tree Species Richness, Stand Structure ,and Soil Properties in a Successional Chronosequence in Northern Chiloé Island, Chile," *Revista Chilena de Historia Natural* 75 (2002): 339–60.

[53] C. Smith-Ramírez, P. Martínez, M. Nuñez, C. González, and J. J. Armesto, "Diversity, Flower Visitation Frequency and Generalism of Pollinators in Temperate Rain Forests of Chiloé Island, Chile," *Botanical Journal of the Linnean Society*147 (2005): 399–416.

[54] L. O. Hedin, J. J. Armesto, and A. H. Johnson, "Patterns of Nutrient Loss from Unpolluted, Old-Growth Temperate Forests: Evaluation of Biogeochemical Theory," *Ecology* 76 (1995): 493–509; C. A. Perez, L. O. Hedin, and J. J. Armesto, "Nitrogen Mineralization in Two Unpolluted Old-Growth Forests of Contrasting Biodiversity and Dynamics," *Ecosystems* 1 (1998): 361–73.

graduate students, and the local community of landowners and school teachers. In collaboration with Chilean Ministry of Education, the Senda Darwin Biological Station adapted the "schoolyard inquiry cycle"[55] to an "everyday environment," using this education tool for improving the awareness of park guards and local landowners.[56]

INTEGRATING BIOCULTURAL CONSERVATION AND ENVIRONMENTAL PHILOSOPHY

The southernmost site in the Chilean long-term socio-ecological research network, found in the Cape Horn Biosphere Reserve, is the Omora Ethnobotanical Park (55ºS). From its beginning in 1999, Omora park has involved scientists, philosophers, artists, and other professionals from Chile and abroad. This interdisciplinary team worked to unify research, education and conservation and placed a strong emphasis on what became the park's slogan: "linking biocultural conservation and social well-being from the southern end of the Americas."[57]

The approach used by Omora integrates environmental ethics and traditional ecological knowledge (TEK) into conservation strategies for both biological and cultural diversity. Ethno-ornithology provides a central research line for blending scientific and indigenous perspectives on the habitats and habits of birds and humans. In Yahgan, *omora* signifies the green-backed firecrown hummingbird (*Sephanoides sephaniodes*), but it also occupies a central place in Yahgan cosmology, whereby it is understood to be a bird and at the same time a small person-spirit that maintains social and ecological order. In fact, many indigenous narratives about birds begin with the statement "in ancestral times when birds were humans."[58] Through the recording and analysis of ethno-ornithological traditional ecological knowledge, Omora researchers concluded that

> Ornithological narratives of the Yahgan and Mapuche people in southern Chile permit us to expand our ways of knowing about and inhabiting nature and of living together with the birds and their ecosystems. . . . [They] not only contrast scientific views; we also find substantial similarities between them. For example, the indigenous narratives share two central notions with the contemporary, ecological-evolutionary perspective: (1) the sense of biotic communities or ecological networks, of which humans and birds form part, and (2) the sense of kinship between human beings and birds, derived from common genealogies or evolutionary histories. . . . From the point of view of contem-

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[55] P. Feinsinger, L. Margutti, R. D. Oviedo, "School Yards and Nature Trails: Ecology Education Outside the University," *Trends in Ecology and Evolution* 12 (1997): 115–20

[56] See http://www.sendadarwin.cl. See also Rozzi, R., P. Feinsinger, and R. Riveros, "La Enseñanza de la Ecología en el Entorno Cotidiano," *Módulo de Educación Ambiental* (Santiago, Chile: Ministerio de Educación de Chile 1997).

[57] Rozzi et al., "Ten Principles for Biocultural Conservation."

[58] R. Rozzi, "Implicaciones Éticas de Narrativas Yaganes y Mapuches Sobre las Aves de los Bosques Templados de Sudamérica Austral," *Ornitología Neotropical* 15 (2004): 435–44.

> porary environmental ethics, the three cultural perspectives—Mapuche, Yahgan and scientific—emphasize the *intrinsic value* of avifauna because *the birds are our distant evolutionary relatives*. This implies that, to some degree, the existence of birds can be subject to moral considerations based on ontological and ethical judgments on par with those we use to judge the value of human life.[59]

This biocultural approach has allowed the Omora program to overcome anthropocentrism by focusing attention on the bird species and its habitats, and the hummingbird itself was an appealing image for diverse stakeholders in Puerto Williams. By directing public attention toward a species that was both biologically and culturally interesting, it furthermore helped reverse some socio-cultural prejudices that Yahgan people were facing. Plus, it invited the Yahgan community to participate in a substantive and respectful way in the park's educational and research programs.[60] As a result, *omora* became a flagship species that not only provided the name for the park, but grew to embody a comprehensive and appealing image for the program's overall ecological and social goals. The utility of flagship species for conservation initiatives also has been demonstrated to have a positive impact on ecotourism and site identity.[61] For these reasons, flagship species are currently being identified and implemented at all three Chilean long-term socio-ecological research sites.

The integration of sciences and philosophy at Omora park has been effectively translated into regional biocultural conservation through the creation of the Cape Horn Biosphere Reserve designated by UNESCO in 2005.[62] This biosphere reserve protects the southernmost forest ecosystems of the world and was the result of a six-year collaborative effort between the regional government and the Omora team. Subsequently, scientists and philosophers working together identified a set of ten guiding principles that were essential to integrate research, policy, and conservation:

(1) inter-institutional cooperation
(2) a participatory approach
(3) an interdisciplinary integration of sciences, philosophy, arts, and policy
(4) networking and international partnership
(5) communication through the media
(6) identification of flagship species

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[59] R. Rozzi, F. Massardo, C. Anderson, S. McGehee, G. Clark, G. Egli, E. Ramilo, U. Calderón, C. Calderón, L. Aillapan, and C. Zárraga, *Multi-Ethnic Bird Guide of the Austral Temperate Forests of South America* (Punta Arenas, Chile: Fantastico Sur and Universidad de Magallanes, 2003).

[60] Rozzi et al., "Field Environmental Philosophy and Biocultural Conservation," pp. 325–36, this issue.

[61] M. Walpole and N. Leader-Williams, "Tourism and Flagship Species in Conservation," *Biodiversity and Conservation* 11 (2002): 543–47.

[62] R. Rozzi, F. Massardo, C. B. Anderson, A. Berghoefer, A. Mansilla, M. Mansilla, J. Plana, U. Berghoefer, E. Barros, and P. Araya, *The Cape Horn Biosphere Reserve* (Punta Arenas, Chile: Ediciones de la Universidad de Magallanes, 2006).

(7) "direct encounters" with human and nonhuman beings living in their habitats
(8) economic sustainability and ecotourism
(9) territorial planning and administrative sustainability
(10) conceptual sustainability based on continuous long-term *in situ* research (i.e., the constant renewal of ideas and academic leadership) for conservation.[63]

These principles can now be adapted and evaluated as a conceptual framework to integrate social and ecological dimensions in the Chilean long-term socio-ecological research program and elsewhere.

Finally, the Omora Park's research program involves "hybrid" disciplines, such as ethno-ecology, ecotourism, and environmental ethics. In 2004, this integration was further projected through a partnership with the Department of Philosophy and Religion Studies at the University of North Texas (UNT). Today, the park functions as a consortium between the University of Magallanes (UMAG), IEB, and the Omora Foundation in Chile with main partners in the U.S. including UNT, the Center for Environmental Philosophy (CEP), and the Omora Sub-Antarctic Research Alliance (OSARA).[64] In the area of education, the incorporation of UNT and CEP into this initiative in 2004 allowed the creation of a series of international interdisciplinary field courses, entitled "Tracing Darwin's Path" and coordinated by OSARA.[65] These classes include Latin American and U.S. students, and are co-taught by Chilean and U.S. scientists and philosophers. They allow a direct experience and first-hand learning opportunity for students to apply their study of environmental ethics and biocultural diversity to the actual interdisciplinary approaches that Omora is implementing in the Cape Horn Biosphere Reserve. Building on these pioneering efforts, the new Chilean long-term socio-ecological research network now should work to implement interdisciplinary field education as a transversal program among all the sites.

CONCLUSIONS

A review of the history of long-term ecological research shows that these programs arose from and responded to historical currents within the discipline of ecology, but also to changing administrative and political structure of science related to awareness of the role of humans in the functioning of the biosphere. The genesis of long-term ecological research made large-scale manipulative ecosystem experiments possible, which in turn necessitated medium- and long-term funding cycles

[63] Rozzi et al., "Ten Principles for Biocultural Conservation."
[64] See http://www.chile.unt.edu.
[65] See http://www.chile.unt.edu/studyabroad/index.htm and http://www.osara.org.

and cross-site comparisons to address relevant questions from both a disciplinary and society perspective.[66] Recently, concerted efforts seek to integrate the social sciences into long-term ecological research,[67] and extend their scope to rural, agricultural and urban areas,[68] as well as pristine remote areas, in a context of global change, thus demanding the inclusion of the human-dimension of ecology. In some developing countries, long-term ecological research sites have included people and linked science with decision-making. The creation of the Chilean long-term socio-ecological research network offers a platform to develop new models for linking natural sciences, social sciences, the humanities, and policy concerns. It should take into account these trends and installs itself at the vanguard of efforts to conduct socially relevant, long-term research on coupled human and natural systems. In the context of global ecological and social changes, existing international and interdisciplinary partnerships also represent a strength of this nascent long-term socio-ecological research network.

