



From the Ground Up

How Land Trusts and Conservancies Are Providing Solutions to Climate Change

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ABOUT THIS REPORT

This report shows how land trusts, conservancies, and other civic sector organizations (both nonprofit and nongovernmental) around the globe are addressing climate change. Often working in partnership with others—local, state, and national governments; private sector organizations; universities and research institutions; religious groups; and Indigenous peoples—land trusts and conservancies are effectively designing, demonstrating, and widely deploying innovative responses to climate change. These civic sector entities are conserving land, protecting water supplies, managing stormwater and sea-level rise, maintaining biodiversity, supporting renewable energy facility siting, and sequestering carbon. By sharing examples of innovative and effective initiatives, this report demonstrates that land trusts and conservancies can act quickly and flexibly at all levels, from local to global. These initiatives serve as proof-of-concept models characterized by novel and creative concepts, strategic and measurable significance, cross-boundary transferability, and the ability to endure.

The research contributing to this report includes interviews with practitioners, program staff, decision makers, and citizens from six continents; the composition, vetting, and editing of working papers and case profiles; in-depth

bibliographic research; online webinars and dialogues conducted by Lincoln Institute of Land Policy staff members and our partners around the world; and research seminars held between 2018 and 2021. The report offers policy recommendations to improve the effectiveness and participation of civic sector land conservation organizations in such initiatives. The lessons learned have global relevance and will be disseminated through webinars, publications, regional meetings, and Global Congresses of the International Land Conservation Network, a program of the Lincoln Institute of Land Policy, as well as through the convenings of our colleagues and partner organizations.

POLICY FOCUS REPORT SERIES

The Policy Focus Report series is published by the Lincoln Institute of Land Policy to address timely public policy issues relating to land use, land markets, and property taxation. Each report is designed to bridge the gap between theory and practice by combining research findings, case studies, and contributions from scholars in a variety of academic disciplines, and from professional practitioners, local officials, and citizens in diverse communities.



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Front Cover: Wild blue indigo in the Flint Hills region of Kansas.

Photo: Brad Mangas

Back Cover: Páramo de Sumapaz, a highlands region in Colombia above the forest line but below the permanent snow line. Páramos are important and threatened water sources throughout South America. Photo: Luis Alejandro Bernal Romero/Wikimedia

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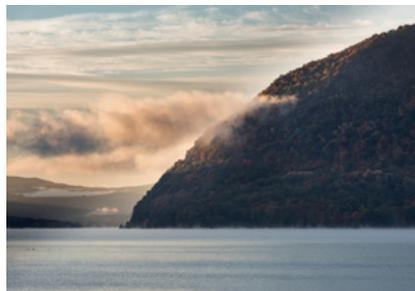
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Executive Summary



This Policy Focus Report presents a dozen case studies that demonstrate how land trusts, conservancies, and other nongovernmental organizations in the civic sector have meaningfully addressed climate change over the past several decades. These organizations are working to protect land, biodiversity, and historic resources in more than 100 countries on six continents. They work in partnership with public agencies as well as private companies, other nonprofits, colleges and universities, and Indigenous communities. They offer largely nature-based solutions that are conceptually creative, measurably effective, strategically significant, transferable, and potentially enduring. These civic sector entities often add continuity to projects that may take decades to fully implement, especially as political leadership and attention can fluctuate dramatically from year to year.

Wild blue indigo in the
Flint Hills region of Kansas.
Photo: Brad Mangas

The long-predicted disruptive impacts of human-induced climate change are now upon us, often with disastrous consequences. In Canada, record-breaking summer temperatures related to climate change (World Weather Attribution 2021) have set the stage for unprecedented forest fires, such as the one that consumed 90 percent of Lytton, British Columbia, in one day in 2021 (Isai 2021). Heat-related human deaths in the region tripled compared with previous years. In Australia, heat waves in the state of New South Wales since 2017 have led to power plant failures and forced authorities to urgently cut demand (Knaus 2017). In China, millions of people living along the Yangtze River risk landslides and inundations due to increasingly intense storms such as those reported in July 2020 that caused economic damages exceeding USD \$8 billion (Stanway 2020).

No single sector of the economy—public, private, or civic—has the resources, will, or tools to confront climate change alone. Droughts, floods, wildfires, water scarcity, extreme temperatures, intense storms, energy sprawl, falling agricultural productivity, an epochal decline in biodiversity, and other related issues require cross-sector solutions. As a parade of public figures have reiterated—from U.S. President Joe Biden to World Bank economists Stéphane Hallegatte and Julie Rozenberg—this global crisis requires “all hands on deck” (Hallegatte 2019, Ritter 2021).

This report illustrates the capacity and determination of land conservation groups working across large areas and long periods of time. It also recommends ways practitioners, funders, and decision makers can enhance and accelerate civic organizations’ efforts to address daunting challenges in the age of climate change.

Consider one example of the many offered in this report. Rocco Buchta was born in 1965 in the East German town of Strohdehne, near Berlin. As a boy, he spent long, happy hours outdoors fishing with his grandfather, who was born in 1904. His grandfather told the boy how green and full of wildlife the town was during his own childhood, before the Havel River was



Rocco Buchta led the restoration of the Lower Havel River in Germany, working through a large civic sector organization.
Photo: NABU

channelized to allow for more barge traffic. Buchta promised his grandfather that he would someday restore the local wetlands along the Lower Havel to their former natural glory.

Following German reunification in 1989, Buchta began to make good on his promise to his grandfather. By that time he had earned an advanced degree in engineering and was working for NABU (Naturschutzbund Deutschland, or the Nature and Biodiversity Conservation Union of Germany), one of the nation’s largest civic sector conservation organizations. After nearly three decades of dedicated work, a 56-mile (90-km) stretch of the Lower Havel River has largely been restored thanks to the leadership of NABU, where Buchta is now project manager of the Institute for River and Floodplain Ecology (Institut für Fluss- und Auenökologie). The project restored thousands of hectares of wildlife habitat, increased capacity to manage stormwater, improved water quality, and restored alluvial forests that sequester carbon and offer tree cover—effectively reducing the heat island effect. In recent years, conservationists from Holland, England, Korea, Russia, and other countries have visited the site to consider how to replicate the Havel River restoration far and wide (Strohdehne 2019).

This and other case studies highlighted in this report—from the restoration of highlands supplying fresh water from Bogotá and Quito, to the reforesta-

tion of Chinese deserts and the greening of urban Baltimore County, Maryland—show how civic sector land conservation initiatives are providing critical nature-based solutions to climate change.

As impressive as these examples may be, the reader should be aware of several important caveats:

- Initiatives such as NABU's Havel River work can take many years and require navigating a multitude of regulatory, financial, political, and organizational obstacles. Many such initiatives fail to reach their ultimate objective due to lack of money, political will, organizational endurance, leadership, and other factors. Some initiatives may ultimately succeed but require multiple reorganizations before they reach their goals, trying the patience of even the most passionate and dedicated project proponents.
- Many such civic sector initiatives are launched with the implicit or explicit support of local, state, or national governments and multilateral organizations. This support may include laws and policies that enable conservation easements and covenants, ecosystem service and carbon credit markets, and incentives for sustainable land stewardship. Land trust and conservancy leaders and members often must advocate for such government policies and programs. Lacking such engagement, government incentives for land conservation may languish or disappear.
- Some of the practices that currently support civic sector participation in land conservation are still evolving, and in some cases their use and regulation are being vigorously debated. One prominent case is the spectrum of carbon credit markets across many jurisdictions. Uncertainty remains over how these markets can appropriately deal with the challenges of permanence, leakage, and additionality. To preserve public trust, conservation groups will benefit by working with certified offset

programs and by following, where applicable, national and regional standards and recommended practices.

Acknowledging these issues, well-organized and strategically motivated nonprofits and nongovernmental organizations remain capable of addressing the climate crisis in unique and effective ways. Accordingly, many organizations are greatly expanding the scale and scope of their climate-related ambitions. The community of land conservation organizations around the world is in the early stages of forming a global network. Members of the community are eager to learn from one another about potential solutions to the difficult and pervasive challenges associated with climate change.

Public officials, citizens, civic sector leaders and practitioners, educators, and advocates can take steps to substantially deepen the impact of this work. These steps include:

1. Empower civic sector initiatives that are creative and ambitious in scope and scale.
2. Invest in initiatives with clear strategies and measurable impacts.
3. Aim for broad collaborations.
4. Share advanced science, technologies, and financing techniques.
5. Support initiatives that are resilient, adaptable, and replicable.

The recommendations in this report can help policy makers and practitioners better understand the potential for land trusts and conservancies to provide effective solutions and leverage their innovation as we mobilize globally to fight climate change.

CHAPTER 1

Introduction



Páramo de Sumapaz, a highlands region in Colombia above the forest line but below the permanent snow line. Páramos are important and threatened water sources throughout South America. Photo: Luis Alejandro Bernal Romero/Wikimedia

In the first two decades of the 21st century, hard-core climate deniers continued to argue in the media and on political campaign trails that the global consensus on climate science is bunk. As recently as June 2020, in developed nations around the globe from Australia to Sweden and the United States, the share of individuals surveyed who thought that the challenge of climate change was “not at all serious” ranged from 8 percent to 12 percent. This compares to a global average of such responses, across some 40 nations surveyed, of about 3 percent (Fisher 2020).

Even the hard-core deniers, however, likely paid attention to a report issued on Earth Day in April 2021. The company Swiss Re Group, an international provider of insurance, reinsurance, and other forms of insurance-based risk transfer, offered a dire economic forecast. The headline on the firm's press release reads, "World economy set to lose up to 18 percent GDP from climate change if no action taken" (Swiss Re Group 2021).

This is very serious economic news, given that the definition of an economic depression is a "severe and prolonged downturn in economic activity . . . that lasts three or more years or which leads to a decline in real gross domestic product (GDP) of at least 10 percent" (Liberto 2021). Publications from the Americas, Europe, Africa, Asia, and Australia reported on the potentially catastrophic changes linked to these projections, ranging from severe drought, widespread wildfire, and dramatic drops in global agricultural productivity to steep hikes in flood and fire insurance rates around the world. In addition, these developments could lead to major shifts in the investment strategies of Swiss Re and other insurance companies, which collectively manage some USD \$30 trillion in assets globally (Flavelle 2021).

Informed by such economic findings, increasingly urgent scientific reports from the Intergovernmental Panel on Climate Change, and the pleas of activists, national governments that had been dormant regarding climate change have sprung into action. The elected leaders of the United States, Canada, Japan, and Brazil in 2021 announced newly ambitious carbon emissions reduction targets for the year 2030. A number of the most prominent global corporations—including Amazon, Microsoft, Unilever, and Mercedes-Benz—have pledged to become carbon neutral by 2040. Universities from New England to New South Wales have launched major academic initiatives to fight climate change. Philanthropies and advocacy groups have for decades invested billions of dollars in addressing the threat of climate change. Pope Francis

Today civic organizations are protecting land and water resources on six continents, in more than 100 nations. They represent millions of engaged citizens working from Finland to Chile to pass our natural heritage on to future generations.

is perhaps the most prominent religious leader to point out the moral imperative of immediate action to arrest these alarming trends. And tribes and Indigenous communities in the Global North and South are working to conserve huge tracts within their territories to protect life on Earth.

Solutions to the immense challenges posed by climate change are literally at our feet. The purpose of this Policy Focus Report is to demonstrate that—often in collaboration with public, private, academic, philanthropic, religious, and Indigenous partners—nonprofit and nongovernmental organizations (NGOs) play critical on-the-ground roles in solving climate change challenges. This is especially the case for civic organizations that work to protect land and water resources. Such organizations are working in more than 100 nations on six continents. They represent millions of engaged citizens working from Finland to Chile to pass our natural heritage on to future generations. Collectively they have raised substantial sums of money to protect millions of hectares of open space in perpetuity, sited from city centers to remote wildernesses. They are ready, willing, and able to play their part to help turn around the existential environmental crisis we face today.

What difference can engaged citizens, working through land trusts and conservancies, really make? The

following historical precedents illustrate how social entrepreneurs working through civic organizations have achieved landmark innovations that are novel, strategically significant, measurably effective, transferable across boundaries, and enduring—in some cases for more than a century.

- In 1891 Charles Eliot, protégé of the landscape architect Frederick Law Olmsted, launched a campaign in Massachusetts to found the first regional land trust in the world. That organization, The Trustees of Reservations, has protected tens of thousands of acres across the Commonwealth and is raising tens of millions of dollars to complete a harborside park that will buffer East Boston from climate change–related storm surges (The Trustees 2021). Furthermore, the land trust movement that Eliot founded has spread to every continent around the globe.
- In the 1970s, Wangari Maathai, a Nobel Prizewinning academic, politician, and activist from Kenya, started the Green Belt Movement. In addition to leading the fight to save Uhuru Park in central Nairobi, Maathai launched a tree-planting movement that has, to date, planted more than 51 million trees. As the impacts of climate change intensify across Kenya, these trees provide shade, preserve ecological niches, and protect the integrity of landscapes across the nation. The Green Belt Movement now supports a climate change program that focuses on the pivotal role that African women can play in climate adaptation and mitigation (Green Belt Movement).
- Beginning in the 1960s and 1970s, Inuit people in Canada’s High Arctic began to advocate for the protection of a terrestrial/marine expanse above the Arctic Circle known then as Lancaster Sound. Working with the Nature Conservancy of Canada, Oceans North, World Wildlife Fund, and Inuit Tapiriit Kanatami (an NGO representing the

Inuit people), the Indigenous community was able to extinguish oil exploration rights in the region, leading to an August 2016 agreement to establish a vast marine reserve (Weber 2016). Tallurutiup Imanga–Lancaster Sound National Marine Conservation Area now covers nearly 27 million acres (109,000 sq km) and is managed under a cooperative agreement between the Qikiqtani Inuit Association and the national government (Nature Conservancy of Canada). Cooperating parties, including several NGOs, are working together to implement plans to sustainably manage the region and adapt to conditions that are rapidly changing due to climate change.

These examples, of course, are only the beginning. The following chapters document the remarkable progress made by civic organizations from Boston to Bogotá, Berlin, and Beijing in developing increasingly effective ways to mitigate the sources and causes of climate change and to adapt to the inevitable repercussions emerging in the 21st century. The chapters of this Policy Focus Report are organized thematically:

- Land Protection, Restoration, and Management
- Water Supply, Stormwater Management, and Buffering Against Sea-Level Rise
- Biodiversity Conservation
- Carbon Sequestration
- Energy Production

In Chapter 2, we look at several exemplary initiatives involving civic sector organizations that are protecting and restoring land that would otherwise continue to be degraded by climate change. One such example, the One Tam initiative in Marin County, California, has been instrumental in spawning a statewide policy initiative named Cutting Green Tape that paves the way for responsive, cross-boundary land management and regulation across the state. A second example, based in China, brings the marketing and financial muscle of one of that nation’s largest consumer financial



In the late 1800s landscape architect Charles Eliot founded The Trustees of Reservations in Massachusetts, launching the land trust movement, which has spread to every continent around the globe. Photo: Wikimedia

companies into a collaboration with a growing group of nongovernmental organizations. Working together, these groups are creating reforested landscapes (called “Ant Forests”) in more than a dozen locations, from the deserts of Inner Mongolia in the north to the mountainous habitat of the Yunnan Golden Monkey in the south.

Chapter 3 follows with a focus on water-related initiatives. Of critical importance to communities everywhere is the quality and quantity of the water supply. A review of water funds created by The Nature Conservancy in Latin America and the Caribbean reveals that, in the context of changing climatic conditions and water-stressed communities, efforts to protect clean water supplies can significantly benefit human health and economic activity in cities such as Quito, Ecuador, and the Norte de Santander region in Colombia, among others.

