

CONSERVATION

EXEMPLARY CONSERVATION FINANCE INITIATIVES

CAPITAL IN THE

JAMES N. LEVITT, EDITOR

AMERICAS

CONSERVATION CAPITAL IN THE AMERICAS

Editor:

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EXEMPLARY
CONSERVATION
FINANCE
INITIATIVES

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FOREWORD

On January 19, 2009—the day before Barack Obama was sworn in as our forty-fourth president—I had the honor of speaking at the closing session of the “Conservation Capital in the Americas” conference in Valdivia, Chile, a university town some 500 miles south of Santiago. While the conference had been in the works for many months, the timing could not have been better. Chile was grappling with a number of important public policy issues surrounding how to protect its breathtaking natural endowments, while in the United States a new administration with a firm commitment to sound environmental stewardship and action on climate change was on the verge of assuming office. What an ideal time, then, for a conference dedicated to bringing together the pioneering thinkers of the conservation finance world.

The need to conserve land and preserve the planet’s natural resources is as pressing an issue as any we face today as a global community. Chile proved to be an ideal host country for a comprehensive hemispheric overview of innovative conservation finance practices. A substantial portion of its land surface is already partially protected, either as national park land or conservation areas. Chile boasts a growing commercial forestry industry that is concerned with sustainability issues, vibrant civil society groups that are dedicated to environmental conservation, an excellent university infrastructure, and a solid legal system with strong protections for property rights. In addition, Chile has an important tradition of private sector involvement in conservation issues.

Nearly 20 years ago, environmentalists in the United States and Chile teamed up to create the El Cani Reserve, Chile’s first private park and its premier forestry education project. Since then, prominent Chilean and international conservation organizations have mounted a growing number of private sector–led conservation initiatives, which include the Parque Tantauco in Chiloé, the Valdivian Coastal Reserve, Parque Pumalín, the Corcovado Reserve, Parque Chacabuco in Aysen, and Parque Natural Karukinka in Tierra del Fuego. Ecotourism based in large part on visits to these public and private reserves has become a major growth area for the Chilean economy. In short, the ground was well laid for this important conference, which thrived under the inspired leadership of Jim Levitt and Antonio Lara, the David Rockefeller Center for Latin American Studies at Harvard, the Lincoln Institute of Land Policy, and our gracious hosts at the Universidad Austral de Chile.

I have been fortunate to serve as the United States’ ambassador to Chile during a period of unprecedented environmental cooperation between our two countries. President Michelle Bachelet’s administration has demonstrated a strong commitment to environmental protection and conservation. Chile is currently exploring establishment of a legal framework for the use of the *derecho real de conservación* (real right of conservation)—a system that would provide financial incentives to private landowners taking steps to preserve and conserve natural resources on their property. In addition,

the Bachelet government is supporting the establishment of two new cabinet ministries, for both energy and the environment. The focus of the new Ministry of Energy extends beyond energy security to a diversification of energy sources, with a focus on clean, renewable sources, the raw materials for which—sun, wind, and geothermal resources—are abundant in Chile.

The new administration of President Barack Obama in the United States has also committed itself firmly to the tenets of environmental protection. Billions of dollars have been pledged to green job training programs, renewable energy research, and energy conservation initiatives under the American Recovery and Reinvestment Act. President Obama has already taken courageous steps to boost fuel economy standards and investment in renewable energy resources. His bold commitment to an 80 percent reduction in greenhouse gas emissions by the year 2050 is creating strong momentum for the development of new technologies, while also strengthening incentives for reforestation and other conservation initiatives.

At the heart of the green partnership between the United States and Chile is our bilateral Environmental Cooperation Agreement, which was put into place in 2004 in the context of the United States–Chile Free Trade Agreement. One of the most important initiatives under this agreement has been the establishment of a Sister Park Agreement between Yosemite National Park in the United States and Parque Nacional Torres del Paine in southern Chile. In May 2009 I had the pleasure of speaking at the fiftieth anniversary of Parque Nacional Torres del Paine. Set in a transitional area between the Magellanic subpolar forests and the Patagonian steppes, the Cordillera del Paine, the park's centerpiece, is a breathtaking expanse of mountains, glaciers, lakes, and rivers. Home to four distinct ecosystems, this magnificent landscape is truly a Chilean national treasure.

During the celebration, Chilean government officials and park representatives highlighted the cooperative efforts between the United States and Chile and the myriad benefits reaped by the park—improved signage and trail maintenance; ranger exchanges and training opportunities on habitat conservation and management; and English-language instruction programs designed specifically for Chilean park rangers to improve their engagement with ever-growing numbers of international ecotourists. This particular sister program has been such a success that a second agreement has recently been established between Golden Gate Park in San Francisco and the Parque Metropolitano in Santiago, Chile's capital.

International free trade agreements provide excellent opportunities for governments to work together on environmental protection and conservation, and private sector initiatives will become even more important in the coming years. Environmental protection is an issue that crosses every conceivable border. Simply stated, the Earth is our shared heritage and good stewardship of the planet and its resources is a responsibility all of us must shoulder. In times of economic or political instability, the needs of the natural world can be lost among more dramatic headlines.

While the economic challenges we face today are certainly daunting, environmental protection is every bit as important as economic reform, and we must redouble

our efforts to defend the needs of the planet. This is precisely why the conference on “Conservation Capital in the Americas” in January 2009 was such a success. In bringing together 120 of the world’s conservation finance experts to engage in dialogue and debate, share experiences, and strengthen relationships, the conference struck a blow against complacency. Participants returned to their countries re-energized and ready to meet new challenges head on. Their efforts truly hearten me—not only their own successes, but also the dedication and commitment to this cause that their work will inspire in others. As President Obama stated during his Earth Day proclamation on April 22, 2009:

We must commit ourselves to protecting our environment and ensuring the health of our planet so we may share the magnificent blessings of the Earth with our grandchildren. . . . We do this not only to acknowledge the environment’s central role in the development of our nation, but also recognize the strong ecological interdependence among nations. History has shown that as we sow, so shall we reap. Let us rededicate ourselves to a world that provides bountiful harvests for us all, not just today, but for many generations to come.

—Paul E. Simons

United States Ambassador to Chile

PREFACE

I always knew that conservation protected value.
Now I understand that conservation creates value.

—Latin American student at the conference on
“Conservation Capital in the Americas”

The history of significant advances in conservation and environmental protection, both in the United States and worldwide, is a story of ebbs and flows. In the United States over the past 150 years, we have seen opportunities arise to create landmark change in conservation and environmental policy and practice at intervals of about 30 to 40 years.

An early achievement at the national level came during and after the American Civil War, when Abraham Lincoln in 1864 created the precursor to the world’s first national park at Yosemite. Grant followed in 1872 with the creation of Yellowstone National Park, which has been an icon for the protection of natural resources ever since. The next high tide came in the 1890s and 1900s, in an era of forest protection efforts made famous by Theodore Roosevelt and Gifford Pinchot.

After a hiatus of nearly three decades, Franklin Roosevelt’s dust bowl era creation of the Soil Conservation Service and the Citizen’s Conservation Corps marked the next significant push. And it was not until the 1960s and 1970s, when Rachel Carson reawakened the nation and helped galvanize the global community into a coordinated effort to address toxic pollution that we had another cresting of policy initiatives and innovation in the practice of conservation and environmental protection.

It appears that another high tide may be upon us. Spurred into action by the Nobel Prize-winning work of the Intergovernmental Panel on Climate Change, the world—with the glaring exception of the United States and several other nations—began taking substantive action on climate change with the widespread adoption of the Kyoto Protocol in 1998. Now, as evidence of global warming becomes ever more undeniable, the international community—this time including the United States—seems once again poised to take meaningful action to secure world economic, social, and environmental security.

In his foreword, U.S. Ambassador to Chile Paul Simons notes that the day after the closing session of the conference on “Conservation Capital in the Americas,” Barack Obama was inaugurated as forty-fourth President of the United States. In his inauguration speech, the new president pledged to his nation’s partners around the world, poor and affluent, “to work alongside you to make your farms flourish and let clean waters flow; to nourish starved bodies and feed hungry minds . . . [We] can no longer. . . consume the world’s resources without regard to effect. For the world has changed, and we must change with it” (Obama 2009).

Halfway around the globe, near the beautiful Chilean city of Valdivia, conservationists from across the Western Hemisphere were, step by step and conversation

by conversation, speeding along that change. They were, at the same moment that Obama was being inaugurated, hiking through a newly preserved *alerce* forest, catching glimpses of increasingly rare and indisputably magnificent trees. As they walked among the towering evergreens, they exchanged ideas for finding new ways to protect and steward land and biodiversity—and achieve sustainable development to benefit human populations—from the forests of Tierra del Fuego to the Alaskan tundra along the Iditarod Trail.

This group had assembled for a four-day conference on “Conservation Capital in the Americas.” Attendees included, by design, a wide diversity of individuals passionate about innovating to sustain natural resources, from senior executives of global conservation groups that had completed deals protecting hundreds of thousands of hectares to first-year college students aspiring to become leading stewards of our land and biodiversity. They included people with deep experience in multilateral institutions, national governments, and city planning; very large conservation nonprofit organizations working at a global scale and tiny local land trusts; private multinational forest product companies selling plywood from China to Chicago and local cooperatives selling sustainably harvested firewood to indigenous people who use simple wood stoves.

Women and men affiliated with academic and research institutions from Lima, Peru, to Panama City and Cambridge, Massachusetts, compared notes with colleagues who had just returned from working trips to South Africa and North Carolina. In one exchange that exemplifies the significance and diversity of the gathering, Ambassador Simons conferred in an open panel discussion with Jorge Burgos, a member of the Chilean House of Deputies, and Yasna Sepulveda, a young woman from a local indigenous community, about new opportunities for advancing the practice of conservation across the hemisphere.

The focus of their conversations is the heart of this book: How do we find the financial capital—as well as the human, social, and natural capital—to steward the earth’s resources for this and future generations? Where do we find the money, the talent, and the political will to do the jobs necessary to address complex threats to wildlife and habitat and to ecosystems that provide a spectrum of essential services that sustain life?