Traditional funding cycles and administrative research structures often favor narrow discipline-specific indicators of success, such as ISI,[69] which may not adequately reward long-term interdisciplinary approaches, whose benefits accrue over time and are not reflected only in those disciplinary indices. Participants and coordinators of the Chilean long-term socio-ecological research network must demonstrate to funding agencies the need to create new indices to assess and validate this new type of academic endeavor. The Chilean long-term socio-ecological research network provides IEB a unique opportunity to legitimize the role of research and ecological education in social processes and dialogue, rather than academics talking to the broader community. IEB can help the Chilean and international academic community move from restrictive evaluation criteria and a focus solely on basic research and monitoring into broader intellectual and practical realms, which better reflect eco-social integration.

Finally, lack of infrastructure, controlled study sites, the national financial-evaluation structure for science and instability in university and governmental policies prevented an earlier formal implementation of long-term research in Chile.[70] IEB will have to overcome these barriers in order to promote transdisciplinary teams and joint multi-institutional research projects and achieve broader goals facilitated

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[66] Golley, *A History of the Ecosystem Concept*, Franklin et al., "Contributions of the Long-Term Ecological Research Program," and Hobbie et al., "The U.S. Long-Term Ecological Research Program."

[67] Redman et al., "Integrating Social Science into the Long-Term Ecological Research (LTER) Network."

[68] N. B. Grimm, J. M. Grove, S. T. A. Pickett, and C. L. Redman, "Integrated Approaches to Long-Term Studies of Urban Ecological Systems," *BioScience* 50 (2000): 571–84.

[69] Institute for Scientific Information, which manages a widely used database that records indexed, peer-reviewed publications and the number of citations of published papers by author is often considered an indicator of scientific production.

[70] J. J. Armesto, "Fundamentos y Necesidades para un Programa de Estudios de Largo Plazo de Ecología en Chile," *Revista Chilena de Historia Natural* 68 (1995): 5–11.

by this new long-term socio-ecological research network.[71] This network will also stimulate a more participatory role for science in decision making and the application of knowledge, instead of the traditional "scientist informant" roles.[72] Long-term commitment and presence is expected to help build mutual trust with local partners and insert research into local socio-political process. In this way, Chilean long-term socio-ecological research programs have the potential to help create cohesion between different disciplines in academia, and between academics and society in general.

[71] J. A. Drew and A. P. Henne, "Conservation Biology and Traditional Ecological Knowledge: Integrating Academic Disciplines for Better Conservation Practice," *Ecology and Society* 11 (2006) at http://www.ecologyandsociety.org/vol11/iss2/art34.

Philosophy Unbound: Environmental Ethics at the End of the Earth

Robert Frodeman*

Environmental challenges such as those facing the Cape Horn region of Chile exceed the competency of any disciplinary framework. Interdisciplinary approaches to knowledge—combining the expertise of several disciplines as well as the trans-disciplinary perspectives of the public and private sectors—require a unifying element that helps integrate such disparate perspectives. The field of philosophy, which traditionally has offered a view of the whole of knowledge, can serve in this role again, if philosophers are willing to embrace a de-disciplined expression of philosophy.

I.

Southern Chile—the archipelago region from Puerto Montt (41ºS) to the tip of Cape Horn (56ºS)—faces a range of environmental challenges:

- Beaver and mink-impacted ecosystems
- Workers displaced from traditional occupations
- Salmon pens in once pristine lakes and fjords
- Climate change
- Deforestation and replanting with Eucalyptus plantations
- Mass ecotourism throughout the region
- The damming of rivers for hydroelectric power

The academy has a wide range of disciplines whose knowledge and perspectives are relevant for understanding and addressing such challenges, including:

- Ecology
- Economics
- Hydrology
- Political science
- Climatology
- Sociology
- History

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Success in addressing the challenges facing places such as southern Chile is thought to be a matter of matching problems with knowledge. In this essay, I explore this issue, the question of pertinent knowledge. I argue that a de-disciplined expression of knowledge, where the field of philosophy is redefined as the theory and practice of interdisciplinarity, has an important role to play in understanding what (if any) contributions knowledge can make for addressing the challenges we face.

II.

At the dawn of the twenty-first century we find two globally dominant paradigms for addressing societal problems: markets and technoscientific knowledge. The two are closely linked. Since the 1970s, neo-liberal policies have placed markets in an ever more dominant position within society. Unshackled from governmental control, markets promote open competition in the production of ever more goods and services. This process, supposedly driven by consumer preferences, is in reality largely the result of the creation of needs through clever advertising. But in any case, the question of whether consumer desires serve as cause or result of production is moot, for at its root, the entire global system is based on an aesthetic of infinite desire. Capitalist and consumer, production and consumption are complicit: there is always another consumer durable or creature comfort being offered, supplied by the inventive processes of technoscience—a new computer, cell phone, or car.

It is striking how rarely the question is raised whether human happiness is truly increased via the infinite accumulation of more and more possessions. In recent years, social scientific research has broached this question,[1] and has found that once people are lifted out of poverty increased money and possessions do not correlate with increased happiness. It seems that after all the wise men of the past had it right: human happiness is rooted in the development of personal skills, strong family relations, and a vibrant life within a community. Moreover—and here *environmental* philosophy gets its purchase—there are serious questions about whether an accumulative lifestyle is ecologically sustainable. It would require the use of multiple Earths in order for India or China to acquire the standard of living currently "enjoyed" by citizens in the United States.

Largely inured to market forces, within the academy the ideology of infinite desire expresses itself in terms of "curiosity." Curiosity is a modern shibboleth, marking those who embrace the mission of the infinite pursuit of knowledge. If outside the academy the market is the solution to every problem, within the academy additional knowledge has become the all purpose answer to every predicament.

Across most times and cultures people placed their trust in god (or the gods), king, or nature, accepting the world more or less as it presents itself. Beyond the narrowly pragmatic or technical, knowledge consisted of trying to identify one's

[1] E.g., Robert E. Lane, *The Loss of Happiness in Market Democracies* (New Haven: Yale University Press, 2000).

place in the natural (and supernatural) order, and in learning to moderate one's desires in order to live a good life, rather than an attempt at world making. Instead of seeking to manipulate the world, life's challenges were dealt with via faith, accommodation, and acceptance.

In contrast, modern academic culture places its faith in itself. Allied with capitalism and grown worldwide in scope, overwhelming other cultures, technoscientific knowledge embraces a linear hypothesis—that increases in knowledge necessarily lead to right action and the fulfillment of desires. On those occasions when disciplinary knowledge does *not* give a solution, the assumption has been that this problem can be addressed by . . . more knowledge.

Over the last sixty years, however, the knowledge society has been conducting an experiment in the pertinence of knowledge. Evidence has been accumulating that additional knowledge may not lead to solutions to our problems. Indeed, knowledge may not help at all—or, perversely, additional knowledge can actually make decisions more difficult. Recent examples of this phenomenon include: (1) climate change science: greater uncertainty concerning future climate change after the $35 billion spent on the U.S. climate science program; (2) health science: the doubling U.S. National Institutes of Health (NIH) budget to $29 billion between 1997 and 2003 shows no improvement in U.S. health statistics; (3) the 2000 U.S. presidential recount in Florida: sophisticated analysis of dimpled, two and three-cornered chads and different voting procedures made identifying a final number more rather than less difficult; and (4) the abortion debate: greater understanding of the mechanisms of conception and embryonic development has not led to lessening of conflict.

Faced with these results, thinkers both within and outside of academia are beginning to rethink the role of knowledge in society. Some have emphasized the need for greater *relevance* of research. For instance, in 2007 the U.S. National Science Foundation inaugurated a new competition called "SciSIP"—the Science of Science and Innovation Policy. The point of SciSIP is to improve the delivery of basic research to the marketplace. Other portions of the knowledge society have spoken of how the relevance of knowledge can be improved through *integration*—both across the academy, and between academia and society at large. Making knowledge more *interdisciplinary* would help to bridge the gap between knowledge and action.

Interdisciplinarity has now become its own code word, the guarantor of the enlightened nature of academic conversation. Generally such talk has remained just talk. This is no wonder, for the institutional and intellectual barriers to truly interdisciplinary teaching and research are daunting. Institutionally, standards of evaluation for tenure and promotion strongly favor disciplinarity—the phrase is in fact redundant, for the very idea of common standards of comparison implies the establishment of a discipline and a common measure. Moreover, intellectually or theoretically, the question of what constitutes interdisciplinary knowledge has formed remarkably little of a research project within the academy. Nationwide, one can find dozens of interdisciplinary centers (e.g., the Centennial Center for Interdisciplinary Science at the University of Alberta, or the Interdisciplinary Humanities Center

at the University of California, Santa Barbara), but the United States's first center for theorizing interdisciplinarity itself—the University of North Texas Center for the Study of Interdisciplinarity—was only launched in 2008.[2]

Interdisciplinarity then—pointing to a new era and means of knowledge management—today remains largely an empty signifier, more a marker of the crisis facing the knowledge industry rather than the beginning of a solution. Most commonly what flies under the flag of interdisciplinarity is actually multidisciplinarity. Different types of disciplinary knowledge are juxtaposed and combined, but not truly integrated. As Julie Thompson Klein notes, the *multidisciplinary*

> . . . juxtaposition fosters wider knowledge, information, and methods. Yet, disciplines remain separate, disciplinary elements retain their original identity, and the existing structure of knowledge is not questioned.[3]

Efforts generally stall at multidisciplinarity because making knowledge interdisciplinary is slow, inefficient, and painful. It requires long hours to become conversant in another's vocabulary, method, and assumptions. In a culture that has made a fetish of efficiency such time and patience is nearly impossible to obtain. Interdisciplinary knowledge also calls on one's psychic resources. It takes decades of effort to master one's home discipline; interdisciplinarity is a humbling education into the limitations of one's training and expertise.