In addition to water supply risks, some communities are grappling with too much water. Again, land trusts can provide leadership to address these climate change–related challenges. NeighborSpace, a small Maryland land trust working in a low-income urban community, has created a series of small parks that provide green play spaces as well as critically import-

ant stormwater management capacity. As a result, homes in Baltimore County that have in recent years experienced chronic flooding can now avoid that fate, even during intense storm events.

Communities with ocean frontage, estuaries, and tidal rivers must increasingly confront inundation from sea-level rise and storm surges. Chapter 3 concludes with several examples of organizations spearheading long-term planning and land protection programs that help create coastal and riverside land buffers, allowing biodiversity to thrive while keeping human settlements out of harm’s way.

Chapter 4 homes in on conservation projects that protect and extend the ranges of plant and animal populations threatened by climate change. Such projects include the restoration of the River Havel, a storied waterway near Berlin that was repeatedly altered over the past several centuries. After NABU, a German NGO, led the Havel’s restoration to a more natural course, the river and its valley are welcoming back vibrant populations of fish, birds, and plant life. In North America, organizations such as the Open Space Institute are leveraging groundbreaking work by Mark Anderson of The Nature Conservancy to expand on the concept of an Eastern Biodiversity Corridor that, in

The work belongs to all of us of every race, gender, and background across parcel, state, regional, and national boundaries. In the face of the global challenge of climate change, the civic sector is helping to lead the way to solutions.

the face of rising temperatures, will allow species to migrate to newly protected safe havens.

As examined in Chapter 5, land trusts and NGOs from northern Vermont to Western Australia are pioneering programs to reforest arid expanses and to aggregate small woodlots into cooperative entities that can market carbon sequestration services and credits. Greening Australia's pilot projects are transforming degraded properties into broad landscapes dotted with clusters of native trees and bushes that capture carbon. The Vermont Land Trust recently formed a carbon co-op of smaller woodlot owners to market their sustainable forestry credits to buyers in an emerging voluntary market.

Examples explored in Chapter 6 center on renewable energy development that minimally affects biodiversity. With roots in Kansas and Oklahoma, the Site Wind Right program developed by The Nature Conservancy uses sophisticated geographic information system (GIS) technology to identify an abundance of appropriate sites across 17 Midwestern states that have both suitable wind resources and low expected levels of conflict with wildlife habitats, for species such as whooping cranes to big game such as elk. Similar efforts are now underway by Nature Conservancy programs in China and India. In a second example, BirdLife International in Africa and Europe is protecting key flyways that allow migratory birds to continue to migrate vast distances to find appropriate breeding

and overwintering grounds, in part by paying close attention to where renewable energy plants are located.

Chapter 7 offers a high-level review of lessons learned. From local nonprofits to larger state and regional NGOs and very large national and international groups, an important common attribute of these civic sector entities is their tremendous patience and resilience, sometimes over the course of several decades, to reach successful outcomes.

Chapter 8 offers recommendations for practitioners and policy makers who want to encourage civic sector organizations to persevere as nimble, inventive providers of climate change solutions. When equipped with the right tools and resources, land trusts, conservancies, and their peers can be critically important partners with public and private actors in finding new paths forward.

“[Together we are] trustees of the coming world. [We must realize] not only that we have a share in the commonwealth, but that the commonwealth has a share in us,” Gifford Pinchot wrote in 1889 (Miller 2017). The examples and case studies in this Policy Focus Report testify to the fact that the spirit of civic responsibility—the sense that together we are “trustees of the coming world”—is still alive and well in the early 21st century. However, our task is not one that should be tackled, as Gifford Pinchot believed more than a century ago, primarily by enfranchised male voters of his time. The work belongs to all of us—every race, gender, and background across parcel, state, regional, and national boundaries. In the face of a global challenge, the civic sector is helping to lead the way to solutions. Let us persist as if life on Earth, as we know it, depends on our collective ingenuity and will. Indeed, it does.

CHAPTER 2

Land Protection, Restoration, and Management



Civic sector organizations have been protecting and managing land for its scenic, historical, recreational, botanical, and wildlife habitat value for centuries. In Boston in the 1840s, the publicly chartered Trustees of the Public Gardens set a precedent for civil society engagement in land conservation by creating one of the first publicly accessible botanical gardens in the United States. Land protection remains a key function of 21st-century civic organizations such as land trusts and conservancies located across the globe, from Santiago, Chile, to Nairobi, Kenya, and Seoul, Korea.

Running down Mount Tamalpais in Marin County, California. Photo: Todd Diemer

Promoting practices that maintain or return land to conditions that can prevent and mitigate greenhouse gas emissions is one of the most effective ways to tackle climate change. In its 2019 special report, “Climate Change and Land,” the Intergovernmental Panel on Climate Change (IPCC) noted that all assessed model pathways limiting warming below the 2°C maximum, as set out in the Paris Agreement, require land-based mitigation and/or reduced land conversion (IPCC 2019).

Given their focus, land conservation organizations are eager and well-positioned to maximize the climate benefits of land protection, restoration, and stewardship. But piecemeal, parceled land conservation in the 21st century is not sufficient to address the challenges presented by climate change. Landowners, users, and managers must cross parcel-level, organizational, and jurisdictional boundaries to maintain resilient landscapes in an era of accelerating wildfires, flooding, and sea-level rise. Civic sector land trusts and conservancies are leading the charge in linking sectors and stakeholders, showing us how to be stewards of whole landscapes, whole watersheds, and the whole earth.

The two examples that follow offer narratives of civic and private land protection, stewardship, and restoration from both sides of the Pacific Ocean—one in California and one in China. They represent a fraction of the multitude of such initiatives across the globe.

Collaborating at Scale in California: One Tam and Cutting Green Tape

Marin County, California, is blessed with some of the most scenic, spectacular landscapes and seascapes on the West Coast of North America. Since the early 1900s the citizens of Marin County have, remarkably, protected nearly 85 percent of the county’s land

(Marin Convention and Visitors Bureau) and have been instrumental in creating one of the United States’ most productive marine sanctuaries in the adjacent ocean waters. Public, private, and civic interests have persevered in their quest to protect land, from the towering redwoods in Muir Woods National Park to the verdant agricultural lands protected by easements held by the Marin Agricultural Land Trust, and the Marin Municipal Water District lands frequented by hikers on Mount Tamalpais. For decades the local organizations have worked to ensure that most of the county’s land will never be encroached upon by developers, hunters, or loggers.

In the 21st century, however, Marin County and all of California face new threats to the land, many of which are strongly associated with climate change. As Thoreau presciently foresaw, “new earths and new themes expect us,” presenting all-new responsibilities and challenges. We face all new expectations in our own work if we are to pass on enduring, resilient landscapes to future generations.

Sharon Farrell, executive vice president for projects, stewardship and science at the Golden Gate National Parks Conservancy (GGNPC) understood this well some 20 years ago. Farrell and GGNPC President Greg Moore brought together the four public-sector entities that own and manage the patchwork of protected lands that stretch across Mount Tamalpais—affectionately known by locals as Mt. Tam. Farrell and Moore asked the four agencies to consider forming a partnership to manage Mt. Tam and its watershed as a whole. Together, they suggested, the four agencies could better address challenges such as drought, wildfire, invasive species, and visitor impacts—problems that don’t care much about parcel boundaries or heterogeneous administrative cultures. Today the National Park Service, California State Parks, the county parks department, and the local water district work closely together through an initiative known as One Tam, with GGNPC as convener and principal fundraiser.

This novel idea has, at least in the administrative culture of California, worked remarkably well. Perhaps most important, it has changed the way the agencies strategize and practice conservation in the field. As Max Korten, director and general manager of Marin County Parks, explains, “In a changing climate, with rising seas and catastrophic fires, we face daunting challenges to steward these important lands, but the size and scope of those challenges feels within our reach because of the power of this collaborative to pool and leverage resources to accomplish landscape-level results.”

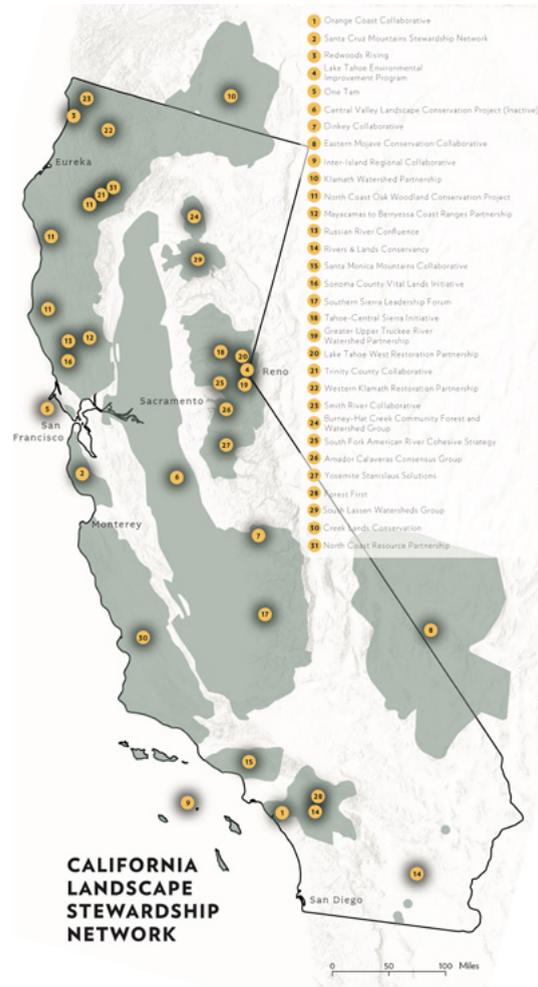
The initiative’s effectiveness is measurable in several ways:

- **Better morale:** Weekly interactions among One Tam partners increased by 185 percent over the partnership’s first four years, and interactions between One Tam partners and the community (including a number of intern and volunteer programs) was up 278 percent over the same period. As a result of participating in One Tam, agency employees report having enhanced morale. For example, one employee who participated in a structured survey said: “Being part of a larger local community of conservation- and stewardship-minded individuals has been incredibly beneficial to me personally. The support system that exists for me within One Tam has increased my work satisfaction and improved my relationships with my peers.” (Mickel 2018).
- **Enhanced knowledge and planning:** Following a comprehensive “Peak Health” resource assessment, partners worked together to plan for rising sea levels and changing ecological and recreational conditions in two popular areas, Botham Marsh and Bolinas Lagoon.
- **Increased private funding:** GGNPC coordinated fundraising, garnering USD \$6.3 million for One Tam activities over the first four years (Mickel 2018).

- **Invasives management:** Nonnative plants and animal species are systematically monitored and controlled using a comprehensive One Tam Early Detection Rapid Response protocol. This tool allows managers across agencies to monitor the presence of some 300 species of nonnative plants.
- **Fire readiness and visitor management:** The recent advent of warmer, drier conditions has corresponded with the outbreak of major fires in Northern California. Lisa Micheli, a conservationist and science advisor, and her colleagues have reported that “fire frequencies are projected to increase on the order of 20 percent for Mt. Tam under projected climate scenarios” (Mickel 2018). Integrated, cross-boundary visitor management protocols on Mt. Tam will be critical to ensuring public safety in the event of large fires in coming years.

Large-scale conservation project managers across California quickly noted the success of the One Tam partnership. This led to the formation of a California Landscape Stewardship Network (CLSN) in late 2016. In 2019 they launched a policy effort, again inspired by Sharon Farrell after she participated in a Large Landscape Peer Learning Initiative sponsored by the International Land Conservation Network, a program of the Lincoln Institute of Land Policy. Visiting peer sites in Chile and the eastern United States, Farrell saw how the experience with One Tam might be powerfully leveraged to streamline the way conservation collaboratives can operate in California. The resulting initiative, called “Cutting Green Tape,” is described on the CLSN website:

California Secretary for Natural Resources Wade Crowfoot and other leaders have launched the Cutting Green Tape initiative to improve permitting and funding efficiencies for ecological restoration and natural resource stewardship. The California Landscape Stewardship Network supported the Natural Resources Agency in this effort by convening five visionary and action-ori-



One Tam Partnership's area of focus and the range of the California Landscape Stewardship Network.
 Images: Parks Conservancy and *Bay Nature* magazine

ented roundtables between December 2019 and April 2020. These meetings brought together the collective wisdom and experience of over 150 regulatory agency staff, local governments, NGOs, public and private landowners, tribes, and a range of other stakeholders. Together, we created specific recommendations for how to increase permitting effectiveness, expedite project review and approval, improve cross-jurisdictional collaboration, and more (CLSN).

The challenges ahead for One Tam and Cutting Green Tape are substantial. California is facing historic and catastrophic wildfires, flooding, and continued loss of biodiversity as well as sea-level rise and incursion by invasive species. The consequences of climate change are diverse, long-lasting, and difficult to predict. And the policy-making process in California's state government is complex at best. One Tam and Cutting Green Tape demonstrate that policy makers and practitioners cannot address large-scale challenges on a piecemeal, parcel-by-parcel basis. In the 21st century, just protecting land is not enough. We must be clever enough to manage whole landscapes across boundaries. Otherwise, climate change could overwhelm geographically and bureaucratically constrained land managers.

LEARN MORE

Find extensive additional resources on One Tam's website, www.onetam.org, and Cutting Green Tape's website, <https://resources.ca.gov/Initiatives/Cutting-the-Green-Tape>, as well as in the case profile of Golden Gate National Parks Conservancy's Story of Collaboration and Innovation, prepared by Kristen Wraithwall for the Lincoln Institute of Land Policy: www.land-conservationnetwork.org/resources-education.

Ant Forest: Using Financial Technologies to Advance Climate Solutions in China

Confronted with mounting environmental challenges, China under President Xi Jinping has prioritized the transition to a low-carbon economy. In 2016, China signed the Paris Agreement, pledging to, among other objectives, reduce carbon intensity by 60 to 65 percent and to increase forest stocks by 4.5 billion cubic meters (about 5.9 billion cu yds) by 2030 compared to 2005 figures (Sandalow 2019). In March 2016, China's "Thirteenth Five-Year Plan" set out measurable carbon emissions targets and laid out decarbonization pathways for a variety of sectors for the first time. Among them was the development of green finance (Climate Change Laws of the World 2021).

In the past, China's environmental protection efforts followed a top-down, government-led approach. Today's ambitious transition toward a low-carbon economy calls for a societal approach, with increasing recognition that the whole society needs to adopt low-carbon lifestyles. However, the gap between the Chinese public's awareness of climate change and its willingness to change is significant. A 2017 survey by the China Climate Communication Project found that more than 90 percent of respondents believed that climate change was happening, but only 27.5 percent were willing to pay the full price for their own carbon emissions (Energy Foundation 2017).