The answers to these questions are neither simple nor uniform. Carefully crafted solutions will need to be devised to fit a dizzying array of local land ownership patterns, political contexts, and economic conditions. As the conference participants made evident through their group presentations and personal conversations, increasingly varied and impressively ingenious solutions do exist. New approaches to conservation finance, from the art of conservation dealmaking to the practice of sustainable development, are being invented and implemented around the world every day.

As noted in *El Mercurio*, Chile’s newspaper of record: “Financing conservation initiatives may sound, *a priori*, like a difficult task in ‘normal times.’ Today it seems almost titanic. . . . Still, at the conference on ‘Conservation Capital in the Americas,’ organized by Harvard University, the Lincoln Institute of Land Policy, and the Universidad Austral de Chile, conservationists looked forward with some optimism, hoping to enhance conservation finance opportunities across the Western Hemisphere” (Gutiérrez 2009).

Among the optimists were people like Marcelo Ringeling (a Chilean information technology executive), Victoria Alonso (head of the Private Lands Conservation Initiative at the Santiago de Chile office of The Nature Conservancy), and Henry Tepper (presently a vice president of the National Audubon Society based in New York), who, along with dozens of colleagues from nonprofits, law firms, multilateral institutions, and many other professional backgrounds, are members of a remarkable team creating new ways of perpetually protecting private land in Chile for conservation purposes. Ringeling has been working for several years with Alonso and Tepper to build a legal and institutional framework for private land protection that has the potential to spark a land trust movement in the southern cone of South America, which, in turn, will have the capacity and scale to meaningfully complement scattered systems of protected public lands.

Their collective dream seems to be approaching realization on several fronts. In early 2009, a committee of the Chilean legislature considered an amendment to the country's constitution that will create a new class of land tenure called a *derecho real de conservación* (real right of conservation). If established in law, this right will set an important precedent, allowing private lands to be protected from development in perpetuity in Chile in a way similar to, but not identical with, the way conservation easements are used in the United States. Furthermore, if that legal precedent is set in Chile, it may spread to other nations in South America that have civil (or Napoleonic) codes of law.

As they make progress on the legislative front, and even before the legislative initiatives are completed, the Chileans are also working to form institutions that can meet the urgent need to conserve vanishing landscapes and habitats. As Ringeling made clear in a May 2009 e-mail to colleagues he met at the conference, ongoing international input can provide substantial value during the conception and start-up of such institutions. "We are very happy," he reported, "to announce the birth of what we consider to be the first Chilean land trust, Corporación Bosques de Zapallar. On 23 May 2009, a ceremony was held in which more than a hundred and eighty local residents and dedicated naturalists showed their support for conserving Zapallar's valuable coastal habitat in perpetuity. As Corporación Bosques de Zapallar evolves, we will need your advice, creativity and brilliant ideas. We would like to thank all of you for your continued support and we look forward to discussing this important project with all of you very soon!" (Levitt 2009).

As goes Zapallar, so goes progress on conservation initiatives across the region. Each of the inventive approaches to conservation finance considered at the conference appears to have benefited from one or more of its objectives: to build capacity, to frame policy, and to disseminate innovation on conservation finance across the Western Hemisphere. How were these objectives achieved? We built capacity by networking colleagues from south to north, and across the public, private, nonprofit, and academic sectors. Limited development experts from Cornell University were able to link up with proponents of sustainable development initiatives from California to Patagonia. The exchange of expertise and fresh insight went in multiple directions. With the enthusiasm and curiosity of students from such varied places as the universities of Maine, Montana, Oxford, and Austral de Chile added to the mix, conversations continued late into the night.

We framed policy by helping decision makers from across the region understand the art of the possible. When Matt Zieper of the Trust for Public Land presented the legislative history and on-the-ground impact of the Community Preservation Act in Massachusetts, he launched a discussion of all sorts of ideas regarding the creative use of property taxes. Likewise, when Hermilio Rosas described the extraordinary cultural and ecological resources that are to be used as foundations for sustainable development at the Caral archeological site near Peru's Pacific coast, colleagues wondered how they might assemble similar resources in their own countries.

We disseminated innovation principally through the presentation and discussion of the case analyses that form the basis of this book. They are organized in pairs, with a case from both North America and Latin America presenting each of the book's seven topics.

- In Part I, Antonio Lara, dean of Forest Sciences at the Universidad Austral de Chile, and David Foster of the Harvard Forest offer overviews of several salient conservation achievements accomplished to date, as well as insights into the grand conservation challenges that lie ahead in their respective countries.
- Part II focuses on conservation finance initiatives related to taxation and tax benefits that yield new sources of financing for land and biodiversity conservation. Matt Zieper offers a concise accounting of the emergence of the precedent-setting Massachusetts' Community Preservation Act, which can be adopted on a town-by-town basis by local voters, placing a surcharge on real estate transfers. The locally raised money can be matched in part by the state and must be used to conserve land, build affordable housing, and fund historic preservation. Henry Tepper and Victoria Alonso report on their work to enact an amendment to the Chilean constitution creating the *derecho real de conservación*. Along with a parallel provision that may offer tax benefits for the donation of such a land protection right, this legislation would likely open the way for widespread private land conservation throughout the country.
- Part III is dedicated to the topic of limited development. Jeff Milder of Cornell University presents a comprehensive overview of how this practice is evolving and being realized in Colorado and throughout the United States. Hermilio Rosas and José Gonzales follow with a fascinating view of how they are striving to bring to life a highly ambitious limited development plan focused on the Caral archeological site—one of the very earliest sites of civilization in the entire hemisphere—located in Peru's Supe River Valley.
- Part IV examines the role of efforts to finance sustainable development at the level of micro-, small-, and medium-sized enterprises. Deidre Peroff and I look at the rapid spread in the use of "eco-palms" to celebrate Palm Sunday in churches in nearly every state in the United States. This achievement was made possible by an inventive marketing effort supported by the University of Minnesota and church service groups, with financial support from a commission created in connection with the North American Free Trade Act (NAFTA). Brian Milder then offers a care-

fully crafted look at the successful effort of Root Capital, where he is director of strategy and innovation, to finance the use of environmentally friendly technologies and professional practices in the Galápagos Islands—a region where long-term sustainability of ecotourism operations is an economic necessity.

- Part V is dedicated to what is becoming known as conservation investment banking—that is, the practice of using sophisticated investment banking techniques to fund conservation initiatives. Greg Fishbein, based at The Nature Conservancy's international headquarters in Arlington, Virginia, does a wonderful job of describing the ups and downs of pursuing a complex financial transaction in his chapter on "Rafting in Valdivia," which describes the dealmaking creativity behind the creation of the Valdivian Coastal Reserve in Chile. Following that is Kim Elliman and Peter Howell's fascinating, in-depth look at the creative process that informs the conservation lending programs at the Open Space Institute in New York.
- Part VI examines the financing of projects that sequester carbon from the atmosphere in the trees and soils of forests across the hemisphere. Now recognized as a key ecosystem service, forest carbon sequestration was pioneered in Latin America by Conservation International (CI) and its partners, as described by Ben Vitale of CI headquarters in Washington, DC, and Luis Suárez and Tannya Lozada, both of whom have worked for CI out of Quito, Ecuador. Laurie Wayburn's account of the Van Eck Forest Project in California, realized by the Pacific Forest Trust, documents a critical and precedent-setting effort, the ramifications of which are still being registered in state and national legislatures in the United States and beyond.
- Part VII looks at the critical role played by noncarbon ecosystem service financing from the U.S. coast of Virginia to the Monteverde highlands of Costa Rica. Shannon Meyer, who authored both chapters, first describes the work of Ecosystem Investment Partners in reclaiming a keystone inholding in the Virginia section of the Great Dismal Swamp, an area first drained of its water resources by a group of adventurers that included George Washington. She also presents Costa Rica's groundbreaking experiment in working with small and large landowners to keep their highly biodiverse forests intact to preserve habitat for the nation's amazing diversity of flora and fauna, reduce erosion that might otherwise end up at the bottom of a hydroelectric reservoir, and maintain water quality and quantity in upland watersheds.

These chapters do not entirely capture the breadth of thought and the depth of entrepreneurial enthusiasm present at the conference. For example, a future case writer will need to chronicle the growing impact of the sustainable firewood initiative spearheaded by René Reyes, vice president of the AIFBN (Agrupación de Ingenieros Forestales por el Bosque Nativo) in southern Chile. And only time will tell which of the several sustainability efforts now being undertaken by forest product companies, such as the native nursery project described at the conference by Jaime Rodríguez of MASISA, will prove to meet the five criteria for landmark conservation innovation—novelty, strategic significance, measurable effectiveness, transferability, and an ability to endure.

What we do know, however, is that a rich store of human capital intrigued with the idea of conservation finance is emerging from colleges and universities located in every corner of the hemisphere. The next generation of conservation professionals active in the Americas was represented by nearly three dozen university students who attended the conference. For example, Jude Wu, a master's candidate in Yale University's School of Forestry and Environmental Studies, presented her novel concepts in a paper titled "Using the CDFI Model to Envision the 'Ultimate' Conservation Finance Intermediary." Her essay was designated as the most outstanding submitted by a North American student for the conference. Bernardo Peredo, a Bolivian national now studying for a master's degree at Oxford University, summarized his paper on "Indigenous Territories, Ecosystem Services, and Conservation Finance in Bolivia," designated as the most outstanding of the South American student submissions.

The energy such student participants added to the conference was, as one of the professionals in attendance put it, "the secret sauce" that kept the level of focus and the sense of potential so high. By the third day of formal sessions, it was clear that some of these young people will indeed follow through to initiate conservation projects that will create lasting value.

Their doing so is nothing less than imperative. The twenty-first century must be the one in which we turn the corner on sustainability, creating value on a global basis that we can be confident will support both wildlife and human life on this planet in perpetuity. Our dreams, our deals, and the laws we live by must keep that fundamental aspiration in focus. For, as Abraham Lincoln (1861) said in his first inaugural address, "Perpetuity is implied, if not expressed, in the fundamental law of all national governments."

We offer this volume in the hope that at least some of the ideas and on-the-ground initiatives considered in Valdivia do advance the world toward the perpetual stewardship of landscapes, ecosystems, and ecosystem services upon which future generations will depend.