At the root, then, investigations into transcending disciplinary limitations themselves bump up against disciplinary structures of knowledge production. This problem has even extended to the academic study of interdisciplinarity, for which discipline has as its charge the study of the relations between and beyond the disciplines?

There is a traditional claimant to that role. At least through the time of Hegel (to 1831), philosophy was the field for thinking about the whole of knowledge. Since the late nineteenth century, however, philosophy has also become a regional rather than fundamental ontology—a field in principle no different from other disciplines, in that it examines a limited region of knowledge (e.g., logic, philosophy of science). In terms of orientation and temperament, the field has become filled by what the nineteenth-century philosopher William James called the "plaster-grey temperament of our balding young Ph.D.'s boring each other in seminaries, and writing those direful reports of the literature in the *Philosophical Review.*"[4] But philosophy has been damaged by more than excessive specialization which neglects the development of a synoptic view of knowledge. There has also been a

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[2] See http://www.csid.unt.edu. The Association for Integrative Studies, founded in 1979, is the main institutional outlet for thinking about interdisciplinary research and education. Its focus has been on interdisciplinary education at the undergraduate level.

[3] Julie Thompson Klein, "The Taxonomy of Interdisciplinarity," in the *Oxford Handbook of Interdisciplinarity,* ed. Robert Frodeman (Oxford: Oxford University Press, forthcoming).

[4] William James, quoted in Bruce Kuklick, *A History of Philosophy in America, 1720–2000* (Oxford University Press), 2003, p. 217.

failure to simultaneously think through the intellectual and institutional aspects of philosophy.

For knowledge to be more than idle chatter, we not only need a synoptic and integrative moment uniting the disciplines; this integration must be taken out into the field, involving stakeholders in the public and private sectors. Philosophy, then, not only needs to de-discipline, it also must change its institutional expression. Returning to the question animating this discussion—the various pressures facing Cape Horn—how can we unite the disciplines to address real world challenges such as those facing southern Chile? This perspective lies behind the work being done at the University of North Texas Department of Philosophy and Religion Studies, especially though the UNT-Chile Field Station.[5]

A "de-disciplined philosophy," then, is characterized by three tasks. First, it seeks to provide an account of the specifically philosophical (ethical, aesthetic, epistemological, ontological, metaphysical, and theological) aspects of societal (in this case, environmental) problems. Second, it offers a synoptic narrative of the relations between the various disciplines (e.g., hydrology, chemistry, geology, public policy, economics) that offer insight into our problems. Such narratives can provide us with something that is sorely lacking today: a sense of the whole. Third, philosophers should seek out institutional settings and real world locations for instantiating the first two points. Akin to journalists in the two recent U.S.-Iraq wars, who placed themselves alongside troops in the field, they should play the role of "embedded philosophers."[6]

In the rest of this essay I discuss the coupled theoretical and institutional barriers to de-disciplining environmental philosophy. I conclude with an examination of one of the issues confronting southern Chile, the question of beaver-impacted ecosystems in Cape Horn.

III.

Environmental problems loom ever larger; yet, environmental philosophy remains a philosophic and academic afterthought. Environmental philosophers would like this situation to change. They feel, justifiably, that many of the problems society faces (environmental or otherwise) are at root humanistic rather than scientific or technical in nature, a matter of outlook and values rather than technique and fact. This marginal existence derives in part from the uncritical acceptance of environmental philosophy being placed within a disciplinary structure.

Despite being squeezed within a disciplinary notion of philosophy, environmental

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[5] See http://www.chile.unt.edu.

[6] D. Barben, E. Fisher, C. Selin, and D. H. Guston, "Anticipatory Governance of Nanotechnology: Foresight, Engagement, and Integration," in E. J. Hackett, O. Amsterdamska, M. E.Lynch, and J. Wajcman, eds., *New Handbook of Science and Technology Studies* (Cambridge, Mass.: MIT Press, 2008), pp. 979–1000.

philosophers have found it difficult to gain the respect of "real" philosophers. Environmental philosophy is a stepchild of the discipline, relegated to the category of "applied philosophy" along with other marginalia such as bio-, computer, and engineering ethics.[7] While its high enrollments are welcomed by administrators, only rarely does it receive a serious commitment of departmental or university resources. Among the nation's top philosophy departments, not one has an environmental philosopher as part of the regular faculty. Instead, faculty profiles announce "Topics that are of special interest include definitions, truth, meaning, and perception." The lack of environmental philosophy, then, is not a matter of simple lacunae. Disciplinary philosophy exists at a level of abstraction and supposed rigor that precludes specifications such as environmental ethics.

True, there's recently been an "empirical" turn within philosophy known as experimental philosophy or "X-Phi." These philosophers do philosophy with clipboards and questionnaires, seeking data about people's intuitions concerning questions of moral intentions. Kwame Appiah recently authored a piece for the *New York Times* describing this movement under the title of "The New New Philosophy." He describes it as paradigm breaking: philosophers reading MRI brain scans to learn about how we puzzle out moral quandaries. But note the flow of the argument. Appiah describes the X-Phi Philosopher so: "The study was conducted by a philosopher, as a philosopher, in order to produce a piece of . . . philosophy" (ellipses in the original). Appiah ends by noting that

> . . . although experiments can illuminate philosophical arguments, they don't settle them. . . . To sort things out, it seems, another powerful instrument is needed. Let's see — there's one in the corner, over there. The springs are sagging a bit, and the cushions are worn, but never mind. That armchair will do nicely.[8]

This type of research is quite different from what de-disciplined environmental philosophers seek to accomplish—to integrate their insights with the work of scientists, philosophers, and policy makers for addressing real world problems.

If philosophers hope to influence conversations of non-philosophers, they need to realize that non-philosophers read philosophy papers only under duress. The solution is to get involved with their work rather than ask them to read ours. It is through work on a weekly basis with scientists or policy-makers that points such as the signature distinction of environmental philosophy—between instrumental and intrinsic value—can be better understood and integrated within ongoing public controversies, illuminating specific cases such as the development of the new management plan for Grand Canyon National Park, or managing the expansion of exotic species in South America.

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[7] See e.g., Leiter's *Philosophical Gourmet* at http://www.philosophicalgourmet.com.

[8] Kwame Appiah, "The New New Philosophy," in the *New York Times Magazine,* 9 December 2007. Available at http://www.nytimes.com/2007/12/09/magazine/09wwln-idealab-t.html?pagewanted=all.

These suggestions fly in the teeth of a set of assumptions that have defined academic philosophy for fifty years: that such an approach is not rigorous enough, or that such work is a simple (i.e., philosophically uninteresting) matter of "applying" concepts. Even within the field the topic of the institutional status and expression of environmental philosophy has not been considered philosophical enough to warrant being the subject of articles, conferences, and curricular and institutional reform. In this we are very much like the philosophic community generally, which since World War II has ignored the philosophic dimensions of the institutional setting and structure of philosophy. This is a shame, for the field is rich enough to embrace both the disciplinary specialties of recondite philosophy and the synoptic reach of field-based philosophic approaches.

To be sure, for fifteen years we have heard comments—most often from ecofeminists and environmental pragmatists—that environmental ethics needs to become more relevant. For example, Bryan Norton is well known for advocating a policy-oriented approach, where we try to think about environmentalism as a force in public policy first and to examine philosophical questions in passing. (Norton, it is worth noting, is located in a school of public policy rather than a philosophy department.) But none of this seems to have moved the needle. The reason is that we are still trying to make better or different arguments, rather than focusing on the institutional situation of and disciplinary limitations of environmental philosophy.

Few think about the institutional aspects of philosophy writ large. The most notable instance is University of Chicago philosophy and law professor Brian Leiter. His "Philosophical Gourmet Report" (http://www.philosophicalgourmet.com) has been ranking philosophy programs for ten years, and his blog is perhaps the best known in the profession in the U.S. Moreover, in 2004 he published an edited volume titled *The Future for Philosophy* which sought to lay out markers for what twenty-first century philosophy should be.[9]

On the first page of the introduction of *The Future for Philosophy* Leiter notes that philosophy has always been characterized by its insistent meta-philosophical questioning—posing questions about "what philosophy is, its proper concerns, methods, and limitations." Leiter notes, however, that in addition to being explicitly posed, answers to this question are also developed "by the *doing of* philosophy" (emphasis in the original):

> In this volume . . . some of the very best and most influential contemporary philosophers . . . are *doing* philosophy of mind, language, and science, as well as ethics, epistemology, feminist philosophy, and the history of philosophy.[10]

For Leiter, then, "doing philosophy" consists of constructing arguments—philosophers writing philosophy essays for other philosophers. There is no sign that he had

[9] Brian Leiter, ed., *The Future for Philosophy* (New York: Oxford University Press, 2004).
[10] Ibid., p. 5.

considered that there might be other kinds or ways of "doing." (Leiter, a student of Nietzsche, might have considered "philosophizing with a hammer.") After all, it is possible that the future of philosophy could turn on something other than theoretical debates between philosophers. We might, for instance, raise questions of whether philosophers should be housed (or housed exclusively) in philosophy departments, or whether they might be scattered across campus; whether or to what degree they can find homes beyond academia; whether philosophy is a "discipline" in the same sense as are other fields; and what public roles philosophy can take in these philosophical times. Of the thirteen chapters in *The Future for Philosophy*, not one raises any of these questions concerning the institutional future of philosophy.