At the same time, China's financial technology sector is developing at breakneck speed. Ant Financial (later renamed Ant Group), a spinoff of China's ecommerce giant Alibaba Group, helped revolutionize the way Chinese people make payments and investments. In 2013, Ant Financial overtook PayPal as the world's largest mobile payment platform. By 2018, some 870 million users conducted transactions worth a total of nearly USD \$10 trillion on its mobile app, called Alipay (Green Digital Financial Alliance 2020). As financial tech-

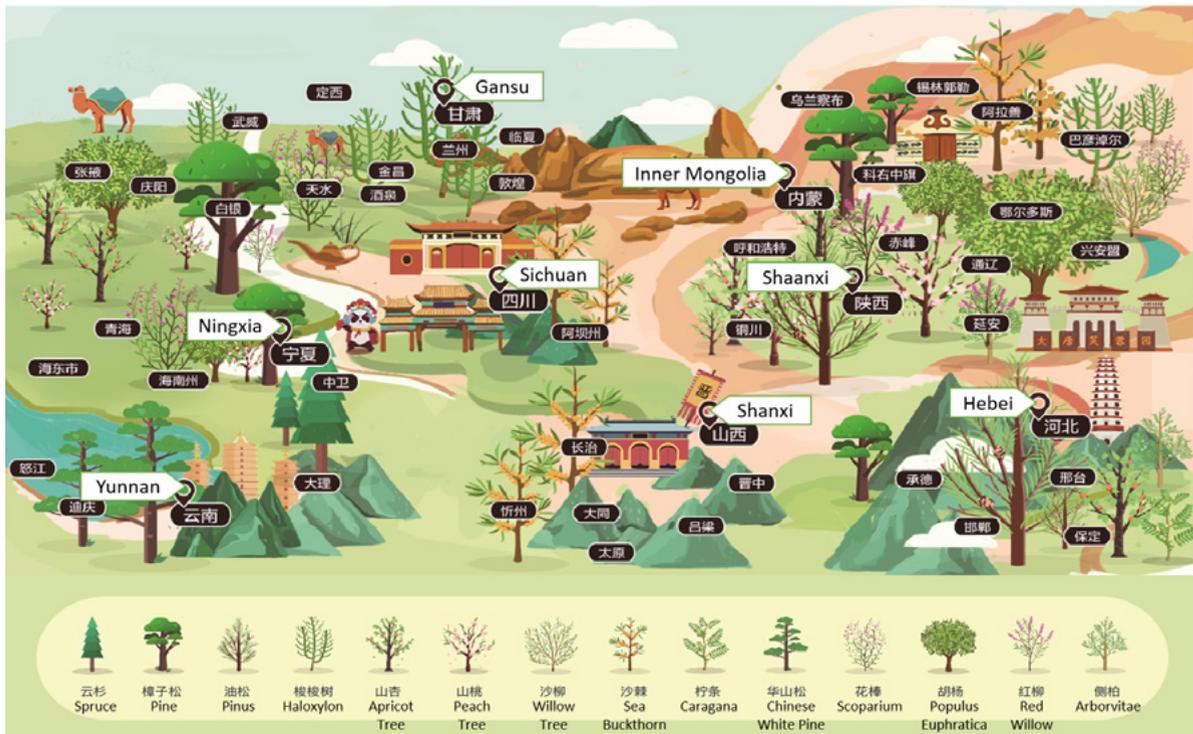


Collecting green energy and planting trees on the Ant Group mobile app. Photo: Shenmin Liu

nology juggernauts like Ant Financial/Alipay became increasingly dominant in consumer finance, managers wondered if they could also leverage the company's data to shift consumer behavior.

In the summer of 2016, Ant Financial decided to explore the nascent idea of green finance. Most employees were put off by the challenge. But a small group of junior employees from different teams volunteered to brainstorm ways to operationalize the "fancy" and "confusing" concept of green finance. They wanted to make green finance accessible and fun. In August 2016, the team launched Ant Forest on its mobile app. Designed as a game, Ant Forest rewarded users with "green energy points" each time they took a step to reduce their carbon emissions (Alibaba Charity 2021).

To do so, Ant Financial evaluated the data of participating users. The algorithm was based on individual behaviors such as walking, riding a shared bicycle, taking public transit, placing utensil-free takeout orders, and other activities that can be recorded by various apps and that reduce resource consumption and carbon emissions (Alibaba Charity 2021). Alipay connected the data of each app as the calculation basis for Ant Forest. For example, users can reduce carbon emission by buying train tickets online instead of going to the train station. Ant Forest then calculates the "avoided carbon emissions" of that activity and



Different tree species were planted in different regions depending on the local climate and environment. Image: Ant Group

credits green energy points to the user. When users accumulate enough points, they can buy and grow trees in the app. Once users have fully grown a virtual tree, Ant Forest plants a real tree.

To make that happen, the Ant Forest team partnered with See Foundation, a Chinese environmental non-profit. To combat desertification, See Foundation had been planting a particularly drought-resistant tree known as haloxylon (commonly called the “saxaul” tree in English) in China’s Inner Mongolia region. One haloxylon tree can stabilize up to 10 square meters (108 sq ft) of sand. See Foundation agreed to provide the funding for 1.6 million real trees in 2016. However, user volumes grew so quickly that all available trees were soon claimed. With its initial success, Ant Forest expanded its implementation partners to include China Green Foundation, Yili Foundation, and Yunnan Green Environment Development Foundation. Tree planting expanded to Gansu, Qinghai, Shanxi, Hebei, Sichuan, and Yunnan provinces (Chinese Academy of Sciences

2021). The newly planted areas provided multiple benefits. In the tropical Yunnan province, for example, Ant Forest launched a green corridor initiative that reconnected two critical Golden Monkey habitats that had been separated by human settlement (Jin 2021).

As the Ant Forest program continued to grow, funding sources also expanded. While See Foundation funded the first batch of trees, Ant Forest attracted so much attention that its parent company, Alibaba Group, soon stepped in to fund the scale-up effort. At the same time, the variety of tree species expanded based on local context. Different types of trees required different amounts of “green energy” to be redeemed, depending on the size and difficulty of planting the tree. For example, 17.9 kilograms (about 39.5 lbs) of points paid for the planting of a haloxylon tree; 146 kilograms (about 322 lbs) of green energy points for a pine tree. Trees were planted and maintained in conjunction with local governments, philanthropic NGO partners, and local farmers and herdspeople.

In addition to planting trees, Ant Forest explored other ways to protect the environment. In early conversations with nonprofit partners, the Ant Forest team learned of “civically protected areas”—demarcated areas where NGOs are involved in governing or managing the long-term protection of nature and the ecosystem. In September 2017, Ant Forest launched a land protection product that allows users to “adopt” or virtually claim to protect five square meters (about 54 sq ft) of protected area. The first protected area to go online was the Yangghu Protected Area in Anhui Province, managed by the Paradise International Foundation, a nonprofit focused on conservation. Each user could redeem 13kg (about 28.5 lbs) of green energy for 5 square meters (or 54 sq ft) of natural reserve. Within five days, eight million Ant Forest users had protected the 809-hectare (2,000-acre) natural reserve (Alibaba Charity 2021).

The success of the Yangghu Protected Area pilot project allowed the Paradise International Foundation and Ant Forest to form a close partnership. By the end of 2020, Ant Forest and several nonprofit partners had jointly launched 13 protected areas in Anhui, Sichuan, Shaanxi, Yunnan, Hainan, Shanxi, Jilin, and Qinghai Provinces. All told, more than 200 million people had adopted a total of 420 sq km (or 103,784 acres) of protected area through Ant Forest (Ant Group 2020). Every protected area became a hit as it came online. Users could view videos of endangered wild animals and satellite images of protected areas on Alipay, deepening the connection between the public and nature.

Moreover, Ant Forest and its implementation partners helped build a symbiotic and sustainable relationship between forests and local communities. In Guanba Protected Area in Sichuan Province, villagers had long relied on forests for subsistence bee farming. Mired in poverty, local communities often believed nature conservation was at odds with their livelihoods. But when Ant Forest experimented with promoting agricultural products from protected areas on Alipay, they sold out 10,000 bottles of Guanba honey within a minute. In the

past, Guanba honey was sold for USD \$5.5 per pound in local markets. Prices jumped six-fold, to USD \$34 per pound, on Alibaba’s ecommerce sites. Average per capita income from bee farming alone grew from approximately USD \$1,500 to USD \$6,000 a year. In addition to connecting local honey with a national market, Ant Forest also provided Alibaba’s artificial intelligence technologies to enable beehives to run autonomously. Liberated by technology, the villagers have now become rangers who patrol the forests, with Paradise International Foundation providing the training and Ant Forest providing the funding. Guanba’s villagers now appreciate that ecological protection and economic development do not necessarily conflict with each other but can be mutually beneficial (The Paper 2020).

The growth of Ant Forest has been spectacular. Within six months of its launch in 2016, the number of users reached 200 million. By the end of 2020, the number of users had exceeded 550 million people—equal to about 39 percent of the total population of China. More than 220 million trees had been planted in areas under the threat of desertification, covering a total area of 3 million mu, a Chinese measurement (equal to about 500,000 acres, or more than 2,000 sq km). In addition, protected areas with Ant Forest support exceeded 630,000 mu (equal to more than 103,000 acres, or about 420 sq km). At the same time, Ant Forest helped create around 730,000 green jobs and generated 98 million RMB (USD \$15 million) in income by paying farmers and herders to grow trees, patrol protected areas, and develop organic agricultural products, and connecting them with ecommerce platforms (Ant Group 2020).

In summary, the Ant Forest initiative has become remarkably successful very quickly. The young employees of Ant Financial who dreamed up the program were extraordinarily creative, inventing a new and highly effective way to promote conservation in China. The program has changed conservationists’ approach to land protection in China, earning a 2019 “Champi-



Ant Forest's Tree Planting Project creates green job opportunities for locals in Kubuqi Desert, Inner Mongolia, China. Photo: Ant Group

ons of the Earth” award, the United Nations’ highest environmental honor, for “turning the green good deeds of half a billion people into real trees planted in some of China’s most arid regions” (United Nations Environment Programme 2019).

Ant Forest has also been measurably effective at scaling up. By the end of 2020, Ant Forest had partnered with more than 1,000 nonprofit organizations, scientific research institutions, local governments, universities, and local companies. Ant Forest has inspired GCash, a leading mobile wallet in the Philippines, to replicate its model, and other countries inquire regularly about building similar initiatives. Time will tell how well the Ant Forest idea and the newly planted forests and protected lands will fare. China’s expanding economy and consumer base may continue to propel the program’s rapid rise.

LEARN MORE

For extensive additional information, see these videos:

www.youtube.com/watch?v=AO8_PW_kW40,
www.youtube.com/watch?v=ZHHIWUPopM and
www.alizila.com/video/alipays-ant-forest-makes-going-green-fun/. See also the Ant Forest case study prepared by Shenmin Liu for the Lincoln Institute, www.landconservationnetwork.org/resources-education.

CHAPTER 3

Water Supply, Stormwater Management, and Sea-Level Rise



Pelican covered in oil following the 2010 Deepwater Horizon spill in the Gulf of Mexico. Photo: Louisiana Governor's Office of Homeland Security and Emergency Preparedness

Climate change can dramatically manifest itself through the water cycle. It can prompt water scarcity and overabundance by altering the location, frequency, and intensity of droughts, floods, melting glaciers, sea ice loss, and storms. Land trusts and conservancies can help ensure that water supplies are sustainable and resilient, to meet the needs of urban and rural residents, by leading the effort to integrate land and water management.

By protecting and stewarding upstream lands, establishing green spaces in cities to absorb stormwater overflow, protecting mangrove ecosystems, conserving wetlands, and other such work, land trusts have formed key partnerships with public agencies and private businesses seeking to secure water quality and quantity and manage rising seas. The conservation and land management these civic organizations have done ensures that communities and regions retain intact and functioning watersheds, river basins, riparian corridors, floodplains, shorelines, and permeable city spaces amid changing and unpredictable conditions.

The case studies that follow represent a range of geographic scales and organizational sizes. The Partnership of Latin American Water Funds spans an entire continent. In the United States, the Gulf Coast Partnership is a successful regional collaboration. Also in the U.S., NeighborSpace of Baltimore County, Maryland, focuses on a specific portion of a larger metropolitan area. Each initiative has significantly affected its landscape's climate-related water issues, using different tools to achieve different purposes.

Latin American Water Funds Partnership

Latin America is considered “water-rich”: Its abundance of freshwater reserves constitutes nearly one-third of the world's total, even as the region represents just 8 percent of the global population. As climate change becomes more intense and widely felt, this wealth of water is increasingly tested and at risk—from the Galápagos Islands in Ecuador to Brazil's Mata Atlântica forest to the deserts of Chihuahua, Mexico, and Argentina's Tierra del Fuego.

The stresses on water supplies are particularly acute in the region's highly urbanized centers of economic growth. South America's six ballooning megacities are finding it increasingly difficult to access sufficient

water resources. Especially in low-income neighborhoods, residents face not only periodic shortages of fresh water but also the threats of extreme weather events, stormwater overflows, and sea-level rise caused by climate change.

At the turn of the 21st century, a group of interested civic sector stakeholders from the municipality of Quito, Ecuador, and The Nature Conservancy noted that rapid population growth was stoking water demand in the metro area. At the same time, growing pressure on resources was leading to watershed degradation in the high-altitude wetlands known as Andean *páramo* surrounding the city.

These stakeholders searched for approaches that would ensure water quality and supply in cities and protect water supplies at the source. They were inspired by a 1990s study commissioned by officials in New York City concluding that investment in natural infrastructure in the Catskills watershed would save the city billions of dollars in gray infrastructure construction and maintenance. In 2000, the municipality of Quito, the Quito water company, and The Nature Conservancy helped create the Fund for the Protection of Water (FONAG).

FONAG established a funding and governance mechanism that enabled water users downstream, such as cities, businesses, and utilities, to invest in upstream land conservation and improved land management practices by communities, landowners, and land stewards there. These management practices help to ensure and improve water quality and quantity over time. The Quito Water Fund eventually served as a model that spread throughout Latin America and the world. Efforts to replicate the Quito Water Fund accelerated after 2011, when a joint effort by The Nature Conservancy, the Inter-American Development Bank, the FEMSA Foundation, and the Global Environment Facility created the Latin American Water Funds Partnership.

Since its founding, the Partnership has promoted the creation of 24 water funds in eight Latin American cities. These funds are collective-action organizations with multi-stakeholder boards from the private, public, and NGO sectors. They empower critical watershed users—ranging from farmers to beverage companies—to exercise their civic responsibility with a view to long-term water security and sustaining their livelihoods in the face of threats such as climate change.

Together, the Latin American Water Funds have leveraged more than USD \$200 million from nearly 500 public and private partners and have protected 227,173 hectares (more than 560,000 acres) through conservation, restoration, and land stewardship and management practices developed with 23,823 families upstream.

Water funds are critical in reducing flooding, improving infiltration, and building resilience in cities facing climate change. An example from the city of Monterrey, Mexico, illustrates the effectiveness of water funds in places at risk of climate impacts such as flooding after heavy storms. The fund has estimated that in priority areas, the water fund mechanism could achieve an annual runoff reduction of 262 cubic meters per hectare (139 cu yds per acre), versus the current rate of 622 cubic meters per hectare (329 cu yds per acre).

The Latin American Water Funds Partnership has identified 25 cities (see map, above) in Latin America where the water fund model likely could be replicated. The Partnership is building systems and improving methodologies and support tools to analyze and create new water funds that address urban watersheds' specific biophysical and social opportunities and challenges.

No issue illustrates the interconnectedness of cities and rural communities, industry, agriculture, and our natural and built environments more than water. Water funds provide a globally replicable model that allows the public, private, academic, and NGO sectors to join forces and invest in natural infrastructure to



As of 2020, 25 water funds are operating in Central and South America, with an additional 14 projects in development. Map: The Nature Conservancy

provide nature-based solutions to one of Latin America's—and the world's—most urgent challenges.

LEARN MORE

Extensive additional resources on this example are available from The Nature Conservancy's Water Fund Toolbox, <https://waterfundstoolbox.org/>, and from the Latin American Water Funds Partnership: <https://www.fondosdeagua.org/en/>.

NeighborSpace of Baltimore County, Maryland

Baltimore County's current social, environmental, and economic conditions result from a series of planning, funding, and conservation decisions dating back to the post-World War II era—which the Baltimore City Planning Department refers to as a time of “suburbanization without end.” Bolstered by federally subsidized home loans and an influx of soldiers returning from war, the counties surrounding Baltimore expanded at astonishing rates in the decades following the war. By the 1950s, between 7,000 and 8,000 homes were being constructed each year in the Baltimore suburbs. Concurrently, the city's population dropped by 10,000 in the 1950s and 35,000 in the 1960s. That's when white residents fled to the suburbs and low-income and African American communities were forced to relocate as the city demolished entire neighborhoods to create highways (Baltimore City Planning Department).