REFERENCES

- Gutiérrez, N. 2009. En buenos tiempos y en los otros: Siempre hay recursos para la naturaleza. English trans. M. Renteria and J. Levitt. *El Mercurio* (20 January). <http://diario.elmercurio.cl/detalle/index.asp?id={f459fbbb-ed9d-412e-b5e7-454c3e7abefd}>
- Levitt, J. 2009. New publications from the conference on Conservation Capital in the Americas. *Conservation Innovation Update*. <http://harvardforest.fas.harvard.edu/research/pci/second2009.pdf>
- Lincoln, A. 1861. First inaugural address (March 4). In *Abraham Lincoln: Speeches and writings, 1859–1865*. New York: Library of America, 217.
- Obama, B. 2009. *The inaugural address*. New York: Penguin, 11.

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First, I acknowledge the principal organizational sponsors for their generosity, time, energy, and patience. Antonio Lara and his team at the Universidad Austral de Chile provided the conference participants and the contributors to this book with enthusiastic professional collaboration, a strikingly beautiful venue, and ample logistical support for all of our efforts. The rector of the university, Victor Cubillos; the university’s director of research and development, Ernesto Zulemzu; the university’s director of public relations, Francisco Morey; and the conference staff headed by Brenda Roman all made sure that we always headed down productive paths of investigation and that we were exceptionally well taken care of on our travels in preparation for and during the conference.

Armando Carbonell and Lisa Cloutier at the Lincoln Institute of Land Policy have been stalwart supporters, offering essential direction for both the conference and the book. Indeed, the Lincoln Institute has supported the bulk of my activities in the field of conservation finance and innovation for nearly a decade. Thanks to Gregory K. Ingram, the Lincoln Institute’s president, and to all the Institute staff for their confidence in this line of inquiry.

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My home base for work on conservation innovation and for the Conservation Finance Forum is the Harvard Forest. The director, David Foster, is a conservation visionary. He and his collaborators on conservation science and policy, including the entire team of Petersham Globetrotters, are carving out a new direction for the conservation community across New England and beyond. His consistent interest in conservation policy, unique insights into conservation history, and generous support of inquiries into conservation finance have been foundational for this effort.

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Special kudos to Katherine Birnie, Story Clark, Anna Milkowski, Brian Shillinglaw, and Matt Zieper, all of whom helped recruit students applying for conference scholarships and then with the selection of winners from an impressive field based on the quality of their submitted essays. As described by Zieper in a postconference letter to Harvard University President Drew Gilpin Faust, “the engaged, passionate participation of the two dozen college and graduate students” added a special spark of inquiry and enthusiasm for conservation and sustainable development to the gathering.

Two people who have most closely assisted me in bringing the conference and book into being are my research assistants: Deidre Peroff in the early stages of the project planning; and Lizzie Reardon, who took responsibility for uncounted details in implementing the conference. I look forward to seeing them both as highly competent professionals in their chosen fields.

My family has in many ways contributed to this book, from the patience shown by my wife, Jane, and children Will, Dan, and Laura during my deep dives into work, to the wonderful enthusiasm offered by my father-in-law Bert Berkley and sister-in-law Janet Dubrava. Jane, Bert, and Janet literally went so far as to travel to Chile to participate in the conference. Their presence added enormously to the high spirits at the event.

Several copy and production editors have overseen preparation of manuscripts used in the conference, and now in this book. Shannon Meyer is author of two chapters, cat herder of her fellow authors, and an editor of the manuscripts of the case study versions used at the conference. Dottie Williams was a great help in reformatting and re-editing the chapters as they were prepared for submission to the Lincoln Institute. Ann LeRoy, senior editor and director of publications at the Lincoln Institute, has been, as always, both gracious and appropriately insistent on high standards as the book has been prepared for publication. Brian Hotchkiss and Peter Blaiwas at Vern Associates, who as final copy and production editors and designer expertly piloted the book to its completion, are both gentlemen and scholars. I extend to all of you my appreciation for your thoughtful collaboration.

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ways. You are defining the future of conservation finance innovation in the Americas. I am honored to work with all of you.

My work on this book is dedicated to Thomas W. Levitt. Tom's enormous passion for the urban and rural places where he worked, his unwavering commitment to his community, and his profound love of family have left us with a lasting legacy, on the ground and in our hearts. We will do our best to follow your lead, brother.

—James N. Levitt
Waverley, Massachusetts
September 2009

PART I THE CHALLENGE

TO THE CONSERVATIONISTS WHO FILL THEIR DAYS WITH EFFORTS TO ATTRACT

the resources necessary to realize ambitious land and biodiversity conservation projects, the terms *conservation finance* and *conservation capital* are relatively familiar. To the rest of the world, they may need definition. Blair Braverman, one of the students who won a scholarship to attend the Valdivia conference, explained the terminology barrier in a blog entry she wrote at Colby College (Braverman 2008):

A few weeks ago, the Environmental Studies and Bio departments sent out an announcement about an essay contest. The winner of the contest would receive an all-expenses-paid trip to attend the Conservation Capital in the Americas conference this January in Valdivia, Chile, and I decided immediately that I wanted to enter. All I had to do was write a six-page paper describing an innovative example of conservation finance—how hard could it be?

Pretty darn hard, it turned out. To start out with, I couldn't for the life of me figure out a working definition of *conservation finance*. I had never heard the term before, Google and Wikipedia were not living up to my expectations, and even my professors gave me somewhat conflicting explanations. At last I decided to assume that conservation finance meant the same thing as financing conservation, and took my research from there.

Blair got it right. Her definition essentially mirrors one arrived at by a group of conservation professionals convened by the Lincoln Institute of Land Policy in Cambridge, Massachusetts. In recent years this group has met and exchanged ideas regarding the most innovative forms of conservation finance—that is, the ways and means practicing conservationists use to finance conservation projects and bring new sources of capital into the conservation field.

The first round of this research resulted in a book that focused on innovative ideas in conservation finance emerging in about 2004 to 2005 in the United States. That volume, *From Walden to Wall Street: Frontiers of Conservation Finance* (Levitt 2005)—along with books by Story Clark (2007), Bill Ginn (2005), Kim Hopper and Ernest Cook (2004), and Mike McQueen and Ed McMahon (2003)—has become a standard resource at the growing number of colleges and universities offering coursework on conservation finance, as well as among field practitioners charged with finding capital to pay for their ambitious land, water, and biodiversity conservation initiatives.

As in all fields in which creativity is at play, however, our understanding of what conservation finance and conservation capital are takes somewhat different forms as settings vary. As Jeff Milder pointed out to me during the conference on “Conservation Capital in the Americas,” a number of relevant forms of capital are required to pursue and complete a conservation project in general, and the financing of such a

project specifically. Financial capital is certainly among them. But successfully completing a conservation project and its financing also requires natural capital (the natural resources that we value so highly that we want to conserve them); social capital (the factors that help to make coherent and durable the group that works diligently, often over long periods of time, to complete a conservation initiative); and human capital (the skills and knowledge gained through education and experience that enable conservationists to do their jobs).

Moreover, the context in which conservation finance practitioners work shifts over time. That context, in two different nations on two different continents, is the focus of the chapters in part I. The challenge and opportunities faced by conservation dealmakers differ greatly today from what they were only twenty years ago. In Chile, as explained by Antonio Lara and Rocío Urrutia in chapter 1, conservationists are faced with the challenge of scaling up areas of conserved land in the more densely developed central and northern sections of the country so that they may someday compare with the substantial areas of land already set aside in southern regions. These conservation practitioners are now able to look for both public and private sources of capital. Indeed, Chilean private conservation and the use of private funds to finance conservation have blossomed in the past decade. As Lara and Urrutia explain, Chileans increasingly understand the potential role of ecosystem service markets to help finance conservation of landscape-scale projects at the southern tip of South America. The authors conclude that the use of such markets could have an important impact on the scope and scale of conservation activities in the country in years to come.

Focusing on New England, in chapter 2 David Foster explains how forests in that region of the United States have experienced a renaissance over the past century. Responsible in part for that remarkable greening are a number of conservation financing tools first used there, such as allocation of public funds for regional parkland acquisition by the Metropolitan Park Commission in Massachusetts in the 1890s; the protection in the 1950s of land with high ecological value along the New York–Connecticut border by The Nature Conservancy; the donation of conservation easements to a land trust, yielding a federal charitable tax deduction, a practice pioneered in the state of Maine in the 1970s; and, in the 1980s and 1990s, the deployment of funds from the federal Forest Legacy Program in the Northern Forest, which stretches from New York State’s Adirondack Mountains into the New England states of Vermont, New Hampshire, and Maine.

One of the challenges Foster points out is that the historic reforestation of New England began to reverse itself in the last decades of the twentieth century. Without concerted effort by the present generation, the gains may be forever lost

to a wave of development that will be very difficult to reverse. Foster takes heart from the efforts of woodland councils and other collaborative efforts that experiment with new financing techniques, such as the aggregation of small forest parcels into larger conservation packages. These projects may be more readily financed through traditional sources, such as Forest Legacy Program funds, as well as emerging funding sources of interest such as the ecosystem service markets noted by Lara and Urrutia. While it is not yet clear which of these financing sources will prove to be the most significant, it is evident that as the challenges proliferate, so will the efforts of innovators to address them.

REFERENCES

- Braverman, B. 2008. Chile, baby! *Inside Colby* (November 22). www.insidecolby.com/blogs/index.php
- Clark, S. 2007. *A field guide to conservation finance*. Washington, DC: Island Press.
- Ginn, W. 2005. *Investing in nature*. Washington, DC: Island Press.
- Hopper, K., and E. Cook. 2004. *Conservation finance handbook*. San Francisco: The Trust for Public Land.
- Levitt, J. 2005. *From Walden to Wall Street: Frontiers of conservation finance*. Washington, DC: Island Press.
- McQueen, M., and E. McMahon. 2003. *Land conservation financing*. Washington, DC: Island Press.

THE GROWING SIGNIFICANCE OF CONSERVATION

The Chilean Experience

Antonio Lara and Rocío Urrutia

Chile has a very diverse climate and occupies a long, narrow strip of South America between the summits of the Andes Mountains on the east and the Pacific Coast on the west. It extends for more than 4,000 kilometers, reaching the southern tip of the continent. The northern and central parts of the country (18 degrees to 35 degrees latitude South, or 18° S–35° S) are characterized by desert and semiarid regions dominated by barren lands, shrublands, and grasslands, with a high degree of biodiversity and endemism. Over the past three centuries, human activities have had a heavy impact on this area, and it is here that the nation's population, economic activity, and irrigated agriculture are concentrated.