Even when Leiter does consider the institutional expression of philosophy, his perspective remains remarkably unphilosophical. In the "Philosophical Gourmet Report" he does not even consider alternative methods of rating Ph.D. programs. The report prominently features a list of the philosophers whose opinions determined the results of the survey: 450 were canvassed; 270 replied. Of the 450 who were asked to respond, out of the approximately 15,000 philosophers employed in the U.S., all are employed at the so-called top universities (Leiter offers an account of his selection criteria). It will thus come as no surprise that Leiter's results have been "remarkably stable" over the years. But more to the point here, Leiter not only fails to consider what the rankings might look like if a random cross-section of employed philosophers were surveyed; he also gives no thought to how *non*-philosophers might rank departments, or how programs could be evaluated according to citations outside philosophy journals, or by the amount of sponsored research they attract.

I have argued elsewhere for a policy turn within environmental philosophy—a focused and concerted turn outward, toward non-philosophers, training philosophers to be part of interdisciplinary teams working on projects with public agencies, policy makers, and the private sector.[11] Rather than aspiring to become philosopher-kings, advising presidents, or philosopher-isolates, writing for an audience of only a few, we need a different model for the role of philosophers. Call it the philosopher-bureaucrat—philosophers placed within institutional structures that dominate life today: the local water board, the regional EPA office, or the U.S. Forest Service, the places where the decisions are made and policies set.

Bureaucrat, of course, is a disagreeable word. No one wants to be labeled a "bureaucrat." But philosophers have an obligation to think through the terms that rule our lives. The term has the virtue of truth, for we live in a bureaucratic age. Few of us would want it any other way. Whatever their burdens, bureaucratic structures such as the U.S. Federal Aviation Administration, the Food and Drug Administration, and the Environmental Protection Agency protect things that we deeply value, adding to the richness and safety of our lives. Developing the alternative philosophical

[11] Robert Frodeman, "The Policy Turn in Environmental Philosophy," *Environmental Ethics* 28, no. 1 (2006): 3–20.

model of the philosopher bureaucrat offers us a way to integrate environmental philosophy, and philosophy in general, into societal concerns and gain more attention and respect for our work.

At the 2006 annual meeting of environmental philosophers in Colorado, philosopher Dale Jamieson claimed that if the field wanted to gain more respect from the philosophical community, environmental philosophers needed to be "twice as good": matching the philosophical skills of the top people in the field, while also mastering enough knowledge of environmental science or policy to be able to rigorously relate philosophic insights to our environmental problems. This, I suggest, is an impossible standard. To reach anywhere near the top of any specialized field today requires high intelligence plus a commitment to a more-than-full-time work schedule.

But even if such skills could be purchased by brilliance or sleepless nights, it would be a mistake. In his introductory essay, Leiter gives voice to the crucial assumption underlying philosophy and indeed the entire knowledge industry. Concerning a point so obvious that it could be placed within a rhetorical parentheses, Leiter claims that we must aim for the highest possible pitch of philosophical rigor: "(Which 'camp' of philosophy could possibly be committed to less careful analysis, less thorough argumentation?)"[12] But contra Leiter, analysis and argumentation are not paramount virtues. They are only two virtues among many, to be balanced with others such as timeliness, cost, and pertinence to one's audience. As Aristotle notes, it is a sign of an educated person to seek only as much clarity as a subject matter admits of—or for that matter, needs. Rigor of argumentation should also be subject to a mean.

Certainly our environmental problems require a modicum of philosophy—and a great more than they currently get. But at this point, thirty-five years in, rather than simply more argumentation, what environmental philosophers most need is skill in "translation." Master the basic arguments, yes, but then learn how to insert the pertinent insight into a non-philosophical conversation in a powerful and brief (!) manner. Philosophers should make sure that their graduate students become adept with the basic concepts of environmental philosophy. But once they graduate, they should understand that their careers need not consist of thirty or forty years of further sharpening of their philosophical razors. It is time to go abroad in the world and see what work can be done.

IV.

Yes, environmental philosophers are philosophers. But this fact does highlight the differences between two very different conceptions of philosophy. It need not be an either-or proposition; there should be room for continued philosophical detail work as well as a new type of philosopher-bureaucrat.

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[12] Leiter, *The Future for Philosophy*, p. 12.

Environmental philosophy should explicitly challenge the current, failed, and curiously ahistorical notion of philosophy that has dominated the academy for the last 100 years. Surely it is strange that the same people who pay homage to our philosophical ancestors—Socrates, Descartes, Leibniz, Nietzsche, William James—fail to recognize that if a young version of any of these thinkers showed up for a job interview today they would be dismissed out of hand. None of these people were specialists—people who Nietzsche dismissed as "dwellers in nooks and crannies." None of them spent the majority of their time reading and writing for a philosophical audience. It is quite unlikely that they would unquestioningly adapt to the times and start reading and writing for the *Philosophical Quarterly* or *Nous*.

How did philosophy get to this point? A few turning points can be highlighted. Kant was a harbinger. In the *Groundwork,* originally published in 1785, he sought to apply Adam Smith to philosophy:

> All industries, crafts, and arts have gained by the division of labor, viz., one man does not do everything, but each confines himself to a certain kind of work that is distinguished from all other kinds by the treatment it requires, so that the work may be done with the highest perfection and the greatest ease. Where work is not so distinguished and divided, where everyone is a jack of all trades, there industry remains sunk in the greatest barbarism. Whether or not pure philosophy in all its parts requires its own special man might well be in itself a subject worthy of consideration. Would not the whole of this learned industry be better off if those who are accustomed, as the public taste demands, to purvey a mixture of the empirical and the rational in all sorts of proportions unknown even to themselves and who style themselves independent thinkers, while giving the name of hair-splitters to those who apply themselves to the purely rational part, were to be given warning about pursuing simultaneously two jobs?[13]

Post-Civil War higher education saw Kant's program institutionalized via two developments—the creation of the undergraduate major, and the founding of the research university. The major and the elective system were created at Harvard in 1869, placing knowledge within disciplines and emphasizing specialization. In contrast with the traditional college, within the university it was possible for anyone to pursue a course of study in any field. The research university was inaugurated with the founding of Johns Hopkins in 1876. Rather than the collegiate focus on the preservation and integration of perennial truths, the research university defined the professor's work in terms of the endless pursuit of new knowledge.

Some philosophers protested this redefinition of philosophy in terms of specialization and expertise, but they were quickly overwhelmed. Philosophy became one more regional ontology with its own areas of recondite research in principle

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[13] Immanuel Kant, *Grounding for the Metaphysics of Morals,* trans. James W. Ellington (Indianapolis: Hackett Publishing, 1981), p. 2.

no different from any other discipline. In *Time in the Ditch* John McCumber adds another layer to the institutional history of philosophy.[14] In the 1950s and 1960s three factors came together: the arrival within the U.S. of analytic philosophy, the rise of McCarthyite persecution of academics, and a demographic boom and bust within the philosophy market. Analytic philosophy matched up well with the specialist-oriented research agenda of the research university. According to McCumber's research, McCarthy and his surrogates red-baited philosophers at a higher percentage than any other field within the academy. Finally, the bust of the academic job market in the late 1960s meant that the inward-looking, scientistic orientation of analytic philosophy dominated philosophy departments for a much longer time than it might have otherwise.

Evolutionary change almost always comes from the periphery rather than from the center, from isolated locations where evolutionary advances can develop without being overwhelmed by the status quo. Only later do they bring their innovations into the mainstream. It is possible and even likely, then, that new models of philosophy and of academic work in general will first take hold at the end of the Earth.

V.

In 1946 the Argentinean navy released twenty-five pairs of North American beaver (*Castor canadensis*) in the forested area of Fagnano Lake on the island of Tierra del Fuego.[15] The navy's goal was to bolster the local economy through the development of a fur industry. The plan never prospered, but the beavers did quite nicely. The absence of natural predators and human hunting for beaver and the suitability of the terrain allowed the offspring of these hardy pioneers to spread far beyond the lake. Beaver were soon established throughout the region—migrating up streams, crossing highlands, and swimming from island to island. By the 1990s, fifty beaver had become more than 50,000.[16]

The beaver have also left marks on the landscape. Aerial photographs of the Cape Horn region show areas of new marshland and meadows, and the tree canopy has been reduced along stream banks. Research has documented changes in habitat structure and the species composition of fish, algae, freshwater invertebrates and bird assemblages as well as the increased retention and deposition of organic

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[14] John McCumber, *Time in the Ditch* (Evanston: Northwestern University Press, 2001).