Rapid suburbanization compounded by a reliance on single-use zoning throughout the mid-20th century meant that Baltimore County developed as a series of car-dependent “bedroom communities” around major transportation corridors with limited walkability and few—if any—open spaces. Redlining and rampant discrimination exacerbated these conditions in communities of color, which were deliberately granted fewer federal housing loans and less government investment. Baltimore County attempted to curtail sprawl by establishing an urban growth boundary called the Urban-Rural Demarcation Line in 1967, but much of the damage had already been done. Today, nearly 70 percent of residents in Baltimore County lack access to open space within a quarter mile of their home. All but one of the watersheds in the region are polluted by stormwater runoff.

NeighborSpace of Baltimore County was founded in 2002 to begin to address the dearth of open space. By protecting and improving green space for small pocket



Ridgely Manor Park, Baltimore County. Photo: Norman J. Barker Jr.

parks, gardens, trails, and other natural areas, NeighborSpace seeks to improve livability. NeighborSpace defines livability by the sum of social, environmental, and economic factors that affect quality of life—a guiding principle that has driven NeighborSpace to conserve 21 parcels totaling 100 acres within the county. The organization has succeeded by developing close working relationships with the Baltimore County government, local universities, and—most important—community-based organizations. These partnerships have enabled NeighborSpace to establish itself as the go-to organization for urban and suburban land conservation in the Baltimore area.

NeighborSpace has turned the toolkit for large, rural landscape conservation on its head, fitting parcels as small as 0.15 acres into urban and suburban environments. In partnership with the National Park Service, it has developed a first-of-its-kind GIS prioritization methodology for assessing the conservation value of a parcel of land based on its potential for improving the social, environmental, and/or economic factors of livability of the nearby community. This resource—which relied heavily on the feedback and stated priorities of residents—is one of the many ways in which NeighborSpace can serve as a leader and a model for other urban and suburban land trusts across the United States and elsewhere.

“Stormwater runoff is the primary cause of the pollution of Baltimore County’s urban water resources. A failure to set aside land for open space and to protect and buffer stream valleys when the county was developing has resulted in all but one watershed inside the region’s Urban Rural Demarcation Line becoming impaired by sediment and/or nutrients.”

—Barbara Hopkins, Executive Director, NeighborSpace of Baltimore County

While a close relationship with Baltimore County is foundational to NeighborSpace’s work, funding through the county’s local open space waiver fees is absolutely essential. According to county law, developers must set aside 1,000 square feet of open space for each newly constructed dwelling unit. If they cannot, they are allowed to seek a waiver from the county and pay a fee in lieu of open space. Since 2004, the county has allocated a portion of those waiver fees to NeighborSpace to support its conservation work. In 2004 Baltimore County Council approved an allocation of up to 10 percent, and in 2013, they increased the amount to 20 percent of all fees (Patch 2013). In fiscal year 2018, the county collected nearly USD \$600,000 in fees. NeighborSpace’s 20 percent cut makes up a substantial portion of its operating budget. A clear leader in Baltimore County, it is the only green space nonprofit using GIS modeling and conservation plans developed in partnership with residents and other key stakeholders. It is also the only nonprofit receiving a portion of the county’s local open space waiver fees.

The waiver revenue, along with funding from individual donations and grants, has enabled NeighborSpace to make real change in its communities. At Ridgely Manor Park, the site of a Hess Oil gasoline leak, a new drainage system coupled with the green infrastructure benefits of the park made a notable difference for residents. Dale Cassidy, president of the Ridgely Manor Community Association, noted that before the park

was developed, the neighborhood’s storm drains would overflow during heavy rains, and residents could see and smell enzymes and pollutants—remnants of the gas leak—flowing down the street. Cassidy noted that this issue has vastly improved since the park was completed. In addition to serving as a critical conservation buffer for the neighborhood, the park provides recreation for more than 180 nearby duplexes. “Through combined efforts, it has developed into an inviting and purposeful space for those in the area,” said Cassidy. “On any given day, you find folks dropping by for lunch and kids utilizing the open space for football, soccer, or just tossing a ball around” (Hopkins 2019).

Addressing stormwater flows is critically important not only to homeowners and renters in Baltimore, Washington, DC, and other urban, suburban, and rural settlements within the eight-million-acre Chesapeake Bay watershed. It is also critical to the health of the bay itself. Small-scale organizations such as NeighborSpace, regional NGOs such as the Chesapeake Conservancy, and large-scale organizations such as The Nature Conservancy are working with a multi-state coalition of local, state, and federal government agencies in a long-term effort to dramatically improve the Chesapeake Bay’s water quality and accessibility. They are doing so in the context of increasingly intense storms associated with climate change. As noted in a 2021 publication from The Nature Conservancy (TNC):

Over the past [several years], the mid-Atlantic region has experienced record rain and heat. In the [Chesapeake] region, we're working with community partners and landowners to implement natural solutions to address the challenges of deadly heat waves, flooding, and stormwater runoff—the fastest growing source of pollution to our rivers and to the Chesapeake Bay (Kleinschroth 2020).

LEARN MORE

Extensive additional resources are available from NeighborSpace of Baltimore County, www.neighborspacebaltimorecounty.org/, and the case profile of NeighborSpace of Baltimore County prepared by Kristen Wraithwall for the Lincoln Institute of Land Policy, from which this example is excerpted, www.landconservationnetwork.org/resources-education.

The Partnership for Gulf Coast Land Conservation

The Gulf Coast, in the southeastern United States, is severely threatened by climate change. Coastal areas and communities in the Gulf of Mexico states (Florida, Mississippi, Alabama, Louisiana, and Texas) are highly vulnerable to extreme weather events, storms, erosion, and coastal land loss due to rising sea levels. The region accounts for 85 percent of coastal wetland loss in the U.S.—a loss, on average, of a football field-sized area of land every 100 minutes. Along the Gulf Coast states, more than 7,000 square miles, including large urban centers such as Houston and New Orleans, are fewer than 5 feet above sea level, putting large

numbers of people and critical infrastructure at risk. Natural areas including salt marshes, oyster reefs, and mangroves—which protect the shoreline and water quality, and have fishery and tourism value—are also affected by sea-level rise, storms, and coastal land loss.

Both gray and green infrastructure projects may help address environmental declines in the Gulf. To date, gray infrastructure solutions to sea-level rise in low-lying coastal areas include installing seawalls and breakwaters to protect the coast. However, these solutions can be expensive. For example, the 1.4-mile-long steel and concrete seawall that protects New Orleans cost USD \$1.1 billion. Gray infrastructure projects can also be carbon intensive due to the torrent of carbon dioxide released during steel and concrete manufacture, transportation, and construction.

Green infrastructure, in contrast, can provide lower-cost, less carbon-intensive natural climate solutions. In coastal areas, green infrastructure can include living shorelines and conserved wetlands that buffer sea-level rise and storm surges, thereby reducing flooding and associated impacts. For example, a recent study found that healthy coral reefs can significantly reduce wave energy, buffering the shore from storm surges. Coastal land conservation can protect residential properties from storm damage. Green infrastructure can provide additional cobenefits including carbon sequestration, habitat protection, reduced air and water pollution, recreational resources, and jobs.

The 2010 Deepwater Horizon oil spill disaster released 210 million U.S. gallons (or 780,000 cu m, plus or minus 10 percent) of petroleum into the Gulf of Mexico (Fears 2020). The disaster caused extensive and profound environmental damage in the Gulf, underscoring the need to address and mitigate the underlying environmental challenges of sea-level rise, land loss, and pollution in the region. The policy response to the Deepwater Horizon oil spill provided a number of funding sources that Gulf Coast con-



Robinson Preserve, a 150-acre parcel in Manatee County, Florida, was conserved with the help of the Partnership for Gulf Coast Land Preservation's Project Assistance Fund. Photo: Manatee County Parks

servation organizations are using to improve coastal resilience.

Funding for Gulf Coast restoration in the wake of the disaster is based on penalties required under federal laws governing natural resources. Funding procedures are complex and distributed across three primary mechanisms: the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States (RESTORE) Act, signed in 2012; a Natural Resource Damage Assessment under the Oil Pollution Act; and settlement of criminal charges associated with the oil spill that are disbursed by the National Fish and Wildlife Foundation.

The Land Trust Alliance launched the Partnership for Gulf Coast Land Conservation in 2010 to give land trusts and land conservation proponents a voice in the Deepwater Horizon settlement process and to grapple

with the daunting environmental challenges facing the region. The Partnership has been instrumental in securing post-disaster funding for land conservation. Today, the Partnership is a coalition of 26 state, regional, and national conservation organizations in Alabama, Florida, Louisiana, Mississippi and Texas with “the collective mission . . . to increase the pace, quality, and permanence of voluntary land and water conservation within the Gulf Coast region.” The Partnership so far has protected more than 29,000 acres of coastal habitat and brought more than USD \$52 million in land conservation funding to the Gulf Coast region.

The Partnership facilitates additional land conservation in the region through capacity building, public policy, and communications. A pair of the Partnership's projects have been especially consequential: the 2014 report, “A Land Conservation Vision for the Gulf of Mexico Region,” which is a consensus document

involving land trusts that prioritizes areas for conservation; and the Partnership's Project Assistance Fund (PAF), which provides matching grants of up to USD \$25,000 to help land trusts conduct due diligence for land conservation initiatives such as the Robinson Preserve Expansion. That initiative, championed by the Conservation Foundation of the Gulf Coast, conserved a 150-acre parcel in Manatee County on the west coast of Florida. In a similar effort, the PAF helped to finance due diligence work on the Fleming Plantation project, which, with leadership from the Trust for Public Land, conserved a 3,000+ acre parcel in coastal Louisiana.

The Partnership for Gulf Coast Land Conservation, serving as a regional coordinating organization, offers a model for how local land trusts can bring conservation to scale. Such collaborations help propel the growing movement recognizing the ecological benefits of conserving connected landscapes. The Partnership is similar to Regional Conservation Partnerships (RCPs) established to increase the pace and scale of conservation in New England. RCPs facilitate collaborative decisions on land conservation goals and leverage their knowledge and strengths to fundraise for larger projects. The number of RCPs in New England has grown from four in the 1990s to 43 in 2021, encompassing 60 percent of the region's landscape. In the Gulf region, the Partnership continues to develop its Conservation Vision and Partnership Assistance Fund to meet larger conservation goals. It is revising the Conservation Vision, for example, to add flood mitigation benefits to the criteria for conservation prioritization. The Partnership is also developing a conservation assessment tool to prioritize projects seeking PAF support, and will be issuing a second round of PAF grants, funded by the Gulf Coast Ecosystem Restoration Council through the United States Environmental Protection Agency.

LEARN MORE

Extensive additional resources are available from the Partnership for Gulf Coast Land Conservation, <https://gulfpartnership.org/>, and the case profile of the Partnership for Gulf Coast Land Conservation prepared by Kavita Macleod for the Lincoln Institute of Land Policy, from which this example is excerpted: www.landconservationnetwork.org/resources-education.

CHAPTER 4

Biodiversity Conservation



A pair of *Merops apiaster*, or European bee-eaters, feeding in France. The migratory species breeds in southern Europe and in parts of northern Africa and western Asia and winters in tropical Africa. Photo: Pierre Dalous

Land conservation organizations are protecting and restoring the habitats of important species on private lands, contributing to the conservation of biodiversity within regions, countries, and across the globe. Increasingly, the organizations focus on building greater connectivity by finding and conserving places and corridors that allow species to persist even as the changing climate pushes them well beyond their usual ranges.

Climate change is shifting habitats in ways that prevent key pollinator species from supporting functioning ecosystems. This loss of biodiversity can disrupt Earth's nitrogen, carbon, and water cycles. The interrelation between the climate and biodiversity was highlighted in a 2021 report cosponsored by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services and the Intergovernmental Panel on Climate Change (IPBES-IPCC). The report exhorted government leaders, scientists, policy makers, and practitioners to consider and address climate and biodiversity issues jointly (Pörtner 2021).

Land trusts and conservancies work with landowners and communities to support and encourage stewardship and land uses compatible with biodiversity conservation while acquiring and protecting key parcels. They also are pioneering methodologies to identify and prioritize places where conservation will enable species to thrive. The following two examples illustrate the different ways civic organizations from both sides of the Atlantic—one in the eastern United States, the other in central Germany—are working to stem biodiversity loss. These examples offer a small window into what land conservation organizations are doing to address climate and biodiversity.

Open Space Institute: Prioritizing Climate in Land Protection in the Eastern U.S.

The story of the Open Space Institute starts in 1963, when Richard Pough established an informal Open Space Action Committee (OSAC) program as part of the Natural Areas Council that he ran. Pough was a gregarious and highly competent fundraiser as well as a passionate advocate for protecting wildlife and habitat. He played a key role in the founding of The Nature Conservancy in the 1950s.

OSAC was formally incorporated in 1964. It published

the book *Stewardship* in 1965 to start “moving the message.” By 1967, the organization had changed its name to the Open Space Institute. As explained by Pough's close associate Charles Little, “Our open space protection plan had a clear course of action: salesmanship, persuasion, and planning. . . . Our goal was to reach the non-specialist.” As further detailed in an Open Space Institute remembrance of Pough, “efforts to prevent the loss of open space would be fruitless without a successful campaign to enlighten landowners living within 22 counties (those closest to metropolitan New York City), providing information about how they could continue to enjoy their properties while protecting the land for future generations” (Open Space Institute 2003). Pough was delighted that the book and an associated field promotion campaign had a positive influence over time. “It has been a very successful program. We got a good many million dollars' worth of land given, one way or another, to private or public agencies” (Boyle 1973).

Pough handed over leadership of the group to John Adams (who was also running the four-year-old Natural Resources Defense Council) in 1974. Thanks to a very large gift from the estate of Lila Acheson and DeWitt Wallace, founders of *Reader's Digest*, OSI launched an expanded geographic focus within New York State. In 2003, nearly 30 years after Adams began his tenure, he said of the endowment gift: “Their generosity and foresight enabled OSI to acquire land throughout New York's highlands through fee and easement purchases. Since . . . 1974, we have protected over 80,000 acres. I think it would be fair to say that the Lila Acheson and DeWitt Wallace Fund for the Hudson Highlands not only changed OSI but had a huge impact on New York and its landscape.”

OSI's strength as a leader in regional land conservation continued to grow as the institute celebrated its 40th birthday in 2003 and 2004. Christopher “Kim” Elliman returned to the organization after a four-year hiatus to become its chief executive officer alongside President Joe Martens. Peter Howell joined OSI from



Abby Weinberg, Open Space Institute's research director, has managed a number of the organization's initiatives, including a recent two-year project, "Catalyzing Land Trust Capacity for Data and Science Integration."

Photo: Brett Cole, courtesy of OSI

the Doris Duke Charitable Foundation to become Open Space Institute's executive vice president and director of the Conservation Finance Program. Abigail Weinberg joined the staff in 2004 to coordinate the conservation finance program as a newly minted graduate of the master's program at the Yale School of Forestry and Environmental Studies. The newly refreshed team wasted no time expanding on a trend started several years earlier to invest OSI's talent and conservation capital well beyond the boundaries of New York State, to the Northern Forest of New England and New York, as well as to the south and west in New Jersey (Open Space Institute 2005).

Just as OSI was expanding its scale and scope, a new paradigm of land and biodiversity conservation was emerging. Traditional biological conservation had been described by Karen Poiani, Brian Richter, Holly Richter, and Mark G. Anderson in a February 2000 *BioScience* article as "a crisis-oriented discipline focused on [single] rare or endangered vertebrates." However, conservation biologists were realizing that traditional biological conservation had "quickly broadened to encompass groups of species," and then broadened again into "a growing appreciation of the enormous complexity and dynamic nature of ecological systems [leading] to the concept of ecosystem management, wherein success is best assured by

conserving and managing the ecosystem as a whole."