Further south, greater rainfall and the occurrence of forests give rise to the Valdivian rainforest ecoregion of Chile and adjacent areas of Argentina (35° S–48° S). The Global 200 initiative launched by the World Wildlife Fund (WWF) and World Bank has classified these unique ecosystems as having among the highest conservation priority worldwide (Olson and Dinerstein 1998). The high conservation value and importance of these forests is due to their high degree of biodiversity and endemism, as well as to the threats to them by human activities. Among the most impressive of the species living in this forest are long-lived trees such as the *alerce*, or *Fitzroya cupressoides*, which may live over 3,620 years (Lara and Villalba 1993). Currently, the main threats faced by forests in the ecoregion are human-set fires, land clearing for agriculture and pastureland, high grading, unsustainable logging, and conversion to plantations of fast-growing exotic species, such as *Pinus radiata* and *Eucalyptus* spp. (Echeverría et al. 2006; Lara, Reyes, and Urrutia 2006).

Still farther south, southern Patagonia (48° S–56° S) is dominated by islands, fjords, lakes, forests, grasslands, ice fields, and barren lands. Although this large, remote area has remained mostly pristine, its ecosystems are of high conservation value and face various threats, such as the expansion of salmon farming and the introduction of enormous hydroelectric projects that are now being planned.

The Chilean economy depends on the extraction and export of natural resources through activities such as mining, agriculture, plantation forestry, fisheries, and aquaculture. As these industries continue to grow in the context of long-term export demand, Chilean conservationists face significant challenges to find innovative approaches to make development and conservation compatible.

Given this context, our purpose in this chapter is to provide a description of some significant progress achieved in recent years by public and private sector conservation organizations in Chile. Our focus is south-central Chile and Patagonia (35° S–56° S). We also describe ecosystem services as an outstanding opportunity for conservation in Chile.

PROGRESS AND CHALLENGES FROM THE PUBLIC SECTOR

Among the most important advances in Chilean public policy regarding conservation was the government's ratification of the Convention on Biological Diversity in 1994. In December 2003 the Comisión Nacional de Medio Ambiente (National Commission on the Environment, or CONAMA) approved the National Biodiversity Strategy. The strategy specifies that "actions shall be proposed towards the long-term survival of the representative biodiversity at the ecosystem, species and genetic levels, beginning with the protection of at least 10 percent of the surface area of each of the most relevant ecosystems before the year 2010" (Gobierno de Chile, Comisión Nacional de Medio Ambiente 2003).

In 2005, the Chilean government took a further step to conserve the nation's natural resources by establishing a National Policy on Protected Areas that acknowledges the need to identify a national system of terrestrial and aquatic protected areas, owned and managed by public and private organizations, that adequately represents the biological and cultural diversity of Chile. Significant areas in southern Chile are protected by the state and by private interests (figure 1.1).

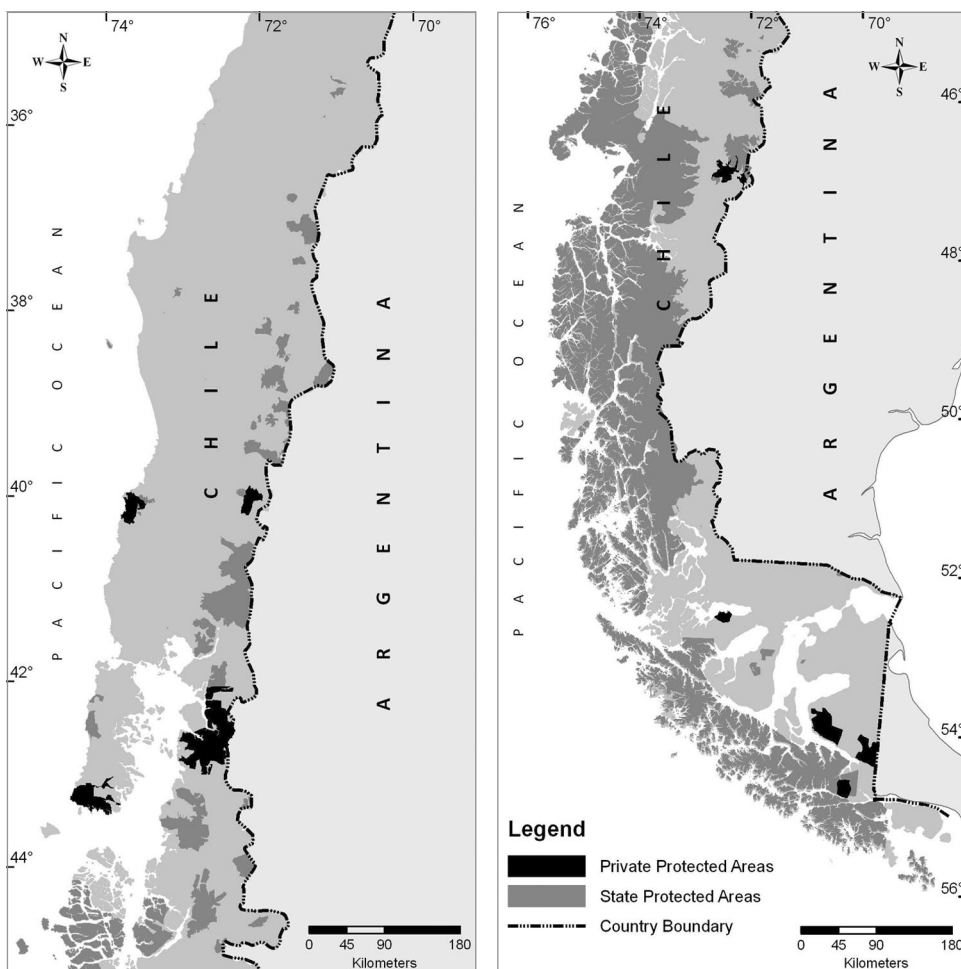
The National System of Public Protected Areas (SNASPE) encompasses 14.3 million hectares (35,336,070 acres, or 14,300 square kilometers), representing nearly 19 percent of Chile's total land area of 75,609,600 hectares. Most of the protected area is located in the southern portion of the country, between 44° S and 56° S, including administrative Regions XI and XII (figure 1.2). Almost 50 percent of that territory is included in SNASPE. By comparison, only 5 to 10 percent of the land area of northern Chile (18° S–26° S, including Regions I, II, and III) is within SNASPE. In central Chile (29° S–36° S, including Regions IV, V, VI, VII, and M), less than 1 percent of the land area is included in SNASPE.

In order to meet the goal of protecting 10 percent of representative plant communities, which is used as an available indicator of biological diversity, on a regional basis (excluding privately protected lands), some 5 to 15 percent of additional public land would need to be protected in the southernmost administrative regions. In northern Chile, an additional 30 to 50 percent would need to be protected. In central Chile, to reach the goal of protecting 10 percent of relevant ecosystems in each of the nation's

**FIGURE
1.1**

DISTRIBUTION OF PUBLIC AND LARGE PRIVATE PROTECTED AREAS ($\geq 35,000$ HA) IN CHILE SOUTH OF 35° S

Source: Squeo (2003).



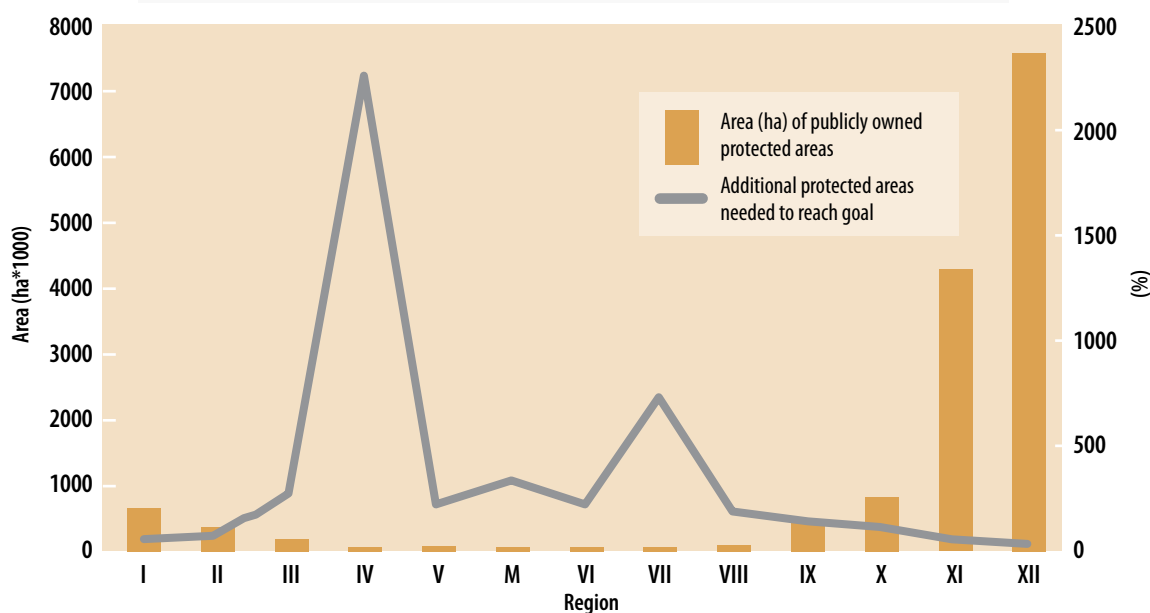
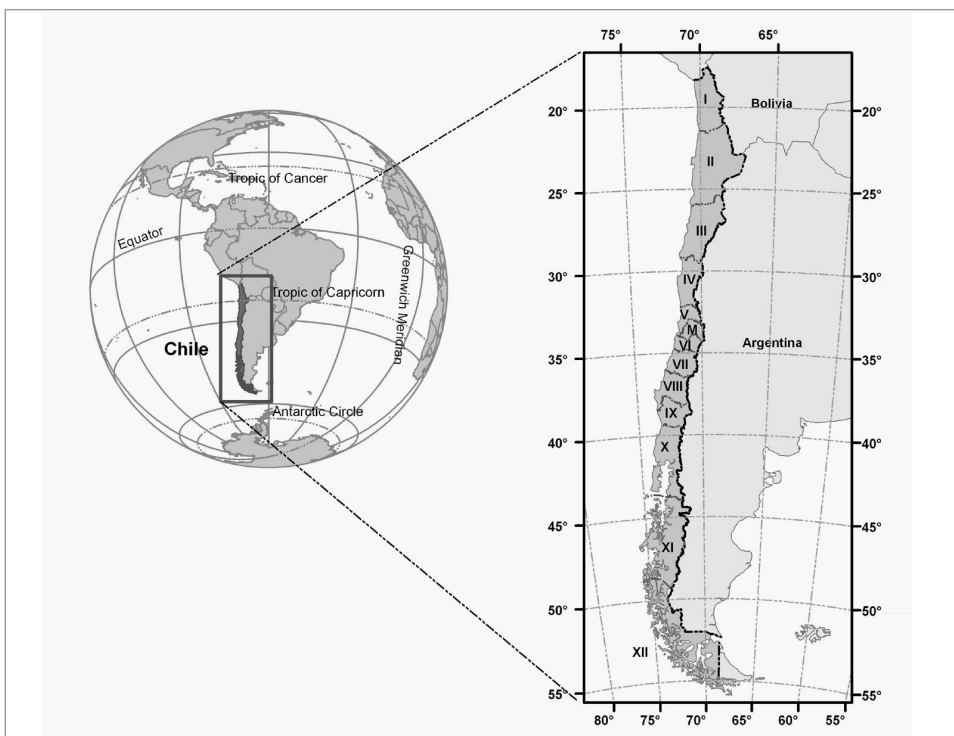
regions, the amount of protected land would need to be increased dramatically—by a multiple of 23 times in Region IV (Squeo 2003), for example. In short, a much more balanced land protection strategy would have to be implemented across all of Chile’s regions in order to achieve a nationwide goal of increasing protected lands by 3.3 million hectares.