[15] M. Lizarralde, and C. Venegas, "El Casto: Un Ingeniero Exotico en las Tierras Mas Australes del Planeta," in R. Primack, R. Rozzi, P. Feinsinger, R. Dirzo, and F. Massardo, eds., *Fundamentos de Conservación Biológica: Perspectivas Latinoamericanas,* 2d ed. (Mexico City: Fondo de Cultura Económica, México, 2006), pp. 231–32; C. Anderson, R. Rozzi, J. C. Torres-Mura, S. McGehee, M. Sherriffs, E. Schuettler, and A. Rosemond, "Exotic Vertebrate Fauna of the Remote and Pristine Sub-Antarctic Cape Horn Archipelago, Chile," *Biodiversity and Conservation* 15 (2006): 3295–13.

[16] Lizarralde and Venegas, "El Casto," p. 231.

materials.[17] Moreover, the beaver have crossed the Magellan strait and look to be moving further northward. Southward, they have reached Navarino Island and could reach the pristine Cape Horn archipelago, the last land before Antarctica.[18]

Weighing the scientific, social, economic, political, and ethical aspects of the penetration of the beaver in the region presents a difficult challenge. The beaver have in one sense become "native": Puerto Williams has adopted the beaver as a town mascot. The choices for addressing the beaver question come down to four: eradicate, control, tolerate, or promote.[19] At least the first two would require economic resources, and any of these choices would need to garner political consensus. Moreover, any debate over the fate of the beaver will in part turn on an interdisciplinary account that combines scientific data, environmental philosophy, and economic and political realities on the ground. How, for instance, does one define *exotic?* How long must a species be in a location before counting as a native? Does it matter how the species was introduced (e.g., by their own initiative, or by human actions)? By what criteria do we establish that exotics or the landscape changes they initiate are "bad?"

Such questions are not "answered" in the sense of identifying a unique solution. The same for the overall question of how to handle the beaver question of Cape Horn, which will be only be addressed via an ongoing debate among the communities that are affected. Such a debate will be inter- and transdisciplinary rather than disciplinary in nature, political rather than scientific in structure. The academy has disciplines, but the world has problems. These problems inevitably overwhelm every disciplinary boundary. Mono-disciplinary approaches are almost always doomed to failure, promising as they do the dream of isolating an answer from the welter of facts, values, and perspectives. Our challenges defy such an approach. The world is more complex than that.

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[17] C. Anderson, A. Rosemond, G. Clayton, R. Rozzi, and O. Dollenz, "The Effects of Invasive North American Beavers on Riparian Plant Communities in Cape Horn, Chile," *Biological Conservation* 128 (2006): 467–74.

[18] Ibid.

[19] S. Haider and K. Jax, "The Application of Environmental Ethics in Biological Conservation: A Case Study from the Southernmost Tip of the Americas," *Biodiversity and Conservation* 16, no, 9 (2007): 2559–73.

Field Environmental Philosophy and Biocultural Conservation: The Omora Ethnobotanical Park Educational Program

Ricardo Rozzi, Ximena Arango, Francisca Massardo,
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Habitats (where we live), habits (how we live), and inhabitants (who we are) constitute an ecosystem unit. The biosphere is composed of a reticulate mosaic of these habitat-habit-inhabitant units, where humans (with their indigenous languages, ecological knowledge, and practices) have coevolved. Today, these diverse ecosystem units are being violently destroyed by the imposition of a single global colonial cultural model. In Cape Horn at the southern end of the Americas, educators, authorities, and decision makers do not know about the native habitats, language, and flora, and do not distinguish between Cape Horn's flora and the flora that grows in other parts of the country or the world. In contrast, indigenous people and old residents have a detailed knowledge, but they do not participate in education, and decision making. It is not *Homo sapiens* in general, but bioculturally biased educators, authorities, and decision makers who need to be transformed into (educated and responsible) members and citizen of biocultural communities. The Omora Ethnobotanical Park educational program was launched to contribute to a biocultural citizenship involving three critical steps: (1) the disclosing of biocultural diversity with a "fine filter" approach that permits understanding of the cultural and ecological diversity hidden by general universal labels; (2) direct "face-to-face" encounters with human and nonhuman co-inhabitants; and (3) actions for protection of habitats and implementation of interpretative spaces that facilitate direct encounters and conservation of biocultural diversity. These steps have been implemented at local and regional scales through the creation of the Omora Ethnobotanical Park and the UNESCO Cape Horn Biosphere Reserve.

HABITATS—HABITS—INHABITANTS

In its most archaic form, the Greek word *ethos* means den, the dwelling of an animal.[1] Through an extension of the word's use, its meaning came to include the dwellings of humans. Later, this noun also became the verb "to dwell." This dual noun-verb meaning of the Greek *ethos* is mirrored by the Latin words *habitat* and

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[1] H. G. Liddell and R. Scott, *A Greek-English Lexicon*, 9th ed. (New York: Oxford Press, 1996). See also J. Gonzalez, *El Ethos, Destino del Hombre.* (Mexico City: Fondo de Cultura Económica, 1996), pp. 9–12.

to inhabit. Moreover, from the action of inhabiting a habitat, habitual ways of inhabiting emerge configuring "habits" or recurrently performed behaviors; i.e., the *ethos* of animal or human inhabitants. In this etymological drift, our understanding of the concept of *ethos* moves from its meaning as a vital physical space (the habitat) toward its meaning as the act of dwelling in the habitat; in turn, it arrives at a meaning that defines the identity of living beings (inhabitants). *Ethos* is also the Greek root of the word *ethics.* However, most modern ethics have been developed without consideration of the habitat, as if individuals and their identities could exist in isolation from their environment. In turn, this "conceptual gap" of modern ethics generates a second problem. Since the colonial period, modern moral theories developed in Europe are applied to moral situations in the colonies without consideration to native *ethos,* as if indigenous ethics and their intricate interconnections with local habitats would not exist. To overcome this colonialist gap of modern ethics, we propose to develop ethical approaches rooted in specific habitat-habit-inhabitant ecosystem units. These units also provide a conceptual foundation for environmental ethics embedded in transdiciplinary collaborations, such as the ones explored in this special issue of *Environmental Ethics.* Habitats are mostly studied by ecologists, and habits are mostly studied by philosophers, with little interaction among these disciplines. A greater integration of their methods, concepts and findings would generate a more integral understanding of human and nonhuman inhabitants' ecologies, behaviors, and rights, and human's identities and ethical duties.

The integration between habitat and inhabitant found in the Greco-Roman roots of the meaning of *ethos* in Western civilization is also deeply rooted in Amerindian world views. For instance, the names of the indigenous communities of the largest ethnic group of southern South America, the *Mapuche*, are defined by the habitats where they live. Overall the *Mapuche* people define themselves as people (= *che*) of the land (= *mapu*), and the three main communities define themselves more specifically according to the habitat types they inhabit: in the monkey-puzzle tree (*Araucaria araucana*) forests of the volcanic Andean mountain range of central-southern Chile and Argentina live the *Pewenche*, i.e., people of the monkey-puzzle tree (= *pewen*), who are dependent on the fruit of this tree (fig. 1); in the coastal forests of central-southern Chile live the *Lafkenche*, i.e., people of the coast or sea (= *lafken*), who are dependent on marine resources (algae, mussels, fish); in the evergreen rain forests of southern Chile live the *Williche*, i.e. people of the south (= *willi*), who are dependent on the plants and animals of the southern rain forests.[2] Not only the names of humans, but also the names of other animals are linked to their habitats and habits by indigenous languages. For example, at the southern end of the Americas, in the Cape Horn

[2] Habitat types and ethnic groups of southern South America are characterized in R. Rozzi, F. Massardo, C. B. Anderson, S. McGehee, G. Egli, E. Ramilo, U. Calderón, C. Calderon, L. Aillapan, and C. Zárraga, *Multi-Ethnic Bird Guide of the Austral Forests of South America* (Punta Arenas, Chile: Editorial Fantástico Sur and Universidad de Magallanes, 2003).