Managing the ecosystem as a whole, the authors argued, would require ecologists to understand the attributes of remaining "functional landscapes," including composition and structure, dominant environmental regimes, minimum dynamic areas, and connectivity across multiple scales. The authors conclude with a key imperative for conservation planners:

"It is critically important to identify and prioritize all remaining functional landscapes for future conservation. Such areas will likely remain viable over long time frames and provide the diverse environmental gradients and regimes necessary for biodiversity to respond to global change."

Evolving ecosystem science, as well as the State Wildlife Action Plans developed by colleagues concentrating on habitats from Maine to Georgia, spurred OSI's continuing geographic expansion as well as its focus on landscape-scale conservation throughout the first decade of the 21st century. The outcomes of these long-term efforts were considered in OSI's 2010 annual report:

At the beginning of the last decade, the Open Space Institute—after establishing itself through

a quarter-century of land acquisition and conservation leadership in New York State—began to broaden its reach. Since then, OSI has grown into a singular conservation intermediary, targeting and increasing funds for transactions and conducting research for smarter conservation up and down the East Coast, from Maine to Georgia.

OSI began supporting conservation projects outside New York in fall 2000. With support from several foundations, OSI launched its initiative to provide funding, through loans and grants, to deserving projects in places where conservation was needed most. Armed with the experience of conserving 100,000 acres in New York State, OSI targeted hotspots in the southern Appalachians, Western Massachusetts, and the Northern Forest of New York and New England—places where its conservation dollars would have the greatest impact.

Ten years later, it has funded the protection of 1.7 million acres across seven East Coast states, with significant secondary effects as well. OSI's early and substantial funding helped protect hundreds of thousands of acres in the Northern Forest, and its regrant initiative in northwestern Georgia helped attract additional money and land trust involvement to accelerate the conservation of almost 7,000 acres. "More than once, OSI's expression of interest and commitment of financial resources for priority wildlife habitat projects has been the deciding factor in the successful protection of a landscape," said Bruz Clark, president of the Chattanooga-based Lyndhurst Foundation, a frequent partner in the southern Appalachians.

In July 2010, Mark Anderson, based in the Boston regional office of The Nature Conservancy (and a coauthor of the 2000 *Bioscience* article cited above), and his colleague Charles Ferree published their landmark scientific article, "Conserving the Stage: Climate Change and the Geophysical Underpinnings of Species

Diversity" (PLOS One 2010). In the paper, the authors make a strong case that "geologic factors may take precedence over climate in explaining diversity patterns," and that "if geophysical diversity does drive regional diversity, then conserving geophysical settings may offer an approach to conservation that protects diversity under both current and future climates."

By 2013 it was clear that OSI and one of its principal funders, the Doris Duke Charitable Foundation (DDCF), were paying close attention to Anderson's work. In August 2012, Andrew Bowman, then director for the environment at DDCF (now president of the Land Trust Alliance), wrote:

New approaches are emerging to enable habitat conservation planners to identify key sites that exhibit climate change resilience. Because species distributions are tightly correlated with physical characteristics of the land, especially geology and elevation, conserving a broad variety of geophysical settings, such as limestone valleys and silt floodplains, could offer a robust and efficient approach to protecting biodiversity under future climate scenarios. By mapping geophysical settings across ecoregions and evaluating sites within them for resilience characteristics (landscape complexity and connectivity), scientists can identify critical resilient places—those that will conserve the full spectrum of settings where biodiversity, writ large, can flourish and evolution can play out.

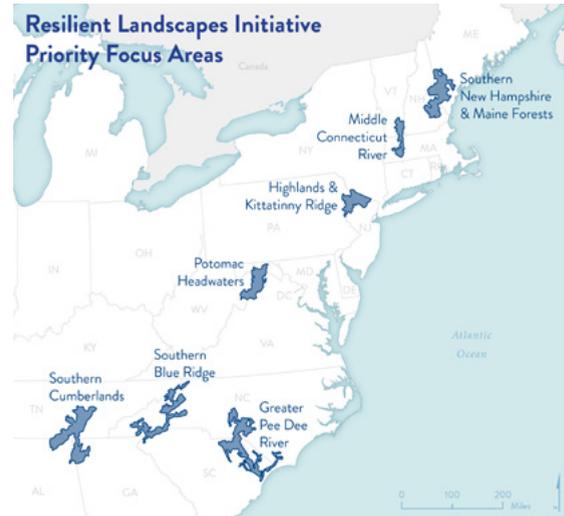
Developing methodologies focusing on geophysical settings and resilience factors continues within The Nature Conservancy (TNC), supported in part by grants made by the Doris Duke Charitable Foundation's Environment Program. For instance, TNC applied these methodologies in the 13 Northeast/Mid-Atlantic states of the U.S., to identify sites resilient to climate change. We recently awarded grants totaling more than USD \$12 million to the Open Space Conservancy to support

habitat conservation planning, prioritization, and acquisition activities that will be informed by TNC’s resilience analysis (DDCF blog, 2012).

In OSI’s 2012 annual report, the organization indicates how the grant to the Open Space Conservancy (the land acquisition arm of the Open Space Institute) would shape the further evolution of OSI’s strategy.

In 2013, with the generous support of the Doris Duke Charitable Foundation, OSI is targeting the conservation of these places by launching the Resilient Landscapes Initiative, a capital fund using TNC’s science as its basis that is designed to protect some of the most diverse lands in the eastern United States. Along with complementary educational and training programs, the Fund will support land protection projects in four focus areas chosen from 13 mid-Atlantic states (OSI 2012).

Peter Howell, who by 2013 headed the Conservation Capital and Research Program, provided strategic oversight of the Resilient Landscapes Initiative. Reporting to Howell and leading the research and training portion of the work was Abby Weinberg, who had become the organization’s director of research. Weinberg led the effort to publish a three-part guide for land trusts in the Northeast called *Conserving Nature in a Changing Climate*. She also managed a two-year project at OSI focused on “Catalyzing Land Trust Capacity for Data and Science Integration.” Actual land acquisition efforts were overseen by Jennifer Melville (who also reported to Peter Howell), supported by field staff in seven regions: Southern New Hampshire and Maine Forests; the Middle Connecticut River in Massachusetts and Vermont; New Jersey Highlands and Kittatinny Ridge; the Potomac Headwaters of Virginia and West Virginia; the Southern Cumberlands in Alabama, Georgia and Tennessee; the Greater Pee Dee River in South Carolina and North Carolina; and the Southern Blue Ridge in North Carolina, South Carolina, and Tennessee (see map, above).



Areas targeted for protection by OSI’s Resilient Landscapes Initiative. Map: Open Space Institute

From 2013 to 2021, the Resilient Landscapes Initiative’s cumulative outcomes have been impressive. OSI awarded roughly USD \$11 million in funding—provided by DDCF, Jane’s Trust, and other organizations—to support 59 projects that protected about 50,000 acres that met the program criteria. The USD \$11 million leveraged a cumulative total of USD \$117 million invested in land protection by federal and state governments, philanthropies, landowner donations, and local contributions. The protected land, now owned and managed by a variety of public and nonprofit organizations, includes sites critical to the entire Appalachian region’s resilience, such as select parcels within the Cherry Valley National Wildlife Refuge (NWR) in eastern Pennsylvania (see photo, page 32). In addition to protecting the water quality in the Delaware River basin, the site is an important wildlife refuge and recreational resource, providing a critical buffer of protected land around the Appalachian Trail, which runs through it. The Cherry Valley NWR now provides connectivity and biological integrity along a portion of the 2,200-mile trail that extends from Maine to Georgia.

In addition to providing financial capital for land protection, OSI’s effort built human capital and organizational capacity. The organization has engaged 120 land



Mountaintop meadow in the Cherry Valley National Wildlife Refuge in eastern Pennsylvania. Support from OSI's Resilient Landscapes Initiative has expanded the refuge. Photo: Nicholas A. Tonelli

conservation organizations in preparing “climatized” conservation plans and reached 1,300 conservation practitioners through its Climate Trainings (Open Space Institute 2021). Of particular importance to wildlife, the acres protected included more than 13,000 acres of rare limestone habitat and 10,250 acres of climate connectors linking resilient stretches of land. The emphasis on limestone habitats derives from Mark Anderson’s underlying scientific insight, which introduced a new paradigm in conservation science and was explained in an OSI publication reviewing the Resilient Landscape Initiative’s progress.

The exciting promise of resilience science lay in its emphasis on protecting persistent features of the land—not just its biological aspects, but physical features as well. Of particular importance were certain geologies, such as limestone soils, that highly correlate with biodiversity, and microclimates, typ-

ically found in more topographically diverse landscapes, that allow species to find refuge during climatic upheaval (Open Space Institute 2021).

OSI managers identified tension inherent to implementing the goals of the Resilient Landscapes Initiative. Because conserving key geophysical settings is important, including fertile ones at low elevations that contain a lot of development and farming, the staff had to wrestle with committing relatively large amounts of money to protecting relatively small parcels, or doing more traditional “bucks and acres” deals. Based on Mark Anderson’s analysis, staff members felt the tradeoff was justified but emphasized that this is an ongoing challenge.

Furthermore, additional research and mapping is needed to better understand how to bring more equity into resilience work. Resilient landscape investments and

the priorities of leaders in the Black, Indigenous, and People of Color (BIPOC) community don't always mesh. To better integrate resilience with equitable conservation, OSI is considering how mapping can identify places where alignment exists and provide those areas with more resources.

OSI's scope is much larger than its Resilient Landscapes Initiative. The total USD \$12 million land acquisition and education budget spent on Resilient Landscapes over about seven years—an average of less than USD \$2 million per year, principally regranted funds supplied by DDCF—is a small portion of OSI's cumulative annual budgets over that period. In fiscal year 2020, for example, OSI reported total expenditures of more than USD \$54 million and total net assets of more than USD \$296 million. With a portion of that budget, OSI is striving to “embrace diversity to accomplish the mission of conservation for all people.” It does so in part through land protection initiatives such as its ongoing work along the Black River in South Carolina, which is home to a large low-income African American community. In 2020, OSI helped protect the 310-acre Hinds-Canada property along the Black River to provide recreational opportunities and important wildlife habitat in addition to safeguarding local communities from flooding by protecting low-lying areas from development (Open Space Institute 2020).

In 2020, when the Resilient Landscapes effort was complete, OSI launched a fund called the Appalachian Landscapes Protection Fund (ALPF). ALPF (see its target areas on the map, page 34) builds on the accomplishments and strategy of earlier programs at OSI. In addition to targeting resilient lands that are likely to provide long-term “stages” for biodiversity, the new fund also prioritizes forests that now—and in the coming decades—are expected to sequester significant volumes of carbon. The new fund also emphasizes collaboration with diverse human populations most likely to bear the full brunt of the accelerating climate

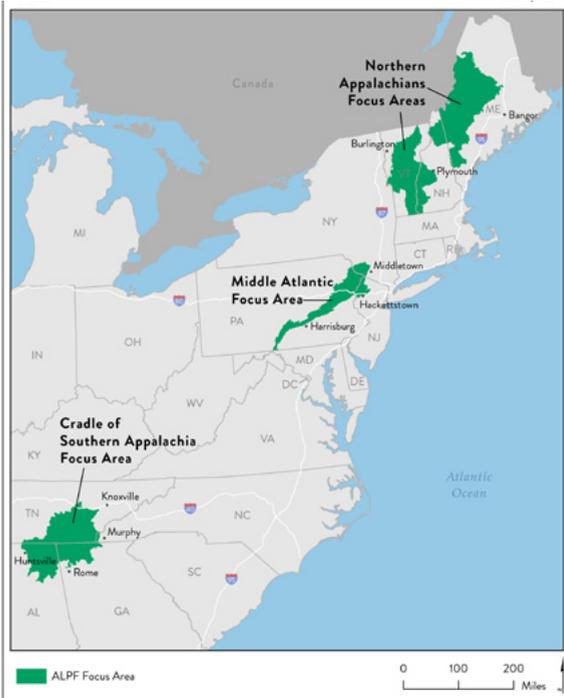
crisis. As OSI noted in a February 2021 press release:

To achieve critical, climate-related conservation goals, OSI is providing grants and loans for the acquisition of land and conservation easements that will leverage an additional USD \$66 million in matching public and private funds. The ALPF also advances efforts by states, local communities, Native American tribes, and land trusts to align their conservation goals around climate priorities. The ALPF will ease funding requirements for organizations that identify as Black, Indigenous, and People of Color—led that have a high risk of being negatively affected by the climate crisis.

The Northern Appalachians focus area is one of three specific regions that are priorities for conservation by the ALPF, based on their intact habitat; ability to serve as corridors for migrating wildlife; contiguous forests; and ability to protect and increase carbon storage in vast forest resources that also provide clean water and recreational opportunities for millions of people (OSI press release 2021).

OSI was created to focus on open space and biodiversity conservation; the organization now puts increasing emphasis on climate change. That shift aligns with a recent workshop report jointly issued by the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES). The IPCC and the IPBES are two panels associated with major international agreements on climate change and biodiversity that are monitored by the United Nations—affiliated “Conventions of the Parties,” or COP meetings, held every several years.

The synopsis of the report offers the following statement, which indicates that actions taken to address climate change are much better coordinated than those taken to protect biodiversity: “Limiting global warming



Areas targeted by OSI for protection through the Appalachian Landscapes Protection Fund. Map: Open Space Institute

to ensure a habitable climate and protecting biodiversity are mutually supporting goals, and their achievement is essential for sustainably and equitably providing benefits to people.”

Later in the report synopsis, the authors state: “The mutual reinforcing of climate change and biodiversity loss means that satisfactorily resolving either issue requires consideration of the other” (IPCC and IPBES 2021).

OSI appears likely to turn its attention, and action, to increasingly addressing both challenges in a comprehensive, coordinated fashion.

LEARN MORE

Extensive additional resources are available from the Open Space Institute:
www.openspaceinstitute.org

NABU’s Restoration of the Lower Havel River, Germany

The Lower Havel River project in northeast Germany highlights an effort to restore an industrialized river system to its more natural, organic state. The river once transported goods via barge for the local economy, but today this service is no longer needed. The rehabilitation that has followed provides multiple benefits, including enhancing biodiversity and habitat, delivering significant recreational value, and providing natural flood protection to the region. This project now serves as an example for other river restoration projects across Europe and beyond.

The project started with a dream of a better future for a beloved resource. Rocco Buchta is one of the passionate conservationists who has advocated for the river’s restoration over many years. He was born in 1965, when the first conservation efforts along the Havel were just starting. Childhood memories motivated Buchta to join the conservation movement—he remembered wandering around flooded meadows, taking morning fishing excursions on the misty riverscape with his grandfather, and carefully observing the abundant birdlife across the watershed. He is now the project coordinator, and his hopes for his children’s generation are finally being fulfilled: They can swim in the Havel’s crystal-clear water, sit on its sandy beaches, and observe the daily routines of kingfishers, beavers, and otters.

Work on the physical restoration of the Lower Havel River finally commenced in 2005 after decades of persistence by river conservationists. The project area is 70km (43 miles) west of Berlin. Naturschutzbund Deutschland e.V. (NABU), the German partner of BirdLife International and one of the nation’s largest conservation organizations, led the project.

The Havel River flows through a mostly flat and sandy landscape in northeast Germany. Over its course of



334km (208 miles), the Havel passes through Berlin and into one of the most critical noncoastal wetland areas in the western part of Central Europe, the Lower Havel Lowland. Finally, the Havel flows into the Elbe River, a major German waterway that flows into the North Sea.