The encouraging news is that, building on the national strategy, conservation progress has continued to be recorded in the last several years. Recent progress includes creation in 2007 of the Corcovado National Park, which encompasses nearly 300,000 hectares ($43^{\circ} 11' \text{ S}$ – $43^{\circ} 77' \text{ S}$), and the establishment of two new UNESCO Biosphere Reserves—at Cape Horn in 2005, and in the temperate rainforest region of the southern Andes in 2007. The southern Andes project is a binational initiative that includes an area of 2.2 million hectares in Chile and 2.3 million hectares in Argentina.

FIGURE
1.2

THE NATIONAL SYSTEM OF PUBLIC PROTECTED AREAS (SNASPE) AND ITS REPRESENTATION GAPS

Source: Squeo (2003).



Bars indicate area (ha) of publicly owned protected areas (SNASPE) in each administrative region of Chile (shown on map at top). The solid line shows additional protected areas needed to reach the goal of 10 percent of each plant community per region. Region X includes Region XIV, created in 2007.

Additional progress has been made in the implementation of three Global Environment Fund projects, funded with a total of \$70 million for the 2005 to 2013 period. This amount includes cofinancing and cooperation from both public and private organizations in Chile. These projects are focused on the creation of an integral system of protected areas in Chile, the conservation and sustainable use of the temperate Valdivian rainforests, and the conservation of coastal marine ecosystems.

Probably the most important progress in conservation policy was the enactment of the Native Forest Law in July 2008, after 16 years of discussion. This law provides economic incentives to landowners who practice sustainable forest management and conservation. The multistage incentives to landowners will amount to between \$77 and \$300 per hectare, which will be paid for conservation activities in forests of high ecological value, planting of native species in open areas, recovery of degraded forests, control of invasive species, and fencing. After an initial implementation phase, the effectiveness of this law to promote on-the-ground conservation will need to be evaluated.

NEW PROTECTED AREAS: THE BOOM IN PRIVATE SECTOR AND NGO CONSERVATION EFFORTS

The establishment in 1997 of Parque Pumalín (317,000 hectares) by Douglas Tompkins, a citizen of the United States, has been widely covered by the media in Chile and the United States. The park contains some of the most beautiful ecosystems and landscapes in southern Chile. While it may be the best known of the private protected areas, Pumalín is only the tip of the iceberg. Chile has witnessed a dynamic process of creation of privately owned reserves in the last 10 years, resulting in the conservation of some 500 protected areas encompassing a total of 1.5 million hectares. Individuals own 66 percent of these areas (Sepúlveda 2006).

Ten of these areas, ranging in size from 35,000 to 317,000 hectares, are concentrated south of 40° S and cover approximately one million hectares (see figure 1.1). Individuals and small groups own many of the other areas, which were created between 1997 and 2005 and range in size from a couple of hectares to a few thousand hectares. As shown in figure 1.3, the number of acres protected by private individuals, private groups, and NGOs steadily increased between 1997 and 2005 (Lara, Reyes, and Urrutia 2006).

Many of the largest privately conserved areas have been protected by international NGOs, such as The Nature Conservancy and the Wildlife Conservation Society, as well as by Chilean foundations, which are generally linked to large corporations and holding companies.

A preliminary assessment of private-area costs from available data indicates that acquisition costs ranged between \$294 and \$409 per hectare for small areas of between 700 and 1,000 hectares.¹ Per hectare costs for larger reserves were relatively lower (e.g., \$126 for a 60,000-hectare reserve). Annual operating costs ranged between \$9.30 and \$18.90 per hectare for small reserves to between \$1.50 and \$24 per hectare for larger protected areas (see figure 1.4). The high value is probably explained by the large amount invested in research included in that figure.

¹ Unless otherwise noted, amounts indicated with a dollar sign (\$) refer to United States dollars.

FIGURE
1.3

**ACCUMULATED AREA WITHIN PRIVATE PROTECTED AREAS
CREATED BETWEEN 1997 AND 2005, INCLUDING ONLY AREAS
LARGER THAN 35,000 HA SOUTH OF 40° S**

Source: Lara, Reyes, and Urrutia (2006).

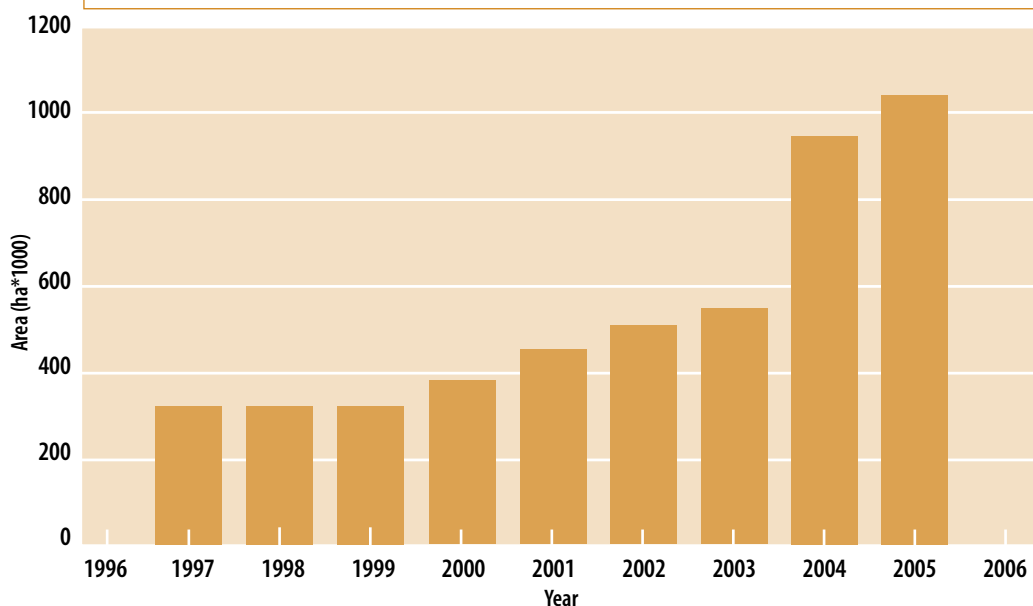


FIGURE
1.4

INVESTMENT IN PRIVATE PROTECTED AREAS

Sources: Personal communications with P. Troncoso, L. Pezoa, B. Saavedra, C. Little, Fundación Huinay Annual Report.

Area (ha)	Acquisition Cost (\$/ha)	Operating Costs (\$/ha/year)
Small		
700	294	18.90
1,000	409	9.30
Large		
35,000	126	24.00
60,000		5.20
300,000		1.50

As a comparison, the annual operating cost per hectare in the public protected areas that are part of SNASPE ranged from \$25 to \$36 in the central Chilean Regions IV, V, Metropolitana (M), and VII, where the total protected area per region ranges from 13,000 to 38,000 hectares. Funds spent in the operating costs of public protected areas south of 40° S decrease to \$0.27 to \$1.88 per hectare per year in regions where the total protected area fluctuates between 800,000 and 7.5 million hectares (Corporación Nacional Forestal [CONAF] personal communication).

While quite valuable, the large private protected areas in Chile are concentrated south of 40° S. They therefore contribute little at present to efforts to balance conservation efforts across the nation by addressing the insufficient protection of biological diversity in central and northern Chile.

Another shortcoming of the private protected areas is that they lack a legal framework that secures their protection in perpetuity. Furthermore, few economic incentives

exist for the acquisition or management of privately protected lands other than land tax exemptions applicable to some forested lands. This situation continues despite Law 19300, passed in 1994, which declares that the state will promote and encourage the creation of private protected areas. An important change was the approval in 2008 of the Native Forest Law, which provides that forest owners within and outside private protected areas may apply for incentives and be selected on a competitive basis for both management and conservation incentives.

A new initiative is now under way to develop and pass a law in Chile that would allow private landowners to put a *derecho real de conservación* (real right of conservation) on designated lands to secure the perpetual protection of that land. The effort, which has been under way since 2008, is being advanced by a group that includes private businesspeople, public administrators, Chilean legislators, representatives of NGOs, and lawyers. The law will mandate an amendment to the Chilean Constitution, thus requiring a broad consensus in Congress in order to pass.