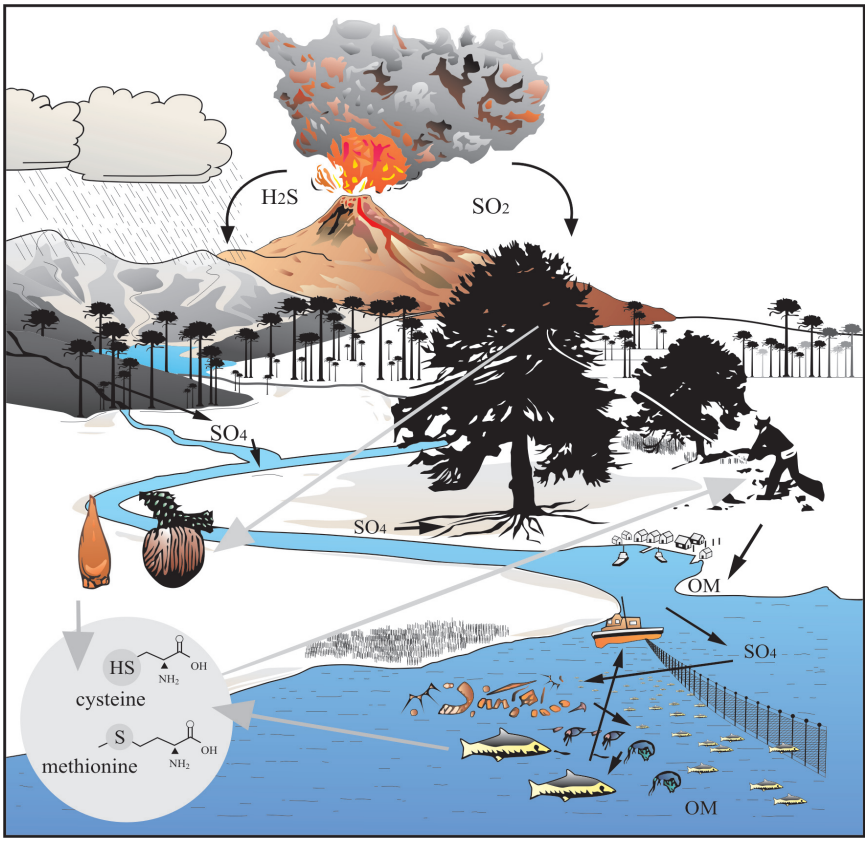

Figure 1.The integration between habitats, habits, and inhabitant identities is deeply rooted in the life of the largest indigenous group of southern South America, the Mapuche people. Their language is called Mapudungun, the language (= dungun) of the land (= mapu), and they define themselves as people (=che) of the land. One of the three main Mapuche subgroups is the Pewenche people. Their habitat is the forest of monkey-puzzle tree (Araucaria araucana) or pewen in Mapudungun. An essential habit of the Pewenche is the gathering of pewen fruits, which provide the basis for their alimentation. These fruits contain cysteine and methionine, an essential amino acid that cannot be synthesized by the human body. By eating these fruits, Pewenche actually are the people of the pewen. Interestingly, a scientific biogeochemical perspective offers an ecosystemic view of these habitats, habits, and inhabitants that concurs with the Mapuche worldview. These amino acids contain sulphur in their molecules. Sulphur input to the biogeochemical cycle from volcanoes is transported by the wind and the water of the streams to the soil, where the microflora carry out processes of oxidation and reduction, permitting sulphur to be absorbed by the roots of the pewen. Therefore, when Pewenche eat the fruits of the pewen, they also eat the sulfurous rocks and ashes of the volcano. Hence, not only are they people of the pewen, but also Mapuche, people of the land.

archipelago, the Magellanic woodpecker (*Campephilus magellanicus*) is called by the indigenous Yahgan people: *lana*. This name derives from the Yahgan word *lan,* which means tongue. It alludes to the habit of this woodpecker of extending its long tongue to extract larvae from the holes it pecks in the trunk of old growth trees in the sub-Antarctic forests of the Magellanic archipelago. The Latin scientific name defines the bird as "caterpiller-lover" (*Campe-philus*), inhabiting the Magellanic forests (*magellanicus*). Its English common name, Magellanic woodpecker, also characterizes the identity of this bird by its habit of pecking wood in the austral woodlands. Hence, the intimate connection between the habitats, habits, and the identity of the woodpecker is expressed by the three languages.

In South American academic philosophy, a pioneer effort to understand the deep links between regional landscapes and Amerindian cultures was initiated by the Argentinean philosopher Rodolfo Kusch. He realized that no genuine philosophy in the Americas can be conceived without incorporating the Amerindian cultures. Kusch's perspective contrasted with the fact that indigenous languages and lives have remained almost completely unknown, forgotten or even denied in academic philosophy. Against this trend, in the 1960s, Kusch initiated a comparative ethno-philosophy practice while working in Northern Argentina at the University of Salta. He coined the concept of *geoculture* through which South American geography ceased to be seen through "colonial lenses" as a virgin territory to be conquered and used.[3] Instead, it was understood as the land where cultural meanings were rooted. Kusch disclosed how the South American *ethos* of each is embedded in the environment, "always situated, always grounded."

In this paper, we build on an ethno-ecological interpretation of the concept of *ethos,* as grounded in southern South America, which reintegrates the identity of the animal or human inhabitant with its ways of inhabiting in a particular habitat. This ethno-ecological perspective differs from the disembedded, anthropocentric, and individualistic perspective on human habits or consumer preferences used in market economy.[4] The social and environmental detachment of individual consumers institutionalized by current global market economy seems to represent an exception, not the rule among South American cultures. Instead, a biocultural world view, which integrates habitats, habits, and the identities of the inhabitants, prevails in both the Western and indigenous roots of South American cultures. However, the Greco-Roman and Amerindian meanings of *ethos* are ignored by current hegemonic educational practices. To confront alienation of global society from the environment, and reconnect societies and their local habitats and habits, environmental philosophers and ethno-ecologists can provide a valuable contribution to fostering the cultural and educational reintegration of these ancient meanings of *ethos*. To introduce this approach, we begin with a biocultural field experience.

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[3] See R. Kusch, *Geocultura del Hombre Americano* [Geoculture of the American Man], Philosophical Studies Collection (San Antonio de Padua, Argentina: Editorial Castañeda, 1976).

[4] See S. Castro-Gomez, "Traditional Theory and Critical Theory," *Critique* 49 (2001): 139–54.

RE-ENCOUNTERING BIOCULTURAL DIVERSITY AT CAPE HORN

Accompanied by Ursula and Cristina Calderón, the last two fluent speakers of Yahgan, in March 2000 we embarked on one of the first educational journeys at the Omora Ethnobotanical Park with students from the Puerto Williams public school.[5] When we arrived at what would later be the entrance to the park, we paused and remarked about the great abundance of wild currant shrubs growing in the area. The sisters, Ursula and Cristina, told us that the indigenous name for this shrub is *upush*. Knowing that the Yahgans traditionally named places after the predominant bird and plants species in the area,[6] we suggested that Puerto Williams might have originally been called *Upushwaia*, the bay (*waia*) of *upush* shrubs. Ursula and Cristina welcomed the suggestion, and the name has since then been adopted and used by the local community.

In order to better understand how this plant was recognized and named by members of different cultures inhabiting or exploring Cape Horn, with the students, we researched the origin of the Spanish, English, and scientific names for the *upush* shrub. We concluded that the Spanish Conquistadors, upon observing the bush growing in such abundance in the southern regions of Chile, associated it with the behavior of a weed (*zarza)*. The shape of its leaves reminded them of a small grapevine (*parrilla*), and the Spaniards chose to call the shrub *zarza-parrilla*. The Anglican missionaries, in contrast, called this species *wild-currant,* because its fruit reminded them of the currants of their native country which in Cape Horn were growing in the "wild." Scientists determined that the bush belongs to the botanical genus *Ribes*, which has a worldwide distribution and includes 200 species. Because this species is characteristic of the Magellanic region of southern Chile, it was classified by European botanists with the Latin scientific name *Ribes magellanicum*.[7]

Names of each culture's familiar plants were projected onto the new species they encountered in southern South America. Upon seeing the bush, the Spaniards, who came to Cape Horn from a Mediterranean country, were reminded of grapevines predominant in their homeland. To the British, arriving from a temperate region dominated by hedges and morelands, the fruit resembled berries they cultivated. Similarly, European botanists followed the Aristotelian and Linnaean formula of

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[5] The Yahgan people are the original inhabitants of the Cape Horn region. See C. McEwan, L. Borrero, and A. Prieto, *Patagonia: Natural History and Ethnography at Uttermost End of the Earth* (London: British Museum Press, 1998). For the location of Omora Ethnobotanical Park, Puerto Williams, and Cape Horn, see map in p. 231 in this volume.

[6] Cf. P. Stambuk, *Rosa Yagán: El Ultimo Eslabon* (Santiago: Editorial Andres Bello, 1986), p. 17.

[7] *Ribes magellanicum* was originally classified by Sydney Parkinson as *Ribes antarcticum* during Captain Cook's first expedition in 1769. Poiret changed the classification to *Ribes magellanicum* in 1812. R. Rozzi and K. Heidinger, *The Route of Darwin through the Cape Horn Archipelago* (Punta Arenas, Chile: Gobierno Regional de Magallanes y Antártica Chilena and Universidad de Magallanes, 2006), p. 28.

scientific names composed of a substantive (essence) and an adjective (accident) when classifying the plant. In this way, the students realized that the names of *upush*, *zarzaparrilla*, *wild currant*, and *Ribes magellanicum* express as much about features of the shrub as they do about the cultures that named it. This is one of the reasons we refer to Omora's research-educational approach to conservation as *bio-cultural.*[8] By preserving the shrub populations and the various names given to this species, we preserve both the biological and cultural diversity and the intricate relationships between them.

On our excursion in the field that day, we also discovered that place names are expressions of the ways we understand and relate to the habitats we inhabit. For example, at the end of the nineteenth century, Anglican missionary Frederick Lawrence named the site we visited Puerto (Port) Luisa, after his daughter Luisa. In the mid-twentieth century, after the arrival of the Chilean Navy to the area, this toponomy was changed to Puerto Williams in memory of Captain Juan Williams, who helped maintain Chilean sovereignty in the region before territorial disputes arose with Argentina.[9] In the names of Puerto Luisa and Puerto Williams, the original inhabitants of Cape Horn—humans and nonhumans—are absent; we remember instead the colonizers who took possession of the region. By reincorporating a Yahgan name like *Upushwaia* at the beginning of the twenty-first century, we recover the profound sense of living together with the plants and features of the landscape which are expressed by the indigenous language. By preserving an explicit reference to the biocultural diversity of the place, the Yahgan name helps to continue cultivating an indigenous environmental ethic that regards the place as belonging to the whole biotic community and not only to humans.