In the past several centuries, the Havel River served as a critical transportation corridor connecting Berlin to the sea. During the post–World War II era, when Germany was divided in two, the Havel was used intensively to ship cargo between West Germany and Berlin. Like many other rivers in Germany and Europe, the river had been heavily modified to construct and maintain shipping channels. To maintain commercial river traffic, the water level was regulated by weirs and water gates, cutting the river off from its floodplains. These measures resulted in major losses of biodiversity and severe disturbances of the natural river dynamics. Ecosystem services such as

Havel River in Brandenburg, Germany. Photo: hsvrs/Getty Images

natural flood protection and the delivery of nutrients and water to agricultural sites were steadily reduced.

Still, the Lower Havel River and its adjacent wetlands remained ecologically important. Even before the restoration project began, the Lower Havel Lowland provided habitat for more than 1,100 threatened and endangered plant and animal species. Nature conservationists successfully achieved legal protection for some parts of the area. In 1978 a Ramsar site, wetlands designated as internationally important, was established. Additional areas within the watershed were protected under the auspices of the European Union's Natura 2000 protected areas network. Despite these official protections, however, the river ecosystem and its adjacent wet-

The Havel River flows through northeast Germany to Berlin and into one of the most critical noncoastal wetland areas in the western region of Central Europe. Map: Elena Wenz



lands were severely degraded by the last decades of the 20th century.

The turning point came after German reunification in 1989. The Lower Havel Waterway's importance as a freight shipping corridor declined in 1990, when unified road and highway networks opened. A group of nature conservationists then began to promote a large-scale river restoration project, meant to restore a near-natural watershed with a meandering river and adjacent wetlands, and rich biodiversity. In addition, the project was expected to foster natural flood prevention for downstream cities and infrastructure; improve water quality for residential, commercial, and industrial water users; improve conditions for peatlands; and augment recreational value for the local population and tourists.

As of 2021, many of these expectations have been met (NABU-Aueninstitut). Funding of about 51 million euros (USD \$58 million) has been committed for the project, with an application pending for an additional 29 million (USD \$33 million), which would effectively extend the project to 2033. Most of the project costs have been financed by the German Environmental

Ministry, the federal states of Brandenburg and Saxony-Anhalt, and NABU. Some smaller projects have been funded by small donors including municipalities and private companies.

When the restoration is completed along the 90-km (56-mile) stretch of waterfront, the river will have space to flow again. The Project Development Plan aims to do the following:

- Reconnect river and flood plains by removing 32 dams and two dikes; reconnect smaller watercourses (including up to 23 cut-off meanders) to the river, thereby creating about 500 hectares (1,236 acres) of additional active floodplains;
- remove 71 bank stabilizations along roughly 29km (18 miles) of shoreline;
- increase the floodplain forest area on existing and newly created areas by about 494 acres (200 hectares) in the near term, and potentially by about 700 hectares (1,730 acres) over the long term;
- establish nature-compatible river maintenance in the entire core zone, including developing a more dynamic water management system,

- building fish ladders, and adapting grassland management, and
- purchase about 620 hectares (1,532 acres) of land to ensure that the goals of the maintenance and development plan are met.

The institutional and administrative framework of the waterway was a significant issue raised by the project. In Germany, most rivers are still treated as major infrastructure for transportation, even as that role has significantly diminished for most of these waterways. Implementing nature conservation measures required contending with numerous regulations, most of which don't deal with river restoration. A successful lobbying strategy for changing how the waterway is administered proved important in making the restoration project possible.

Several factors have contributed to the project's success thus far. First, the long-term commitment of dedicated nature conservationists, many of them deeply connected to the area, was essential. A group of scientists, foundations, and NGOs working with the project design and implementation team played an important role, especially in lobbying for the legal conditions required to implement the project. The project team felt that being trustworthy and reliable with public authorities and the local population was important. For instance, all conservation measures implemented had been agreed upon in official resolutions by municipal parliaments. Furthermore, the restoration project office has been flexible regarding specific conservation measures. Most of the actions were planned in the preparation phase and implemented when money was available.

Lobbying and networking were crucial, starting long before the first physical conservation measures were undertaken along the river. Stakeholder involvement was a huge part of the planning phase, and a project advisory group was established consisting of 130 institutional members. Between 2005 and 2009, 90 municipal events were organized at 30 locations

Restoring the Havel River took the long-term commitment of dedicated nature conservationists working in collaboration with scientists, foundations, and NGOs.

to provide general information, present intermediate results, and secure official adoption of the restoration measures by municipal parliaments.

To conclude, the restoration of the Lower Havel waterway serves as an important precedent, laying the groundwork for other river restoration projects spurred by the European Union's Water Framework directive and by additional funding sources. Project staff members are sought-after experts on river restoration proposals and projects throughout the region. The restored river is becoming increasingly attractive to visitors and residents. Additionally, the project demonstrates that natural flood protection is possible, effectively replacing portions of the older gray flood protection infrastructure system without adverse effects on surrounding settlements.

The copious benefits for biological diversity are obvious, especially as near-natural river ecosystems have become quite rare in the European Union. Starting in 2022 and continuing for about three years, the project's ecological impacts will be thoroughly evaluated by public authorities. For now, anecdotal and visual evidence is convincing locals that the Havel River is coming back strong. As a World Wildlife Federation EU representative tweeted in April 2021, alongside emojis of a fish, beaver, eagle, snake, and evergreen tree: "Thanks to restoration, the Havel River in Germany is once again full of biodiversity and wildlife. . . . It is possible to bring nature back from the brink."

CHAPTER 5

Carbon Sequestration



In 2020, global carbon markets grew by 20 percent, hitting a record USD \$272 billion. In the European Union, the benchmark carbon price surpassed 50 euros (about USD \$56) for the first time ever in May 2021. As carbon markets gain traction globally, the value of protecting and restoring plants, soils, and geologic formations that store and remove carbon from the atmosphere is growing.

Torres del Paine National Park in Chile's Patagonia region.

Photo: Mirko Thiessen/Wikimedia

Much is still unknown about carbon, and storage capacity and carbon stocks are highly dependent on context and land type. But in general, land-based practices such as afforestation (creating new forests), reforestation, agroforestry, and soil carbon management can maintain and strengthen the carbon-sink role played by forests, wetlands, peatlands, and grasslands.

As trusted partners in sustainable land management, land trusts and conservancies are progressing toward linking conservation and restoration action to carbon markets for businesses and landowners. This includes directly conserving and restoring land and making it easier to participate in voluntary carbon offset markets. Consequently, they are helping to inspire enough carbon sequestration at scales large enough to attract the interest and partnership of stakeholders in public and private sectors.

The following examples show the multiple ways in which land conservation organizations are boosting the effort to draw down and store carbon, whether measured in tonnes (metric tons) of carbon sequestered or in the number of acres used to store it. The

Australian organization Greening Australia has audacious goals to sequester carbon and help companies offset their emissions. In a different hemisphere, Scenic Hudson is building a comprehensive climate action plan that involves working closely with farmers across a region of New York State to undertake agriculture practices that keep carbon in the soil. And a little farther north, public, private, civic, and academic institutions in Vermont are collaborating to enable landowners to generate carbon offsets in small family forests. These steps illustrate the myriad ways land trusts and conservancies are offering solutions to the challenge of carbon.

As noted in this report's Executive Summary, markets for carbon credits are still evolving globally, from California to China to the European Union. Leaders are vigorously debating issues such as additionality, leakage, and verification. As they consider protecting land that may yield marketable carbon credits, land trusts, conservancies, and other civic organizations will benefit from due diligence by participating in certified markets and adhering to local regulatory standards.

UNDERSTANDING CARBON MARKETS

Carbon dioxide emitted into the atmosphere is a major contributor to climate change. Research has shown that even relatively mature forests have the potential to sequester and store large quantities of carbon (that is, remove carbon from the atmosphere and store it in woody biomass and forest soils). The carbon storage potential of such forests can be enhanced further through certain forest management practices.

Landowners can manage their forests using methods that improve carbon storage, and monetize this potential by then selling carbon credits (also known as

carbon offsets) into compliance markets or voluntary carbon markets. Such credits can then be bought by regulated entities that must meet current environmental regulations to reduce their carbon footprint (that is, the net amount of carbon they emit after offsets), or by individuals, nonprofit organizations, and companies that want to reduce their carbon footprint. Such companies might want to meet corporate sustainability goals and shareholder expectations; enhance the public reputation of their company or product; fulfill their civic duty; or demonstrate that they'll be able to comply with potential future regulations.

Greening Australia

On the 10th anniversary of World Environment Day (June 5, 1982), then Prime Minister of Australia Malcolm Fraser announced a National Tree Program to reverse the decline of trees across his nation. Greening Australia, created as the nonprofit partner of the government program, took responsibility for organizing a program to replant trees.

The organization has evolved since that date nearly 40 years ago into one of Australia's largest and most ambitious land conservation groups. Greening Australia's first corporate partner, Alcoa, started working with the nonprofit in its first year. By the early 2000s, the Greening Australia–Alcoa partnership was well on its way to setting a string of important precedents, including:

- refining now-common direct seeding techniques;
- launching an accredited carbon offset program available for participation by the general public in the mid-2000s, when climate change science was still being widely debated;
- developing a large-scale native seed bank, enabling the “collection, storage and sowing of 25 tonnes (27.6 tons) of native seed” across Australia; and
- helping to create a leading pilot for native grassland restoration projects (Greening Australia).

During the first decade of the 21st century, a young manager in Alcoa's corporate affairs department in Australia took a particular interest in the Greening Australia–Alcoa relationship. Prior to joining Alcoa, Brendan Foran had served as a Green Corps supervisor in Conservation Volunteers Australia programs and understood the value of cross-sector collaboration. After nine years with Alcoa, during which he earned a master's degree in business administration from

Federation University Australia, Foran joined Greening Australia and now serves as its chief executive officer.

Foran continues to appreciate the strategic significance of such nonprofit-corporate collaboration today. In an article that named him a “champion” of the Shared Value Initiative (a project conceived of by Harvard Business School Professor Michael Porter and his collaborator Mark Kramer), Foran offers his take on working across sectors.

“The opportunity for us lies in better articulating and broadening the conversations we have with corporate partners and private landholders of the commercial return and environmental benefits of undertaking large and ambitious large-scale landscape restoration projects in Australia” (Shared Value Project 2018).

Greening Australia's interest in collaborating with the private sector can be seen in its current small-scale projects and in the organization's very ambitious plans for the next decade. For example, in the midlands of the island state of Tasmania, south of the Australian mainland, Greening Australia is working to restore about 6,000 hectares (almost 15,000 acres) of critical habitat for seven local species that have global significance, including the Tasmanian Devil. Nearly 1,000 hectares (2,500 acres) have been restored with native vegetation, with 5,000 more hectares (12,355 acres) to be restored in coming years as part of the “Tasmanian Island Ark” project. In addition to restoring habitat, the project also generates carbon credits for local customers such as Pennicott Wilderness Journeys, a company based in Tasmania. The company reports that “Pennicott has 100 percent carbon offset its operations through Greening Australia for the past nine years. To date, it has contributed over AUD \$400,000 (USD \$284,000), which is being spent on biodiversity restoration across Tasmania. These donations have

helped Greening Australia to plant over 200,000 trees, offsetting our CO₂ emissions more than six times” (Pennicott Foundation 2021).

As a whole, Greening Australia in 2020 sequestered some 60,000 tonnes (66,000 tons) of carbon and protected about 6,000 hectares (almost 15,000 acres) of habitat. That level of activity is only a modest base compared to the organization’s annual targets for 2030. Those targets indicate the organization’s tremendous scope, scale, and level of ambition. Greening Australia aims to protect more than 60,000 hectares (almost 150,000 acres) in 2030, more than 10 times the level reached in 2020. In addition, it aims to sequester some 3,300,000 tonnes (3,630,000 tons) of carbon in 2030, a figure more than 50 times as large as its annual achievement in 2020. As Greening Australia’s *2020 Year in Review* report details, such ambition is in line with the huge climate challenge the world faces.

We are serious about maximizing our impact. To ensure that we are contributing to solutions at a global scale, Greening Australia’s 2030 goals are aligned with worldwide targets for climate action, sustainable development, land restoration and biodiversity (Greening Australia 2020).

Greening Australia’s intention to achieve its 2030 goals is clear in its recent agreement with the Australian real estate giant Coldwell Banker Richard Ellis (CBRE). Greening Australia’s agreement with CBRE, which staffs more than 90,000 professionals in more than 100 countries, is described in a May 2021 press release:

The appetite to invest in environmental offsets including carbon sequestered through large-scale tree plantings has increased substantially amid corporate demand to achieve zero net emissions targets.

Greening Australia has consequently appointed CBRE’s agribusiness team as its exclusive real estate services partner, with a target to source 330,000 hectares of land by 2030, via a combination of lease, license, or ownership.

Greening Australia’s Foran said, “The scale of the challenge means we need to leverage the best capabilities. CBRE will assist us in meeting our ambitious targets but also reward landholders for their role in improving the environment.”

CBRE Agribusiness Associate Director Phil Melville said, “CBRE is committed to using its expertise, resources and market influence to help our clients reduce the emissions their properties generate and to applying best practices that improve the sustainability of our own operations” (Greening Australia 2021).

CBRE Australia is not the only large corporate entity to recognize the economic significance of climate change. For example, Andrew “Twiggy” Forrest, a multibillionaire industrialist, recently announced his plans to vastly expand his investments in Australia’s renewable energy capacity. Forrest expects to invest in projects that will serve both domestic and export markets. Similarly, the head of the Australian Renewable Energy Authority foresees Australia as potentially becoming 1,000 percent energy self-sufficient with renewables. That is, he projects that the nation can produce with renewables some five to 10 times the amount of energy consumed by Australians domestically by exporting both electricity and solar-derived green hydrogen to places such as Malaysia and Japan (Vorrath 2021).

Greening Australia’s remarkably ambitious efforts over the coming decade will be closely watched—and carefully scrutinized—across Australia, especially given Foran’s current position as board chair of the



A Greening Australia tree planting project in Penlup, West Australia. Photo: Greening Australia

Australian Land Conservation Alliance (ALCA). The successes and shortcomings of Greening Australia's effort are reflected in the scope, scale, and ambition of the collective ALCA community. In 2020, the Alliance worked across more than 3 million square kilometers (nearly 750 million acres, a land area about 91 percent the size of India), worked with nearly 3,000 Australian landowners, attracted nearly 50,000 supporters per year, had a collective staff of some 650 individuals, and earned more than AUD \$250 million (more than USD \$190 million) in annual revenue (ALCA 2020).

The 2019 ALCA Congress in Adelaide asked: "How will we rise to the Challenge—smarter, faster, different, together?" Projects such as the Tasmanian Island Ark and Greening Australia's larger ambitions for the coming decade are answering that urgent question.

LEARN MORE

Additional resources are available on Greening Australia's website, www.greeningaustralia.org.au/, and in the case profile of Greening Australia prepared by Cecilia Riebl for the Lincoln Institute of Land Policy, from which this example is excerpted: www.landconservation-network.org/resources-education.

Scenic Hudson

The Hudson Valley in New York State is particularly vulnerable to climate change. The region's biodiversity, economy, and the health of its communities will all need to adapt to the rise of tidal flows, hotter summers, the sudden appearance of new disease vectors and invasive species, and myriad other anticipated and unanticipated changes. Accordingly, the valley's many riverfront communities will experience dramatic demographic change and spatial dislocations due to the region's proximity to New York City. The valley's farms and biodiversity will likely be vulnerable to inundation, fragmentation, and under-regulated development. Without careful planning and the long-term protection of its storied landscapes, the region's resilience to the effects of a changing climate impacts may decline markedly.

To its credit, the New York State government is increasingly alert to these threats and working to address them. For example, New York is a founding member of the U.S. Climate Alliance, launched in June 2017. As a leader of this group of 25 states promising to adhere to the 2015 Paris Agreement on climate change, New York has committed to the Climate Leadership and Community Protection Act, pledging that the state will implement the country's most aggressive clean energy and climate action plan. Hudson River communities will face a significant challenge in meeting the ambition and scale of the state's climate-related goals.