ECOSYSTEM SERVICES: AN OUTSTANDING OPPORTUNITY FOR CONSERVATION IN CHILE

Ongoing research in Chile has started to demonstrate the importance of native forests in the provision of ecosystem services that directly or indirectly benefit society. Such benefits include water supply, tourism and recreational fishing opportunities, and the maintenance of soil fertility (Lara et al. 2003; Nahuelhual et al. 2007; and Lara et al. 2009). Degradation of ecosystem services in different regions of the world can be explained by the fact that they have not been adequately quantified and, in most cases, they lack a market price (Costanza et al. 1997; Nahuelhual et al. 2007; and Lucke 2008). Progress in the quantification and economic valuation of ecosystem services will allow their value to be considered in decision making regarding conservation and management of forests and other ecosystems within and outside of protected areas.

A research project was launched in 2002 to quantify water supply and recreational fishing ecosystem services provided by native forests in southern Chile (39° 50' S–42° 30' S). Lara et al. (2009) document a positive correlation between native forest cover in the watersheds and the runoff coefficient in the dry season (summer) as well as a negative correlation between this coefficient and percentage of exotic plantations. Both the positive and negative correlations are statistically significant. A mean increase of 14.1 percent in total summer stream flow (as an indicator of water yield) was estimated for every 10 percent increase in native forest cover in the watershed. The opposite was true for every 10 percent decrease in native forest.

The analysis of stream flow changes between two paired watersheds dominated by native second-growth *Nothofagus* stands, one thinned with 35 percent of basal area removal, and a control without intervention, showed that the thinned watershed had a 19.7 percent increase in annual stream flow and a 40 percent increase during summer. This indicates the compatibility between water yield and timber production in forests that are adequately managed through thinning.

Finally, the assessment of recreational fishing opportunities as an ecosystem service based on measurements of trout abundance indicates a 14.6 percent increase in trout abundance for every 10 percent increase of native forest cover in 1,000 × 60 meter buffers along streams, shown by the significant positive correlation between both variables (Lara et al. 2009).

Other studies have estimated the economic value of recreational opportunities and drinking water supply as forest ecosystem services in Chile, using methods such as travel cost and production function, respectively. These studies estimated a value of \$1.60 to \$6.30 per hectare per year for recreation opportunities, when all the area of a national park is considered. When only the intensively used areas of the national park are considered, the economic value is in the range of \$35 to \$178 per hectare per year, which compares favorably to operating costs of \$1.50 to \$9.30 required to maintain relevant ecosystem services in the area (figure 1.5).

The value of drinking water supply as an ecosystem service was estimated as \$61 to \$162 per hectare per year for a watershed that provides water to Valdivia City. The high-

est value corresponds to the summer period, when the stream flows decrease (Nuñez, Nahuelhual, and Oyarzún 2006). These values also compare favorably with estimated operating costs. Such comparisons suggest that the estimated values of these services are greater than the operating costs. If a payment system for the ecosystem service values were established,

it could cover operational costs and, in the case of drinking water, may provide extra resources for conservation.

This evidence regarding the economic value of ecosystem services provided by native forests may change societal preferences toward the conservation of these forests. It should also promote the establishment of new protected areas and the promotion of sustainable management practices in timber production areas. We expect that assessments and economic valuations of ecosystem services provide the basis for the establishment of a system of payment for ecosystem services (PES), which would involve the government, private suppliers of ecosystem services, and the users or consumers of the ecosystem service benefits produced.

**FIGURE
1.5**

ESTIMATED ECONOMIC VALUES FOR DIFFERENT ECOSYSTEM SERVICES COMPARED TO OPERATING COSTS OF PRIVATE PROTECTED AREAS

Sources: ¹ Nahuelhual et al. 2007; ² Nuñez, Nahuelhual, and Oyarzún (2006).

Ecosystem goods and services	Economic value (\$/ha/year)	Operating costs (\$/ha/year)
Maintenance of soil fertility ¹	26.30	18.90–24.00
Recreation opportunities ¹	1.60–6.30 (entire park)	1.50–9.30
	35.00–178.00 (intensive use areas)	
Drinking water supply ²	61.00–162.00	

CONCLUSIONS AND RECOMMENDATIONS

Significant progress has been made in the field of conservation in Chile in the last decade. The nation's government has made important progress on devising a land and biodiversity conservation strategy, in accord with Chile's ratification of the Convention on Biological Diversity, and that work is ongoing. The approval of the Native Forest Law in 2008 is another important achievement that is expected to have a positive impact on the conservation of working lands in this nation. Private individuals, small private groups, corporations, and foundations, as well as large, multinational NGOs, also have made notable progress in creating a large new set of private protected areas.

As interest and activity have grown over time, we have seen continued growth in the human, natural, and financial capital devoted to building a framework for the perpetual protection of private land in Chile. The work of the taskforce striving to establish the *derecho real de conservación* could be of particular significance to the future of conservation in Chile.

Significant progress has also been achieved in the effort to quantify and put an economic value on the ecosystem services provided by native forests in Chile, although a policy promoting the establishment of a system for the PES has not yet been designed or implemented.

We recommend that efforts to establish legal frameworks for the private conservation of land and for the establishment of PES systems be supported, and that appropriate legal changes be made. We also recommend that the government intensify its effort to include a fully representative sample of important ecosystems in its protected areas, especially in central and northern Chile. Further progress is necessary to define conservation goals and protection strategies for rivers, lakes, estuaries, fjords, and other coastal marine areas that are threatened by hydroelectric and salmon farming developments.

It is important that we continue to improve our understanding of how to sustain ecosystem services in a way that is compatible with the continued rapid growth (as high as 15 percent per annum) of the salmon farming, tourism, and forestry industries, as well as the projected rapid growth of hydroelectric capacity in southern Chile. Research on the scope, scale, and economic valuation of ecosystem services in Chile should inform decisions regarding natural resource utilization, helping to build an increasingly strong bridge between conservation and development.

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REFERENCES

- Costanza, R., R. D'Arge, R. De Groot, S. Farber, M. Grasso, B. Hannon, K. Limburg, S. Naem, R. O'Neill, J. Paruelo, R. Raskin, P. Sutton, and M. Van den Belt. 1997. The value of the world's ecosystem services and natural capital. *Nature* 387: 253–260.
- Echeverría, C., D. Coomes, J. Salas, J. M. Rey Benayas, A. Lara, and A. Newton. 2006. Rapid deforestation and fragmentation of Chilean temperate forest. *Biological Conservation* 130: 481–494.
- Gobierno de Chile, Comisión Nacional de Medio Ambiente. 2003. National Biodiversity Strategy of the Republic of Chile. (December). www.cbd.int/countries/?country=cl
- Lara, A., C. Little, R. Urrutia, J. McPhee, C. Álvarez-Garretón, C. Oyarzún, D. Soto, P. Donoso, L. Nahuelhual, M. Pino, and I. Arismendi. 2009. Assessment of ecosystem services as an opportunity for the conservation and management of native forests in Chile. *Forest Ecology and Management* 258: 415–424.
- Lara, A., R. Reyes, and R. Urrutia. 2006. Bosques Nativos. In *Informe país: Estado del medio ambiente en Chile 2005*, ed. Instituto de Asuntos Públicos, Universidad de Chile. Santiago, Chile: Universidad de Chile, Centro de Análisis de Políticas Públicas, Programa de Desarrollo Sustentable, 107–139. www.inap.uchile.cl/politicaspUBLICAS/informepais2006.pdf
- Lara, A., D. Soto, J. Armesto, P. Donoso, C. Wernli, L. Nahuelhual, and F. Squeo. 2003. Componentes científicos clave para una política nacional sobre usos: Servicios y conservación de los Bosques Nativos Chilenos. Valdivia: Universidad Austral de Chile.
- Lara, A., and R. Villalba. 1993. A 3620-year temperature record from *Fitzroya cupressoides* tree-rings in southern South America. *Science* 260: 1104–1106.
- Lara, A., R. Villalba, and R. Urrutia. 2008. A 400-year tree-ring record of the Puelo River summer-fall streamflow in the Valdivian rainforest eco-region, Chile. *Climatic Change* 86: 331–356.
- Lucke, S. 2008. Approaches to ecosystem service assessment in forest ecosystems. In *Ecosystem services and drivers of biodiversity change: Report of the RUBICODE electronic conference, April 2008*, ed. F. Grant, J. Young, P. Harrison, M. Sykes, M. Skourtos, M. Rounsevell, T. Kluvánková-Oravská, J. Settele, M. Musche, C. Anton, and A. Watt. www.rubicode.net/rubicode/RUBICODE_e-conference_report.pdf
- Nahuelhual, L., P. Donoso, A. Lara, D. Nuñez, C. Oyarzún, and E. Neira. 2007. Valuing ecosystem services of Chilean temperate rainforests. *Environment, Development and Sustainability* 9: 481–499.
- Nuñez, D., L. Nahuelhual, and C. Oyarzún. 2006. Forests and water: The value of native temperate forests in supplying water for human consumption. *Ecological Economics* 58(3): 606–616.
- Olson, D., and E. Dinerstein. 1998. The Global 200: A representation approach to conserving the Earth's most biologically valuable ecoregions. *Conservation Biology* 12: 502–515.
- Sepúlveda, C. 2006. ¿Cuánto hemos avanzado en conservación privada de la biodiversidad? (December 21). www.parquesparachile.cl
- Squeo, F. 2003. Clasificación revisada de los ecosistemas terrestres del país y sus prioridades de conservación: Informe final. La Serena, Chile: Universidad de La Serena. www.biouls.cl/ecosistemas

MEETING THE CONSERVATION CHALLENGE IN NEW ENGLAND

David Foster

On a global scale, the land area of New England is insignificant. Even when focused on the Americas, most outsiders dismiss the region as an extension of the eastern megapolis, a postindustrial, urbanized landscape, where second-growth forests pale by comparison to the stature and majesty of their counterparts in the western United States and South America. Much to the surprise of most visitors to the region, however, the impression of omnipresent cities and suburbs is readily replaced by extensive forests that dominate this surprisingly wooded land. New England is an environmental paradox.