BIOCULTURAL HOMOGENIZATION

The field experience with Ursula and Cristina, and the students seems to be a simple experience, and it is. What is not simple is that the habit of going out to encounter the everyday habitats—its person, its plants, its languages, its names—constitutes, with each day, an increasingly rare experience within the schools, the universities, the government institutions, and decision-making centers. In order to better understand the current perceptions of Cape Horn's habitats by descendants of the Yahgans, European colonizers, and navy people, as well as today's authorities, teachers, and students in Cape Horn, we interviewed members of each of these

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[8] For a definition of *biocultural diversity*, see R. Rozzi and A. Poole, "Biocultural and Linguistic Diversity," in J. B. Callicott, R. Frodeman, eds., *Encyclopedia of Environmental Ethics and* Philosophy. Farmington Hills, Mich.: Gale, Cengage Learning, 2008); for the biocultrual approach of Omora park. see R. Rozzi, F. Massardo, J. Silander, Jr., C. Anderson, and A. Marin, "Conservación Biocultural y Ética Ambiental en el Extremo Austral de América: Oportunidades y Dificultades para el Bienestar Ecosocial," in *Biodiversidad y Globalizaci*ón, ed. E. Figueroa and J. Simonetti (Santiago, Chile: Editorial Universitaria, 2003), pp. 51–85.

[9] Captain Juan Williams took possession of the Strait of Magellan for Chile on 21 September 1843.

sociocultural groups in Puerto Williams.[10] We started the interviews with a very simple question: "Name the first five plant species that come to your mind." Surprisingly, the abundant *upush* shrubs were not mentioned by most respondents. Instead, the answers given by most people included exotic, cosmopolitan plants: seventy-five percent of the named species were foreign to Cape Horn.

Roses and apple trees were the most frequently named plants.[11] The rose was central to the culture of the Romans, for whom flowers and rose water were an indispensible aesthetic element, which later in the Middle Age gave origin to the perfumes and oils of roses.[12] Roses have also contrasting Christian symbolisms that go from condemnation for their sensual character to a high appreciation for their role in various miracles, such as the desert roses in the cloak of the Virgin of Guadalupe, or the apparition of the Virgin Mary that gave origin to the rosary.[13] In contemporary global-market society, roses are the most popular flowers, representing more than two-thirds of the flowers sold worldwide. Apple trees also have a clear biblical connotation, and apples occupy a prominent place in fruit markets. Today,

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[10] See methodology in X. Arango, R. Rozzi, F. Massardo, C.B. Anderson, and J. T. Ibarra, "Descubrimiento e Implementación del Pájaro Carpintero Gigante (*Campephilus magellanicus)* como Especie Carismática: Una Aproximación Biocultural a la Conservación en la Reserva de Biosfera Cabo de Hornos," *Magallania* 35, no. 2 (2007): 71–88.

[11] See R. Rozzi, C. B. Anderson, F. Massardo, and J. Silander Jr., "Diversidad Biocultural Subantártica: Una Mirada desde el Parque Etnobotánico Omora," *Chloris Chilensis* 4, no. 2 (2001), at http://www.chlorischile.cl/rozzi/fig2.htm.

[12] M. Touw, "Roses in the Middle Ages," *Economic Botany* 36 (1982): 71–83.

[13] The Virgin of Guadalupe is rooted in the folk culture of Mexico. Her image shrine at Tepeyac in are surrounded by an origin myth, which says that: "the Virgin Mary appeared to Juan Diego, a Christianized Indian of commoner status, and addressed him in Nahuatl. The encounter took place on the Hill of Tepeyac in 1531, ten years after the Spanish Conquest of Tenochtitlan. The Virgin commanded Juan Diego to seek out the archbishop of Mexico and to inform him of her desire to see a church built in her honor on Tepeyac Hill. After Juan Diego was twice unsuccessful in his efforts to carry out her order, the Virgin wrought a miracle. She bade Juan Diego pick roses in a sterile spot where normally only desert plants could grow, gathered the roses into the Indian's cloak, and told him to present cloak and roses to the incredulous archbishop. When Juan Diego unfolded his cloak before the bishop, the image of the Virgin was miraculously stamped upon it. The bishop acknowledged the miracle, and ordered a shrine built where Mary had appeared to her humble servant." Quoted in Eric R. Wolf, "The Virgin of Guadalupe: A Mexican National Symbol," *The Journal of American Folklore* 71 (1958): 34–35. The name "Rosary" is explained in the collections of the "Miracles of Our Lady," which were very popular in the Middle Age. "A youth was accustomed to make a wreath of roses or other flowers every day, and to place it upon the head of Our Lady's statue. He became a monk, and in the cloister his occupation no longer permitted him to observe this pious practice. Being much distressed, he asked counsel of an aged priest, who advised him to say fifty Aves every evening. . . . This the young man faithfully observed, until one day, being upon a journey, he has to pass through a lonely wood where robbers were lying in wait. They were employed in watching him, feeling sure of their prey, when he, unsuspicious of their presence, remembered that his Aves were not yet said, and forthwith stopped to say them. Then to their surprise, the robbers saw a most glorious lady stand before him and take one after another from the lips of the kneeling monk, fifty beautiful roses, which she wove into a garland and placed upon her head. The robbers, so the legend tells, conscience-stricken at the vision, were all converted to a better life, and themselves soon after entered the monastery." Quoted inWinifred S. Blackman, "The Rosary in Magic and Religion," *Folklore* 29 (1918): 275–76.

sixty-five percent of Chilean people identify themselves as Roman Catholic, and the country ranks fifth in apple exportation worldwide. Consequently, the overarching presence of roses and apple trees in the imagery of Cape Horn's inhabitants seems to express the central roles that global market and European Christian cultures play at these high latitudes. The strong presence of roses and apples in the minds of most inhabitants prevented their awareness of the sub-Antarctic flora, despite the fact that Puerto Williams is embedded in the luxurious forested landscapes of Cape Horn.

Given that the floristic imageries of the Puerto Williams inhabitants had a strong influence from European and market economy cultures, we assessed whether the absence of native flora in the imageries was equal among all sociocultural groups. Yahgan people and old residents were born in Cape Horn, while navy people and authorities, and most students and teachers, spend only two years in Cape Horn. We reanalyzed the responses of each sociocultural group, and found that the bias toward exotic flora was not homogeneous among the inhabitants of Cape Horn.

Among Yaghans and old residents, native plants were most frequently mentioned, representing eighty percent and sixty percent of their answers, respectively. In contrast, among navy people, authorities, students, and teachers, native plants were only present in approximately twenty percent of their responses. In addition, for these plants only Spanish names were given; indigenous names were completely absent. Was this absence in their responses due to a lack of knowledge, or rather to a selective preference against native plants and their indigenous names? To answer this question, we assessed the degree of knowledge about the flora of Cape Horn, by asking the following question to the interviewed persons of each sociocultural group: "Name fifteen plants that you know grow in Cape Horn."

Almost all Yahgan people and old residents named fifteen plants in their answers. In contrast, authorities, teachers, and students were able to name, on average, only ten plants; navy personnel named on average less than ten plant species. In addition, most of the ten plants mentioned were exotic species and almost half of those exotic plants do not grow in Cape Horn. Therefore, not only did they know very few plants, but were also confused about or were not aware of which plants actually grow in Cape Horn. For example, palms were mentioned by several members of the navy, despite the fact that these tropical trees do not grow at this high latitude. Pine trees were also frequently mentioned by authorities, navy personnel, teachers, and students, despite the fact that these trees are native to the temperate and boreal latitudes of the Northern Hemisphere. The frequent presence of pine trees in their answers could be due to widespread distribution of commercial plantations of Monterey Pine in central southern Chile, where many of the members of these transitory groups were born. They also frequently mentioned the emblematic monkey-puzzle tree and the national flower of Chile (copihue, *Lapageria rosea*), which are native to central-southern Chile, but do not reach Cape Horn. In summary, authorities, navy personnel, and the school community knew little about the plants of Cape Horn, and did not distinguish between this flora and the flora that grows in other parts of the country or the world. In conclusion, the absence of

plants native to Cape Horn in the imagery of transitory residents seems to be due to a lack of knowledge rather than to an informed preference for exotic species.

Under the governance of bioculturally uneducated decision makers and educators, the Yahgan students attending the school were alienated from their habitats, and language. The *upush* shrub and other native plants along with their indigenous names were absent in the answers of the teachers, as well as in the school's textbooks. Gathering *upush* leaves for medicinal tea, rushes for basketry, and mussels for food, as well as other Yahgan practices, which can take place only in native habitats, are interrupted. Consequently, a process of acculturation is generated by a school education that radically changes the habits and habitats where learning and everyday life take place; formal education ignores the Yahgan territory, culture and biota. Under this conflict between Cape Horn's biocultural identity and school culture, Yahgan children suffer in their school performance. In 2000, on average Yahgan students were two years older than their classmates. The lack of biocultural education of teachers, authorities, and decision makers not only stimulates processes of biocultural homogenization, but it also generates problems of environmental and social injustice.