Scenic Hudson, founded in 1963 as one of the nation's first regional environmental advocacy and land protection organizations, is particularly well positioned to help individuals, communities, and institutions in the Hudson Valley mitigate climate change threats as well as meet the state's regulatory requirements. The organization accomplishes its goal by striving to realize its vision of the Hudson Valley as "a community of informed and engaged citizens working to make the region a model of vibrant riverfront cities and towns linked by inviting parks and trails, beautiful and

resilient landscapes, and productive farms" (Scenic Hudson). The organization leads in the climate change arena by advocating for policy at the local, state, and national levels; devising science-based ways to protect lands critical to higher biodiversity resilience, human resiliency, and well-sited renewable energy facilities; and putting all those strategies into practice in the Hudson Valley.

Working on climate change is complicated, dynamic, and emotionally charged. Scenic Hudson specializes in developing resources to help its staff and conservation partners in the valley to bring science-based climate considerations into planning and site selection processes and to help implement prioritized projects responsibly. One such project is the protection, in 2017, of 132 acres adjacent to Scenic Hudson's RamsHorn-Livingston Sanctuary. In leading this effort, the land trust ensured that "this land will continue sustaining one of the most unique and unspoiled habitats along the Hudson River estuary and will help the region be more resilient to the impacts of climate change." The decision to protect the site was shaped in part by the fact that "the property ranked highly in Scenic Hudson's new Hudson Valley Conservation Strategy [HVCS] due to its importance in the estuary's adaptation to sea-level rise and climate change. Scenic Hudson developed the HVCS—the next generation of its strategic ranking system used in its Saving the Land That Matters Most initiative—to pinpoint properties whose conservation will maximize land investments by achieving multiple benefits: sustaining biodiversity, increasing resilience to rising sea levels and other climate change impacts, [and] securing the pathways many species depend on for survival and preserving working farmland." (Scenic Hudson 2017)

Scenic Hudson has similarly used its *Roadmap to a Clean Energy Future* and *Clean Energy, Green Communities* guidebooks to assist residents, farmers, and renewable energy developers in the valley to site and design renewable-energy projects that also minimize



Storm King Mountain along the Hudson River, New York. Photo: brandtbolding/Getty Images

“impacts to areas of natural beauty by avoiding designated scenic areas, keeping [the projects] below tree lines and including robust vegetative screening, [as well as combining] solar energy projects with other uses, such as pollinator-friendly plantings, livestock grazing or crops” (Scenic Hudson). For example, in February 2020, Cypress Solar announced the completion of the Bogart Solar project in the town of Catskill in Greene County, New York. “Capable of generating enough power for more than 300 homes annually, Bogart. . . . [features] 2.5 acres of pollinator-friendly habitat,” the company announced in a press release (Cypress Creek Renewables 2020). Scenic Hudson celebrated this announcement because it had managed to get the project’s design modified so it would not interfere with the spectacular views of the artist Thomas Cole’s home, Cedar Grove, now a National Historic Site. Renewable energy siting remains a big challenge to project developers hoping to diversify New York’s electrical energy capacity. Scenic Hudson advocates for streamlined facility-siting protocols that have minimal impacts on notable environmental resources.

Perhaps most visibly, Scenic Hudson has led land trusts and conservancies in the Northeast United States in promoting natural climate solutions. These land use practices not only reduce the carbon emitted by farmers and forest landowners but also sequester significant stores of carbon in the soil and in plants that grow above the ground. Scenic Hudson’s work in this area has focused especially on regenerative agriculture that builds up stocks of carbon in the soil over time.

As an example, the organization hosts research that helps us better understand how farmers in the Hudson Valley can change their practices to reverse the flow of carbon. The goal is to transform these farms into carbon sinks, storing carbon in their soil and woodlands, instead of releasing CO₂ and other greenhouse gases into the atmosphere. Scenic Hudson has partnered with Hudson Carbon, led by Abby Rockefeller and Ben Banks Dobson, who are implementing regenerative agriculture practices and rigorously monitoring them at the Rockefellers’ 2,000-acre farms to figure out how to more effectively sequester carbon in soil. The Scenic Hudson Soil Lab, located at Abby Rockefeller’s Old

Mud Creek Farm, was established with funding from the Scenic Hudson Land Trust (operating under the auspices of Scenic Hudson) to purchase development rights on the farm in 2015.

Scenic Hudson also is a pioneer in bringing together farm, forest, and wetland managers, scientists, and public policy experts in regenerative practices. These specialists share data and advance policies that will ultimately provide compensation and incentives for landowners implementing regenerative practices. For example, on April 23, 2021 (the day after Earth Day and President Biden's proclamation advancing his climate agenda), Scenic Hudson convened a virtual conference, Carbon Sequestration from the Ground Up: Opportunities in Northeastern Farms and Forests. During the conference's opening panel, Scenic Hudson's Ned Sullivan, Doris Duke Charitable Foundation's Sasha Spector, and the U.S. Climate Alliance's Jennifer Phillips explained the remarkable potential of working lands in the United States to sequester carbon. Spector, for instance, explained that the use of cover crops are highly cost-effective and could potentially mitigate about 100 million tonnes per year of CO₂ equivalent in the United States in 2025 (Scenic Hudson 2021).

Through its thoughtful advocacy, science-based planning, and land conservation strategies, Scenic Hudson remains an exemplary model for land trusts and environmental organizations in the U.S. and around the world that are working to address climate change.

LEARN MORE

Extensive additional resources are available from Scenic Hudson, <https://www.scenichudson.org/our-work/climate/>. Also see the case profile of Scenic Hudson prepared by Kelly Watkinson of the Land Trust Alliance for the Lincoln Institute of Land Policy, from which this example is excerpted: www.landconservationnetwork.org/resources-education.

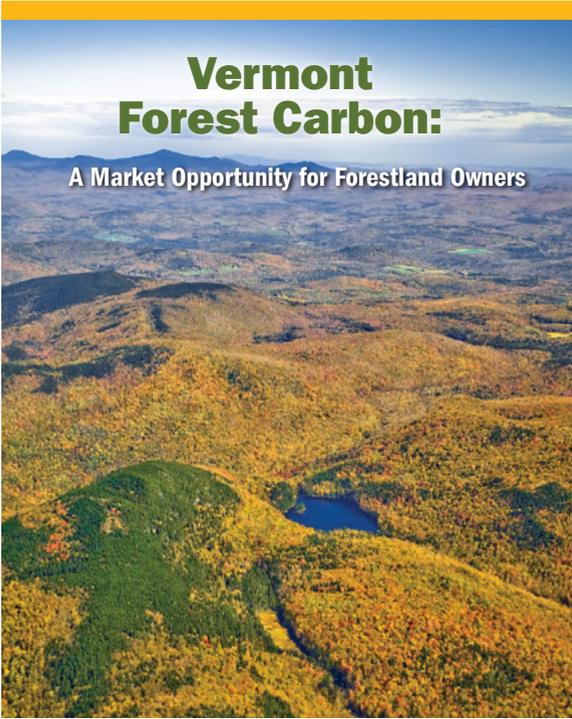
Cold Hollow Carbon (Vermont Land Trust)

Cold Hollow Carbon represents one of the first aggregated forest carbon offset projects in the United States. Developed by a multi-consortium partnership led by the Vermont Land Trust and implemented through its subsidiary, Vermont Forest Carbon Company, this project has successfully aggregated 10 landowners over 12 parcels totaling roughly 8,600 acres within the Cold Hollow Mountains of Vermont. Working together, these landowners generate carbon credits to sell in the voluntary carbon market. This proof-of-concept project has demonstrated that aggregated carbon arrangements can economically and efficiently connect forestland owners to carbon offset markets in areas where smaller, private forestland holdings predominate. It has also demonstrated that land trusts and their special-purpose subsidiaries can host aggregated carbon offset projects.

The multi-sectoral, multi-consortium partnership responsible for organizing and realizing the Cold Hollow Carbon project includes diverse organizations including the Vermont Land Trust, the University of Vermont, the Spatial Informatics Group (a private company providing analytical services), the Cold Hollow to Canada Regional Conservation Partnership, and The Nature Conservancy (TNC). In addition to helping connect potential buyers to the carbon credits, early on TNC also provided guidance and support through a Natural Climate Solutions Accelerator Grant funded by the Doris Duke Foundation. Two organizations deeply rooted in sustainable natural resource use and economic development, the High Meadows Fund and the Vermont Housing and Conservation Board, also provided funding and project guidance. The Lyme Timber Company and Finite Carbon offered financial help, and the principal buyers of the carbon credits supplied by the project are Gratitude Railroad, an impact investment group, and Amazon.com.

Vermont Forest Carbon:

A Market Opportunity for Forestland Owners



Vermont Land Trust's 2018 report highlighted the carbon opportunity in the state. The University of Vermont and the Spatial Informatics Group partnered on the report.

The number of credits that a forest landowner (or a group of them) can sell is determined in part by the size of the available forest parcel(s), the forest type(s), and existing and projected stocking levels associated with certain management practices. All of those details affect “baseline” carbon storage, against which carbon credits are generated. The number of credits is calculated by forestry experts who use field-based measurements and other methods to estimate how much carbon can be sequestered by a specific forest landholding in excess of the established baseline. For both the compliance and voluntary markets, carbon credits are generated following established protocols and listed in registries; the Vermont Forest Carbon Company has used the American Carbon Registry.

High upfront “soft” costs, or transaction costs, can deter owners of relatively small forest lots from partic-

ipating in these markets. Expenses include conducting a field inventory, estimating forest carbon sequestration potential, developing an appropriate financial structure, third-party verification, registry fees, and other necessary work. Cumulatively, such costs can range from USD \$250,000 to USD \$1 million or more per project—prohibitive for most owners of relatively small forest parcels. (Generally, most lots smaller than 5,000 acres and nearly all lots smaller than 1,500 acres get excluded.)

The Cold Hollow Carbon project demonstrates that aggregating small- to medium-sized, privately owned forest parcels of about 200 acres or more can effectively spread soft costs over a larger number of forest acres; this allows the owners of relatively smaller forest parcels to bring their carbon credits to market. In light of volatile timber markets, and with ancillary income from selling such products as maple syrup, owners can generate enough profit and positive cash flow and multiple cobenefits to make keeping their forests financially feasible.

One cobenefit of such aggregated projects is that they can inspire private owners to keep their forests intact over the long term, rather than convert the land for other purposes. For example, selling credits into the Cold Hollow Carbon cooperative agreement requires participating landowners to commit to carbon stocking targets in their forests for 40 years. So for four decades, participating forest owners cannot convert their forests for uses not specified in their agreement with the Vermont Forest Carbon Company.

The incremental protection of many such relatively small forest lots can generate additional systemic benefits across a large swath of Vermont and even the entire Northern Forest, which stretches from the Gaspé Peninsula in Quebec and New Brunswick, Canada, to western New York State. The expected benefits of the Cold Hollow Carbon project (officially known as the Forest Carbon Cooperative at

The Cold Hollow Carbon project demonstrates that by aggregating small- to medium-sized, privately owned forest parcels of about 200 acres or more into one package, “soft” or transaction costs can effectively be spread over a larger number of forest acres, allowing owners of smaller forest parcels to bring their carbon credits to market.

Cold Hollow to Canada), which is administered by the Vermont Forest Carbon Company, a subsidiary of the Vermont Land Trust) include the following:

- increased carbon sequestration by the acres of forest enrolled in such efforts
- income for landowners over 20 years to pay for enhanced forest management practices
- healthier forests, cleaner water, and reduced damage from future floods
- greater diversity of plants and animals and healthier wildlife habitat
- continued timber harvests and maple sugaring
- potential reduction of summer heat island effects in nearby towns and cities; and
- long-term protection of the Northern Forest and the economic and environmental benefits it provides.

Through similar cooperatives, such benefits could potentially be extended across Vermont, the entire Northern Forest region, and elsewhere.

LEARN MORE

Extensive additional resources are available from the Vermont Land Trust, www.vlt.org/forestcarbon, and from the case profile of Cold Hollow Carbon prepared by Kavita McLeod for the Lincoln Institute of Land Policy, from which this example is excerpted: www.landconservationnetwork.org/resources-education.

CHAPTER 6

Energy Production and Distribution



Kansas wind farm as seen along
Interstate 70.

Photo: Getty Images

Renewable energy development illustrates the potential trade-offs between climate and biodiversity. Wind and solar energy are among the most effective tools for reducing greenhouse gas emissions from fossil fuels, so they are crucial to decarbonizing global energy production. Renewable energy has grown remarkably and costs have decreased over the past two decades, and global demand is increasing. Yet renewable energy infrastructure production and development can be noisy; change or destroy habitats; and cause collisions and other risks to plants and animals.

In Chapter 4, examples of land trusts' and conservancies' pioneering work on biodiversity conservation showcased how civic organizations are addressing the interconnected climate and biodiversity crises. Many such synergies exist, but not all climate solutions are solutions to biodiversity loss (IPCC and IPBES 2021). Indeed, without careful planning, mitigating climate change can negatively affect biodiversity.

Land trusts and conservancies are leading ambitious efforts to minimize and mitigate these conflicts through planning that recognizes that ramping up renewable energy sources and protecting biodiversity are both important. These groups are developing strategies, protocols, and solutions with beneficial outcomes that avoid such conflicts.

The following cases represent two initiatives led by international organizations charting new pathways by testing and scaling innovations in specific regions. Site Wind Right is a flagship wildlife-friendly renewable energy siting project of The Nature Conservancy, seeded in the native tallgrass prairie of the central United States. Across the globe in the African Rift Valley, BirdLife International is protecting flyways and critical sites threatened by wind turbines and electric powerlines, among other hazards. In both examples, land trusts and conservancies are developing scalable models to navigate the complexity of climate and biodiversity.

Site Wind Right

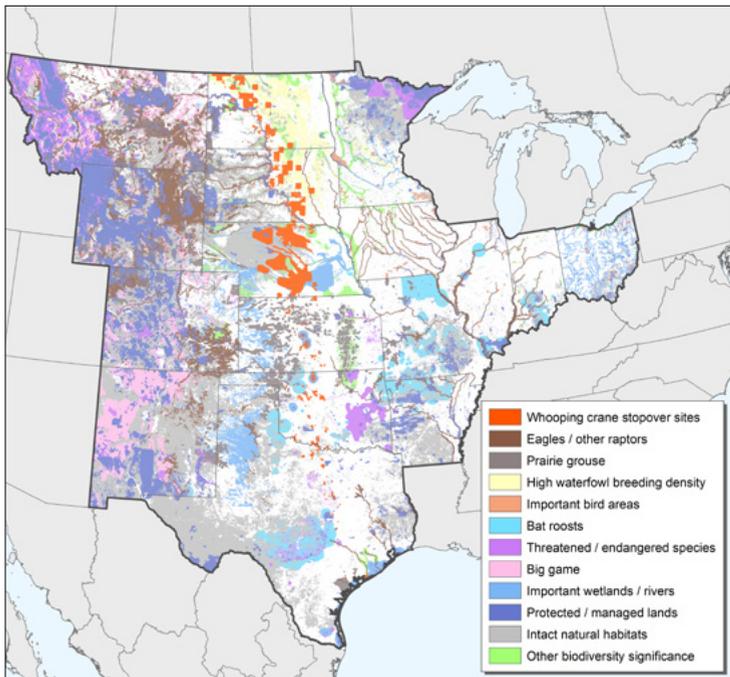
In the popular imagination, the state of Kansas is flat as a pancake as far as the eye can see. In fact, eastern Kansas is home to the remarkably scenic, undulating Flint Hills, also known as the Osage Hills in Oklahoma. These hills host the last remaining landscape expression of tallgrass prairie left in North America (Ricketts 1999). Within the past several decades, the Flint Hills have become the focus of an innovative conservation effort that includes The Nature Conservancy, the U.S.