Some of the densest population in the country is found in these six states, yet this area also remains the most heavily forested region. These forests are the result of a remarkable ecological story of devastation and rebirth paralleled by an equally important story of the human enterprise and conservation innovation that have been applied to protect this varied landscape. These two stories offer broadly applicable insights. Meanwhile, New England forests offer many benefits and important lessons, locally and globally.

The recovery of the New England forest from near devastation is part of a much larger story of the eastern United States, a century-long process of subcontinental reforestation and regrowth that noted environmental writer Bill McKibben has called “the great environmental story of the U.S.” (McKibben 1995). While this recovery was certainly due to human activity, it also happened quite accidentally as a byproduct of larger economic forces and cultural changes that had little to do with active conservation.

For more than 10,000 years after the ice melted from its surface, New England was a sparsely settled, forested land. While native people derived abundant resources from the waters, wetlands, and woodlands, the forests were shaped predominantly by natural forces and dominated by unbroken expanses of ancient trees. This changed abruptly 400 years ago, with the arrival of agrarian settlers from Europe. As the new population grew and expanded across the land,

the forests, from hilltop to valley bottom, were progressively converted to productive farms and woodlands. Alexis de Tocqueville traveled the United States in the 1830s and was captivated by the landscape pattern, which was as distinctive as the social and economic characteristics he described in his landmark writing.

Except for the most rugged mountains and the unsettled northern part of Maine, the New England region was evenly settled in a unique system of townships governed by their residents' local rule. The industrious nature of the people noted by de Tocqueville and other travelers such as Yale University's president Timothy Dwight produced a wave of deforestation so great that Henry Thoreau, their contemporary, could only despair, "Thank God, they cannot cut down the clouds" (D. Foster 2001, 90). Of course, woodlands provided essential resources—fuel; timber; energy for transportation; and materials for household, farm, and industrial goods—so the remaining woodlots were cut heavily and frequently. As Thoreau noted in the cold winter of 1852, "You can walk in the woods in no direction but you hear the sound of the axe" (D. Foster 2001, 90).

Before he died in 1862, however, Henry Thoreau witnessed an ironic phenomenon of cultural change and decline that would save the land from this onslaught and human domination and lead to the expansion of forests across fields, meadows, and pastures. The cause was the decline of agriculture and the progressive neglect and eventual abandonment of farmlands and, later, farmsteads. Thoreau termed the process of forest establishment, growth, and change that he witnessed "the succession of forest trees" (Thoreau 1860). These human and ecological processes spread across New England and, indeed, the entire eastern United States. Driven fundamentally by geography, technology, and economics, they were manifested through a complete reorganization of the regional landscape and its human population.

The opening of productive farmlands in the Midwest and West and transportation via the expanding rail system brought New England farmers face to face with new competition, which led to initial contraction and the gradual shift in focus to perishable items, such as milk, hay, and vegetables, which were needed in growing eastern cities. Industry, centered on streams and rail lines, led to concentrations of growing populations of residents and new immigrants in mill villages, the formation of urban centers, and a depopulation of rural areas.

As agriculture shifted westward and farms were tended less in the eastern part of the country, trees quite naturally increased across the land, first occupying marginal lands that had been neglected, then extending across the bulk of the landscape as entire farms were abandoned. As a consequence today, in most states east of the Mississippi River, the landscape is much more heavily wooded than it was a century ago. In New England, the reforestation has been extreme, leading to more than a doubling of forest area in little more than a century. The result is a rural landscape in which natural forest conditions and processes are increasing and the signs of former human activity—stone fences, small dams, rock house foundations, and ancient roads and rail beds—have become features of our woodlands.

In the mid-nineteenth century, Thoreau, George B. Emerson, and a few other writers and social commentators raised increasingly loud protests over the destruction and

degradation of forests. Despite some early attempts to plant trees and pass local ordinances to protect forests, their calls were largely ignored and had little immediate consequence. The recovery of the forests was not marshaled by legions of conservationists; rather it was the indirect and quite unintended consequence of a wholesale shift in regional and national economy and behavior.

Today, the New England landscape, and indeed the broader eastern forest and much of the United States, is under renewed assault from a second wave of deforestation. In contrast to the indifference that met Thoreau, however, the magnitude and effectiveness of the conservation response to this modern crisis is stunning, as it well needs to be to address the scale of the challenge. While it remains unclear whether our current conservation response will be capable of preserving the remarkable expanse of forest that history brought to this region, the size and quality of the effort offer many lessons for conservation more broadly. It also testifies to the remarkable capacity for conservation—social, human, and financial—that has developed in the century and a half since Thoreau, and that can now be mustered to defend critical natural capital.

THE CURRENT THREAT TO NEW ENGLAND FORESTS AND THE RESPONSE

The second wave of deforestation and environmental degradation that is spreading across the eastern United States presently is qualitatively distinct from and driven by very different social and economic forces than the first wave. This new process is the conversion, fragmentation, and parcelization of forestlands and land ownerships. Its scale and impact are so great that a colleague recently wrote for a leading forestry journal an editorial entitled “The Fire in the East,” in which he compared the urgency in addressing it to the national focus that has been given to wildfires across the drier western part of the country (Kittredge 2009).

Unlike the western United States, with its expansive federal lands controlled by the Department of Agriculture and its Forest Service, the Bureau of Land Management, the Defense Department, and the National Park Service, the eastern region is predominantly owned privately by individuals, companies, and organizations. With the forest industry in decline and real estate values increasing, over time these forestlands and farmlands have increasingly been divided into smaller parcels (or parcelized) and converted to residential and vacation housing or use by industry and commerce (that is, developed). This has led to fragmenting and decreasing the value and effectiveness of both natural and agrarian landscapes. Fragmentation and parcelization decrease habitat value for native organisms, reduce human access to open space, greatly challenge effective stewardship, and undermine the many ecosystem services that nature provides. In contrast to the eighteenth- and nineteenth-century agrarian wave of deforestation, which had harsh consequences but was substantially reversible, this new activity is much more permanent. The hard surfaces of pavement and structures that humans are creating today will defy all but the most cataclysmic forces.

While most residents have ignored this process and its consequences, and many political entities have given higher priority to economic development than conservation, diverse groups have recognized and acted aggressively to address these issues.

With a recent perspective that links forest conservation with energy, the environment, climate change, and the economy, the new attention and emerging response to both sprawl and forest impacts are promising. At a national level, the U.S. Forest Service has recognized deforestation as a national priority, releasing a well-documented project called "Forests on the Edge," which estimates that nationwide 2,500 acres of forest, rangeland, and farmland are lost daily to development.

Many New England states and organizations have released strong scientific assessments of the problem and carefully crafted conservation plans for the future protection of lands and nature. Among them is New Hampshire Everlasting (Society for the Protection of New Hampshire Forests), which seeks to conserve one million acres of forest. Massachusetts-based projects include the Statewide Land Conservation Plan (Executive Office of Energy and Environmental Affairs); the Massachusetts Natural Heritage and Endangered Species Program's BioMap; and the *Losing Ground* series from the Massachusetts Audubon Society.

Presently, New England's conservation community and population are demonstrating great potential for turning these diverse assessments into positive action for land protection and long-term stewardship. Such action is exemplified by the strong response to a recent proposal for Massachusetts, which currently is about 60 percent forested. In 2005, a group of scientists primarily associated with the Harvard Forest issued a report entitled *Wildlands and Woodlands: A Vision for the Forests of Massachusetts* (D. Foster et al. 2005, known as the W&W report). It called for protection of more than 50 percent of the state in forest, either as actively managed woodlands or wildland reserves, which would be allowed to develop under prevailing natural processes. Early in 2010, this group will release a parallel vision for all of New England, in which more than 70 percent of the region will remain permanently forested; farmland and wetlands are protected from development; and new housing, commercial, and industrial activities are focused in and immediately around currently developed areas (D. Foster et al. 2010).

These W&W visions are not based solely on the usual conservation biology rationale of biodiversity and nature conservation. Instead, they are grounded in thinking that focuses more squarely on the role of the forest as a natural infrastructure that supports people, communities, *and* nature, and on conservation of that infrastructure as a critical economic process. These two visions argue that most land protection in the twenty-first century will occur through the actions of private landowners, who place permanent conservation restrictions on their land. In turn, individual landowners will be engaged and supported through the involvement of communities and existing local, regional, and national conservation organizations and entities, also called woodland councils, working collaboratively in regional partnerships.

While they may indeed seem visionary, they have not been dismissed as fanciful but have generated serious consideration, strong backing, and substantial engagement by a diverse group of individuals, organizations, and entities.

- Major editorial boards, including those of the *Boston Globe* and *Providence Journal*, have endorsed them.

- They have been covered in national news and business media, such as the *New York Times* and *Wall Street Journal*.
- The Wildlands and Woodlands Partnership was formed. Initially inspired by support from the Kendall Foundation, The Nature Conservancy, and The Trustees of Reservations, this partnership now comprises 75 organizations from four New England states. It has policy, stewardship, implementation, and outreach committees and a coordinator funded by a private foundation.
- Seven woodland councils, from southern Connecticut to central New Hampshire and bridging three state boundaries, were instituted. Made up of numerous organizations and agencies, from local to national in scope, these councils seek to advance outreach to landowners and assist in stewardship and, especially, land protection.
- Two large land protection efforts that advance W&W goals at statewide and New England-wide scales have emerged. Sponsored by the New England Natural Resources Center and New England Forestry Foundation, they seek to aggregate tens or hundreds of parcels and landowners into fewer larger projects in order to reduce expenses, increase the rate of land protection, and attract major funding.
- The Harvard University Center for the Environment hosted the Woodlands and Wildlands Conservation Finance Roundtable (WWCFR) in 2006. National leaders in conservation finance gathered to evaluate possible mechanisms for funding conservation on the scale of W&W (Levitt and Fallon Lambert 2006).
- A public/private/nonprofit/academic commission on conservation finance was established through a law passed by the Massachusetts legislature in January 2009. An outgrowth of the WWCFR, the commission will identify and provide necessary detail regarding the implementation of important emerging methods of forest conservation finance that may be employed effectively in Massachusetts. The commission's activity will be underwritten in part by grants from the Massachusetts Environmental Trust and a private foundation.