The *upush* shrubs are beautiful. In addition, their grape-shaped leaves make an enjoyable medicinal tea, and the sweet fruits of these wild currants are rich in vitamin C. Yahgan people are those who know the most about the *upush* and other plants of Cape Horn. Why do they have to change their nomadic habits, and suffer within the school? Academic textbooks say that we are living in a post-colonial period, but paradoxically the evidence presented above shows that we are immersed in a wave of ultra-colonialism. Today the austral region of Cape Horn represents a last frontier, where a global cultural-economic model is taking over a set of local habits and habitats, thereby oppressing cultural traditions, subsistence economies, native biota and landscapes. Moreover, Spanish has nearly totally supplanted the indigenous Yahgan language. Similar global-local borderland situations are taking place in a plethora of indigenous, peasant, and fishermen communities in South America, and worldwide.[14] When a human population colonizes a new environment, people need to learn from the beginning about its flora, fauna, the relationships among species, and how to talk about them. As shown in the results of the interviews, recently arrived people to Cape Horn do not know the local flora nor the indigenous names and traditional forms of relations with the plants and habitats. However, recently arrived people who know less about the habitats and habits of Cape Horn have the largest impact on decision making and education in Cape Horn. Indigenous people and old residents who know most about native habitats and habits have almost no participation in decision making and education. These results suggest a mechanism for biocultural homogenization processes taking place in Cape Horn, and at other global-local borderlands.[15]

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[14] For worldwide cases, see L. Maffi, ed., *On Biocultural Diversity: Linking Language, Knowledge, and the Environment* (Washington D.C.: Smithsonian Institution Press, 2001).

[15] Ibid.

The micro-scale example of Puerto Williams leads to macro-scale understanding of biocultural homogenization taking place in many localities in Latin America and around the world. For example, in another archipelago region, Peter Mühlhäusler has shown how drastic environmental degradation on Polynesian islands often takes place at the beginning of human colonization processes.[16] Negative environmental impacts continue over time until an attunement is achieved between the "contours of language and knowledge and the contours of the environment." Mühlhäusler's perspective might help us to understand twenty-first century patterns of linguistic, cultural, and ecological degradation associated with rapid, intensive, and abrupt processes of colonization by the homogenous global urban-industrial society. A single cultural, linguistic model—"global colonialism," as it might be called—is imposed (not coevolved) on the diverse environments of the planet.

The southernmost forested region of the world does not escape this global biocultural homogenization process. Today, the temperate sub-Antarctic region of southwestern South America[17] is subjected to an economy and culture based on exotic species, which consequently generates an increasingly bioculturally homogeneous landscape. During the 1990s, Monterrey pines accounted for more than ninety percent of the milled wood exported by Chile. Textbooks used in Chilean schools between 1975 and 2005 focused on examples of flora and habitats from distant regions, mainly Europe and North America, and fewer than twenty percent of the illustrated or described examples were native. Furthermore, the textbooks made no references to indigenous botanical or ecological knowledge, and decorations in the classrooms of southern Chile were based on exotic plants and habitats, such as roses and Northern Hemisphere pine forests.[18] In this way, formal education separates the children's everyday lives and imageries from their regional ecological and cultural environments.

THE OMORA ETHNOBOTANICAL PARK EDUCATIONAL PROGRAM

Focusing on a specific "habitat" (southwestern South America), and examining the "habits" (floristic imageries and knowledge) of different "inhabitants" (Yahgans, regional authorities, navy people, teachers, and students) led to three relevant achievements. First, the detection of levels of biocultural diversity that often remain hidden behind general universal labels, such as Amerindian or Eurocentric, local or global, ecological knowledge. Second, since the end of the 1990s, an interdisciplinary team led by ecologists, anthropologists, botanists, and philosophers have simultaneously studied the habitats and habits of the people in Cape Horn. These

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[16] P. Mühlhäusler, *Linguistic Ecology; Language Change and Linguistic Imperialism in the Pacific Rim* (London: Routledge, 1995).

[17] For location of the temperate sub-Antarctic region of southern South America, see fig. 1, in Rozzi, Armesto, and Frodeman, "Integrating Ecological Sciences and Environmental Ethics into Biocultural Conservation," p. 231 in this volume.

[18] See R. Rozzi, J. Silander, Jr., J. J. Armesto, P. Feinsinger, and F. Massardo, "Three Levels of Integrating Ecology with the Conservation of Southern American Temperate Forests: The Initiative of the Institute of Ecological Research Chiloé, Chile," *Biodiversity and Conservation* 9 (2000): 1199–17.

simultaneous studies led to the detection of mismatches between the perceptions of decision makers and educators and the results of ethno-botanical surveys. The failure to recognize the importance of the shrub *upush* is just the tip of the iceberg; it is a symptom that expresses authorities' general lack of awareness about the native flora, its ecological services, and traditional ecological knowledge. Third, the former two achievements motivated researchers to become involved not only as researchers but as inhabitants of Cape Horn, interacting with the indigenous community, government authorities and institutions, and educators. These "in situ" and "in tempo" interactions led to the translation of the biocultural insights into conservation actions. Authorities, members of the Yahgan community, navy people, teachers, and researchers were motivated to implement conservation of habitats at local, and regional scales, creating the Omora Ethnobotanical Park in 1999, and the UNESCO Cape Horn Biosphere Reserve in 2005, respectively. In turn, this stimulated new development policies, ecotourism activities, and the creation of biocultural educational programs at preschool, school, and university levels.

The translation of biocultural understanding into conservation and sustainable development actions has promoted "an attunement between the contours of language and knowledge of authorities, decision makers, and educators and the contours of Cape Horn's environment." Hence, the studies of the habitat have been translated into a change in the habits, i.e., an ethical change in the inhabitants. These ethical changes in Cape Horn's habitat-habit-inhabitant ecosystem units were not motivated by normative ethical codes or international and national laws, but by a change in biocultural understanding, and concern for the well-being of the biocultural community. In this way, the ancient and integral meaning of *ethos* was reintegrated in Cape Horn.

For all the participants, the experience of direct "face-to-face" encounters (or re-encounters) with actual living beings co-inhabiting Cape Horn was essential to achieve biocultural understanding. These direct encounters generate instances, such as the silent moment of awareness at Omora Park when the Yahgan women Ursula and Cristina, the Puerto Williams' students, and the *upush* shrub were breathing together in the same habitat. It was not reading about the *upush*, or merely learning about the indigenous name and story of the *upush*; it was mainly an instance of living together. At moments like this, biocultural diversity ceases to be merely a concept and begins to be an experience and awareness of co-inhabitation with diverse living beings and life histories, which regularly remain outside the experiential domain of formal education.

In 1999, the University of Magallanes and the Omora park inaugurated a series of "field environmental philosophy" workshops and courses, which permitted authorities, and decision makers recurrently to have these experiences that fostered both biocultural understanding and concern for the well-being of human and nonhuman co-inhabitants. In Yahgan, *omora* refers to the green-backed firecrown hummingbird (*Sephanoides sephaniodes*); however, in the indigenous narratives it is seen as a bird, and at the same time a small person, a spirit who maintains

social and ecological order. Birds are perceived as distant relatives of humans, inhabitants of common habitats, and this co-inhabitation has strict social and ecological rules. For example, in order to sustain long-term flows of fresh drinkable water in Cape Horn, the Yahgan narratives underline the need of conserving the diverse communities of birds, and other animals that maintain the integrity of the vegetation, and watershed habitats.[19] The little hummingbird was appealing to the diverse parties living in Puerto Williams, and permitted them to understand how Yahgan names, such as *omora*, are carriers of cognitive and ethical dimensions of indigenous worldviews and forms of inhabitation.

To address twenty-first century biocultural conservation challenges at local, regional, and international scales, in 2005 Omora park established partnerships with the Institute of Ecology and Biodiversity, which includes research groups from several universities and study sites in Chile, and the University of North Texas, which has a leading interdisciplinary program in environmental philosophy. Through these collaborations an international research and educational program of biocultural conservation and field environmental philosophy has been consolidated.[20] Field courses foster the experience of co-inhabitation with members of all social groups of Puerto Williams community, and include students from Latin American, the U.S., and other regions. The sense of co-inhabitation demands not only experiences of direct encounters with people, plants, and other living beings in their habitats, but importantly also participating in conservation, education, or other service activities. Participants have the opportunity and duty to give back to the habitat, and only through these reciprocity actions, participants can experience an integral relation of co-inhabitation.

We thank the team of renowned ecologists and philosophers that participated in the navigation through the sub-Antarctic Magellanic archipelago, and in the workshop that originated this volume. These steps are critical in building on partnerships actions which articulate habitat-habit-inhabitant ecosystem units at local, regional, and global scales. Through direct encounters and a sense of reciprocity these partnership relations go beyond "case studies" looking forward to sustainable living together.

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[19] For an account of Omora Park and the Yahgan story, see R. Rozzi, F. Massardo, C. Anderson, K. Heidinger, and J. Silander, Jr., "Ten Principles for Biocultural Conservation at the Southern Tip of the Americas: The Approach of the Omora Ethnobotanical Park," *Ecology and Society* 11 (2006): 43, at http://www.ecologyandsociety.org/vol11/iss1/art43.

[20] See http://www.chile.unt.edu.