The response to the new regional and national crisis, and the positive steps taken to advance the W&W goals, are indicative of New England's solid, well-established capacity for conservation. It also underscores the role that New Englanders have come to play in conservation innovation at national and international scales. So, what has happened since the passionate conservation pleas of Thoreau and his contemporaries that makes the response so different today?

Soon after the arrival of Europeans in New England, conservation measures began with restrictions on hunting, fire, and timber use and the establishment of the first public park, or commons, through self-imposed taxation. Thus, New England has a long history of environmental awareness and conservation of natural resources and land—wildlife and fish, forests, wetlands, coastal lands, and water. The intensity of this focus,

the development of private-based efforts, and the pace of actual protection of land and resources, however, did not pick up until the late-nineteenth century. As described in *Twentieth-Century New England Land Conservation*, which addresses each of the six states, much of this effort, and certainly the institutional and legal framework for most of the activity, is centered in the last one hundred years (C. Foster 2008). The book's subtitle, *A Heritage of Civic Engagement*, underscores the critical roles private individuals, communities, and organizations have played in advancing this new wave of conservation. They have formed the essential partnership with state and, to a lesser degree, federal agencies.

As the conservation history in Thoreau's home state of Massachusetts illustrates, this regional activity is characterized by a variety of factors (box 2.1). Individual leadership in thought and action has been key, with such luminaries as John Phillips (founding member and longtime president of the Massachusetts Fish and Game Association); Harris Reynolds (founder of the New England Forestry Foundation); Harriet Lawrence Hemenway and Minna Hall (cofounders of the Massachusetts Audubon Society); Charles Eliot (founder of The Trustees of Public Reservations); Allen Morgan (president of Mass Audubon in the mid-twentieth century and an important champion of land trusts throughout the state); Charles H. W. Foster (first Secretary of the Environment for the Commonwealth of Massachusetts); and many others.

Additional important aspects of this regional activity include the early formation and critical role of private organizations and community- or town-based efforts, strong public-private collaborations, continual innovation in the approaches to conservation advancement and financing; and the important, supportive role of public funding for major conservation. By the twenty-first century, as outgrowths of these activities, the state and region had developed a substantial infrastructure of existing conservation lands and a capacity for advancing new conservation agendas to address current and emerging issues. All of these initiatives are based on a diverse collection of private groups and public entities and the avid involvement of private citizens and landowners.

BOX
2.1

NOTABLE CONSERVATION LANDMARKS IN MASSACHUSETTS

- 1634** Freemen of Boston vote to impose a tax upon themselves to raise funds to acquire land to establish a cow pasture and military training field called the "common ffield." Boston Common is North America's first and oldest protected open space created in the context of a democratic process.
- 1640** Boston town meeting establishes regulations on use of Boston Common.
- 1650** Plimoth and Massachusetts Bay Colonies' ordinances regulate forest harvests.
- 1660s** Boston Common used recreationally as a promenade policed by town constables.
- 1694** Statewide ban on deer hunting imposed.
- 1792** Massachusetts Society Promoting Agriculture is legislatively chartered; signed by Governor John Hancock and chaired by Samuel Adams.

NOTABLE CONSERVATION LANDMARKS IN MASSACHUSETTS (continued)

- 1799** Citizens of Boston rally to prevent construction of a gun house on Boston Common. They publish broadside posted around town declaring Common to be “Palladium of the People” that offers citizens “incalculable benefits.”
- 1836** Boston Public Garden, first of its kind in the nation, is established adjacent to Boston Common.
- 1846** In *A Report on the Trees and Shrubs Growing Naturally in the Forests of Massachusetts*, George B. Emerson decries rampant cutting and deforestation, extols good management, and identifies many values of forests.
- 1860** Henry David Thoreau talks on “The Succession of Forest Trees,” describing forest establishment on farmland.
- 1865** State Fish & Wildlife Agency—the first such agency in the United States—originates.
- 1873** Massachusetts Fish & Game Association (MFGA), oldest incorporated conservation organization in the U.S., is founded.
- 1876** Founding of Appalachian Mountain Club shifts focus from exploration and recreation to conservation.
- 1891** The Trustees of Public Reservations (now The Trustees of Reservations, or TTOR), the world’s first regional land trust, is established.
- 1896** Massachusetts Audubon Society, the world’s oldest existing Audubon Society, is created in Boston.
- 1898** Establishment of Massachusetts Forestry Association (which becomes Massachusetts Forest and Park Association [MFPA] in 1933). It becomes dominant early force in land protection.
- 1898** Mount Greylock, in the Berkshire Mountains in western Massachusetts, is first reservation in what will become eighth-largest state forest and park system in the U.S.
- 1930** MFGA hosts first New England Game Conference, which is a model for North American Wildlife and Natural Resources Conference.
- 1935** MFPA legislative petition receives 23,000 signatures to purchase 500,000 acres in state forests and parks.
- 1939** Quabbin Reservoir completed following state acquisition of 120,000 acres (~75 percent of watershed) to provide water to metropolitan Boston and 40 percent of state. It is one of four unfiltered, large water systems in U.S.
- 1940** Harris Reynolds leads effort to found New England Forestry Foundation.
- 1947** Great Meadows National Wildlife Refuge established.
- 1957** Authorization of town conservation commissions, which provide local control through more than one thousand volunteer members. Municipal conservation commission movement expanded throughout the Northeast.
- 1959** State parks expanded with \$100 million expenditure.

NOTABLE CONSERVATION LANDMARKS IN MASSACHUSETTS (continued)

- 1966** Boston-based Conservation Law Foundation, one of first public interest law firms, pursues environmental advocacy across New England.
- 1978** Agricultural Preservation Restriction legislation allows development rights to be sold, ensuring farmers' permanent land protection and economic support.
- 1982** Land Trust Exchange, sponsored by Lincoln Institute, leads to formation of Land Trust Alliance.
- 1998** North Quabbin Regional Land Conservation Partnership established in response to undergraduate thesis documenting haphazard nature of land protection in central New England (Golodetz and Foster 1997).
- 1999** Governor Cellucci and Environmental Affairs Secretary Durand set land protection goal of 200,000 acres, which leads to largest bond bill in history (\$743 million).
- 2000** Massachusetts Land Trust Coalition established, with more than 100 land trusts and 100,000 individuals as members.
- 2000** Tully Initiative, led by Mount Grace Land Conservation Trust, protects 10,000 acres over two years.
- 2005** *Wildlands and Woodlands* report calls for permanent conservation of 50 percent of state in forest.
- 2006** Quabbin Corridor Forest Legacy project is first multiple-parcel landscape effort in Forest Legacy Program of the USDA Forest Service.
- 2008** New England Natural Resources Center initiates forest aggregation project to place conservation restrictions on 14,300 acres.

FUTURE PROSPECTS AND A SECOND CHANCE

Despite their remarkable history of conservation leadership and success, New England forests and landscapes face major threats today. While numerous concerns exist—ranging from the introduction of invasive species and pollution impacts (ozone, acid rain, etc.) to the global problem of climate change—the most immediate threat remains a very old one: the ongoing conversion of forests to other land uses. The societal derivation of a range of resources and ecosystem services from its land, the land's capacity to harbor a diversity of organisms and ecological processes, and its ability—by itself and through effective stewardship—to mitigate and adapt to the environmental stresses, disturbances, and changes imposed on it all depend on the maintenance of the natural infrastructure represented by forests, wetlands, streams, and lakes.

While the biological, human, and institutional capacities exist to address these challenges, among the greatest needs are financial resources. In the past, New England has proven to be adept at advancing major financing tools to promote conservation. Public funds have been allocated for:

- land protection for government efforts, such as the Massachusetts Metropolitan Parks Commission;
- major purchases of state forests and parks and, recently, for publicly supported bond bills for both fee acquisition and conservation easements;
- private donations of easements on critical lands; and
- bundling many parcels into coherent projects at the landscape or regional scale.

Through this ability to define new sources of funds, which directly reflect the high value that the citizens of New England place on their natural heritage and infrastructure, we will be able to respond effectively to current challenges. Thus, the present focus on sharing, developing, and advancing thinking about conservation finance lies at the heart of our ability to create a future that supports nature and people.

In many ways, New England has been given a second chance to determine the fate of its forests. In the seventeenth and eighteenth centuries, settlers cut and cleared the expansive woodlands. Over the past 150 years, these forests have regrown, but once again are under assault by even more massive forces. The outcome this time relies on the conservation allies that have roused themselves on behalf of the forests and land.

REFERENCES

- Foster, C. H. W., ed. 2008. *Twentieth-century New England land conservation: A heritage of civic engagement*. Petersham, MA: Harvard Forest, Harvard University.
- Foster, D. R. 2001. *Thoreau's country: Journey through a transformed landscape*. Cambridge, MA: Harvard University Press.
- Foster, D., B. Donahue, D. Kittredge, K. F. Lambert, M. Hunter, B. Hall, L. Irland, R. Lilieholm, D. Orwig, A. D'Amato, E. Colburn, J. Thompson, J. Levitt, W. Keeton, A. Ellison, J. Aber, C. Cogbill, C. Driscoll, and C. Hart. 2010. *Wildlands & woodlands: A vision for the New England landscape*. Harvard Forest Paper 32. Petersham, MA: Harvard Forest, Harvard University.
- Foster, D., D. Kittredge, B. Donahue, G. Motzkin, D. Orwig, A. Ellison, B. Hall, E. Colburn, and A. D'Amato. 2005. *Wildlands and woodlands: A vision for the forests of Massachusetts*. Harvard Forest Paper 27. Petersham, MA: Harvard Forest, Harvard University.
- Golodetz, A., and D. R. Foster. 1997. History and importance of land use and protection in the North Quabbin region of Massachusetts. *Conservation Biology* 11: 227–235.
- Kittredge, D. B. 2009. The fire in the east. *Journal of Forestry* (April/May): 162–163.
- Levitt, J. N., and K. Fallon Lambert. 2006. Report on the Woodlands and Wildlands Conservation Finance Roundtable. Petersham, MA: Harvard Forest, Harvard University. www.wildlandsandwoodlands.org/pubs/WWCFRSummaryfinal1.pdf
- McKibben, W. 1995. An explosion of green. *Atlantic Monthly* (April): 61–83.
- Thoreau, H. D. 1860. The succession of forest trees: An address read to the Middlesex Agricultural Society in Concord (September).