National Park Service, the U.S. Fish and Wildlife Service, the Tallgrass Legacy Alliance, the Ranchland Trust of Kansas, the Kansas Land Trust, local ranchers, and other private landowners. Together, they are stewarding some five million acres of tallgrass prairie.

Brian Obermeyer, who today serves as the director of protection and stewardship for The Nature Conservancy in Kansas, was about one year into the job of leading a community-based conservation initiative in the Flint Hills in 2002 when he first encountered modern wind energy technology. While driving through Iowa to attend a conservation meeting in Minnesota, he noticed a new generation of windmills on the horizon. Obermeyer well understood the importance of renewable energy in helping to mitigate climate change. But it soon occurred to him that wind turbines in the wrong places could disturb wildlife habitats essential to the survival of plants and animals endemic to the Flint Hills and across the Great Plains of North America.

What Obermeyer and a few collaborators started has evolved over the subsequent two decades into a nearly continental-scale effort. The scientific research and wind-siting protocol project involves local and regional scientists across the center of the nation. Named Site Wind Right, the effort is helping to shape the geospatial configuration of a new generation of electric power facilities in the American wind belt, from Texas to North Dakota and from Ohio to Montana. It represents a way to proactively plan to site wind farms to protect biodiversity. The practice of systematically taking wildlife habitat into account when siting wind facilities is now gaining attention from policy analysts, engineers, and senior corporate executives from Argentina to Australia (Sheil 2020).

Conceptually, the Site Wind Right idea is fairly straightforward. An initial step is to make a comprehensive geographic information system (GIS) map of the places that have suitable wind resources for power generation in the geographic range of interest (in this case, a wind resources map layer of the American wind



Biodiversity layer of the Site Wind Right GIS map.

Image: The Nature Conservancy

belt). The second step is to map out areas overlapping with the range or habitat of endemic species (a biodiversity layer), such as the migration route for the whooping crane, along with areas of potential engineering and land-use restrictions (an infrastructure layer). The final step is to overlay the wind resource layer with the biodiversity and infrastructure layers, thereby showing the locations with suitable wind resources and few or no wildlife or infrastructure conflicts—yielding a map of suitable low-impact sites.

What sounds like a relatively straightforward task turns out to present multiple challenges. Gathering and mapping the knowledge of hundreds of biodiversity experts at a multitude of institutions is a huge task that can take many years to complete and then requires regular updating. The wind resource and land-use constraints map layers also require updating, but the underlying data is fairly well understood and readily available. Once the data is in hand, it has to be shared, understood, and used to locate and operate wind farms by potential developers and operators, utility and transmission companies, regulators, politicians at all levels of government, corporate buyers, families, and individuals.

In mid-America, the good news is that the challenges appear to be manageable. The range of suitable, low-impact sites for wind development within the 17-state area of interest is expansive. An in-depth study by TNC staff indicates that approximately 222 million acres of land in the study area have suitable wind resources. Of that land, about 90.4 million acres are considered suitable, and their development is unlikely to disturb wildlife habitats.

Ninety million acres equals the land area of about nine percent of the 17-state region. Based on the nameplate capacity of wind turbines at three megawatts per square kilometer (Gaughan 2018), those acres could accommodate 1,099 gigawatts of wind power capacity on low-impact, suitable land—an amount of power 10 times as great as all U.S. wind-generating capacity in 2019, and “equivalent to the total generating capacity from all sources” in the United States in 2018 (The Nature Conservancy 2019).

The creators of the Site Wind Right map don’t view it as the definitive authority on wind turbine siting in the central United States. They suggest that more finely grained analysis and regulatory guidelines such

as those issued by the U.S. Fish and Wildlife Service, the Federal Aviation Authority, and local authorities should also be taken into account.

Nevertheless, the big picture presented by the Site Wind Right methodology remains highly useful. Myriad sites in the U.S. wind belt could host large numbers of wind turbines while conservationists continue to protect wildlife and habitat. Furthermore, continued research and scientific advances will enable greater precision regarding where to best build renewable energy facilities while also stewarding our natural heritage.

The Site Wind Right methodology has reached beyond the United States. In locations such as China and India, wind facility siting programs are emerging. Crafted to suit local conditions and legal frameworks, they are encouraging wind energy developers to locate their projects at low-risk sites in those nations. A recent report released by the International Union for the Conservation of Nature on mitigating the impact of wind and solar energy developments cites both Site Wind Right and “Power of Place,” a complementary TNC study focused on planning renewables projects, as relevant examples.

As wind and solar technologies in the U.S. and worldwide are deployed at unprecedented rates over the next several decades, a more holistic approach to

renewable energy siting and planning will continue to emerge. If the international community is to reach ambitious biodiversity conservation goals, such as protecting 30 percent of Earth’s land area by 2030, mitigating “energy sprawl” will be imperative. That includes locating renewable energy facilities in low-risk areas. The methodology for doing so, already 20 years in development, must continue to evolve if land and water resources are to remain largely intact for future generations.

Tackling Climate Change with Flyway Conservation in North Africa and Middle East

Flyways consist of the areas covered by a species or population of migratory birds over the course of an annual cycle, including breeding and nonbreeding grounds and connected migration routes. The Rift Valley–Red Sea Flyway stretches from the Jordan Valley down through Syria, Lebanon, Jordan, and Palestine. It then splits into three routes: the first crosses the Gulf of Suez and passes down the Nile Valley; the second crosses the Gulf of Suez and runs down the west coast of the Red Sea (Egypt, Sudan, Eritrea, Ethiopia, and Djibouti); and a third route follows the east coast of the Red Sea (Saudi Arabia and Yemen) and crosses the southern end at the Strait of Bab el-Mandeb to rejoin the other two before continuing south to the East African Rift Valley.

Studies indicate that 1.5 million soaring birds representing 37 species migrate through this flyway twice a year. The Rift Valley–Red Sea Flyway is the biggest in the world, linking European breeding grounds with the African wintering areas for migrating birds. Migrating birds passing through the flyway face myriad threats from feral and domestic cats, people hunting illegally in the Middle East and North Africa, collisions with wind power turbine installations,

LEARN MORE

Extensive additional resources are available from The Nature Conservancy’s Site Wind Right website, www.nature.org/en-us/what-we-do/our-priorities/tackle-climate-change/climate-change-stories/site-wind-right/, as well as the case profile of Site Wind Right prepared by James Levitt at the Lincoln Institute of Land Policy: www.landconservationnetwork.org/resources-education.

The Migratory Soaring Birds project has led to improved practices for responsible hunting in Lebanon and bird-friendly hotels in Egypt along with waste management practices, poison prevention from agricultural chemicals, and the installation of power lines and the siting and managing of solar energy and wind energy facilities across the region.

electrocution by powerlines, loss of habitat caused by damaging agricultural practices, loss of habitat due to poor waste management, and loss of habitat caused by badly positioned tourism facilities.

In 2000, BirdLife International initiated the Migratory Soaring Birds (MSB) project to protect the most important birds and areas with the richest biodiversity from anthropogenic threats caused by five sectors: agriculture, energy, hunting, tourism, and waste management. The project aims to implement safeguards for soaring birds in these five sectors and ensure hospitable stopover sites for feeding and resting. The project comprises two phases: Ten countries participated in Phase 1 from 2000 to 2015; and six countries have participated in Phase 2, from 2018 to 2022.

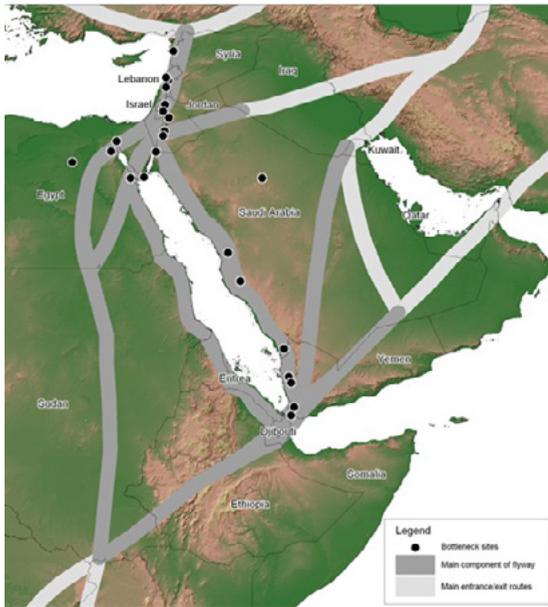
The MSB project helped produce guidelines for all sectors that pose threats to migratory birds. For example, recommendations are now available to improve hunting practices in Lebanon, create bird-friendly hotels in Egypt, prevent poisoning from the region's agricultural chemicals, and manage its waste more sustainably, site and manage solar energy and wind energy facilities responsibly, and safely install power lines.

The Rift Valley–Red Sea Flyway is the world's second most important flyway for migratory soaring birds, with 37 species including raptors, storks, pelicans, ibises, and cranes. These species use the flyway every year, and more than 20 key migration sites have been identified. Existing powerlines throughout the region, where inappropriately placed on poles and

lines, present a high risk of collision and electrocution to migrating soaring birds, especially at migration bottlenecks. A study by the Convention on Migratory Species (Prinsen, Boere, Pires, and Smallie 2011) estimated that up to 10,000 electrocutions and many hundreds of thousands of collisions may occur in each country in the African-Eurasian region every year. MSB guidelines recommend siting power lines so that they avoid important birds and biodiversity areas and don't create migration bottlenecks, or infringe on protected areas and adjacent conservation land often owned by civic and private organizations.

Wind energy is credited as a solution to climate change. The Rift Valley–Red Sea Flyway presents a suitable landscape, with good wind resources, for wind power development. However, birds face significant risks if wind farms are inappropriately located along the flyway. Migrating birds might suffer from collisions, disturbances, or displacements and barrier effects. Developers should pay close attention to siting wind farms and associated powerlines along the flyways, which have so much potential for wind energy. BirdLife International estimates the Red Sea coast alone could potentially generate 20 gigawatts of electricity annually from wind.

Egypt's target for its domestic energy is 20 percent from renewables by 2022 and 42 percent by 2035 (Shehata & Partners 2020). Egypt has designated 650 square kilometers (about 166,000 acres) of land adjacent to the Red Sea for wind energy from 2022. And Jordan's 2020 target for renewable energy was 10 percent (Abu-Rumman, Khdair, Khdair 2020), al-



Rift Valley-Red Sea Flyway with bottleneck areas.
Map: BirdLife International

though various factors, including the influx of Syrian refugees into Jordan, has slowed progress toward that goal.

The MSB recommends “shutdown-on-demand” of wind turbine facilities along critical flyways to minimize collisions between migrating birds and wind turbine rotors. As noted by an MSB report, “the shutdown of turbines during high-risk periods can effectively reduce the number of fatalities.” The report concludes that shutdown-on-demand is still being tested and refined:

Consideration also has to be given to the criteria used in triggering a shutdown. Criteria should aim to minimize the risks to birds while at the same time reducing losses to energy production. In the absence of detailed information as to the factors influencing high-risk situations these criteria must remain dynamic and flexible in order to be able to react to new information and knowledge (UNDP, BirdLife International, Global Environmental Facility 2015).

Thus, shutdown-on-demand protocols should be used flexibly and adaptively. For example, it is difficult for people to spot approaching flocks of migrating birds during sandstorms; more accurate radar, sonar, lidar, or alternative technologies may be more effective in reducing collisions. Monitoring collision victims is important and should serve as an evaluation tool that coincides with the use of shutdown-on-demand protocols.

The MSB project has clearly made it easier to develop clean energy along the flyway in nations such as Egypt, and exporting surplus renewable energy may be possible. Through effective standards and practices, the MSB seeks to better understand whether such developments can protect migrating birds.

LEARN MORE

Additional resources are available from the case profile on the Rift Valley-Red Sea Flyway prepared by Kiragu Mwangi for the Lincoln Institute of Land Policy: www.landconservationnetwork.org/resources-education.

CHAPTER 7

Lessons Learned



Fire management staff conduct a controlled burn in eastern Washington State to improve and restore the health of the ecosystem and reduce the risk of catastrophic wildfires.

Photo: Ken Meinhart/USFWS

The emerging impacts of climate change are felt deeply and widely all over the world. Land trusts and conservancies large and small are providing nature-based solutions that incorporate the best available science and offer multiple benefits for communities of all sizes. These organizations are highly experienced in working directly with communities and landowners. They understand their priorities and connections to land. Often they have forged local and regional partnerships and developed and executed long-term legal agreements, technical protocols, and management plans.

As natural partners in the global effort to fight climate change, more land trusts and conservancies are taking steps to create tools, build partnerships, and engage stakeholders across sectors to manage and steward lands for climate mitigation and adaptation. Their experience can inform future initiatives to catalyze and spread innovative solutions, inform policy, and move at greater scale and speed to meet the 21st century's most urgent conservation imperative.

Work Across Diverse Scales, from Local to Global

Land trusts, conservancies, and other civic organizations are protecting land and addressing climate-related challenges with measurably effective impact at many scales, from the creation of pocket parks in urban neighborhoods to the expansive network of water funds that now circles the globe.

The case examples examined in this Policy Focus Report range in geographic scale. Local initiatives include NeighborSpace in Baltimore and Cold Hollow Carbon in Vermont. State and regional efforts such as the Cutting Green Tape policy initiative in California, the River Havel restoration in central Germany, and the Partnership for Gulf Coast Land Conservation in the southern United States cross multiple jurisdictional boundaries to address complex problems. China's Ant Forest program, Greening Australia, and Site Wind Right—which spans the American wind belt from Mexico to Canada—operate or aspire to operate at a national scale. And BirdLife International's Migratory Soaring Birds program spans multiple nations and continents from North Africa to the Middle East.

The initiatives profiled here also involve a wide-ranging number of active participants. Cold Hollow Carbon engaged 10 landowners managing 12 parcels of land. In contrast, Ant Forest has engaged some 550 million consumers across China—about one-third of the people living in the world's most populated nation.

What should we make of this wide diversity in project scales? The basic concept is that nimble civic organizations working with private interests, academics, other NGOs, and the public sector can devise effective solutions from the very small to the exceptionally large. They can implement these solutions in a relatively direct and adaptive way. They make excellent partners for public sector institutions, which are often more constrained by shifting public opinions and policy priorities.

Address a Broad Scope of Challenges and Provide Multiple Benefits

As indicated by the chapter titles of this Policy Focus Report, civic sector land conservation organizations have launched initiatives aimed at addressing a broad diversity of purposes. Such purposes include coordinating stewardship and management practices across a mosaic of land ownerships (Cutting Green Tape); reforestation to restore ecosystem function and enhance carbon sequestration (Ant Forest); managing stormwater and preventing pollution (NeighborSpace); providing recreational resources (NeighborSpace, River Havel, Gulf Coast Partnership); protecting communities from changing riverside conditions and sea-level rise (Scenic Hudson); providing fresh water to water-stressed metropolitan areas (Water Fund network); providing essential land, inland, and marine wildlife habitats (Open Space Institute, Greening Australia); bringing forest carbon credits to market (Cold Hollow Carbon, Scenic Hudson, Greening Australia); siting renewable energy facilities appropriately (Site Wind Right); and preserving key migratory corridors for a multitude of birdlife (BirdLife Flyways Conservation).

Many of these initiatives provide multiple public benefits. The River Havel project in Germany simultaneously provides wildlife habitat, flood protection, economic development opportunities in the tourism sector, and recreational opportunities for local residents. Like-

wise, the Scenic Hudson programs in New York State are intentionally designed to provide holistic benefits including protection from rising water levels, pathways to carbon credit markets, improved agricultural practices, and enhanced local recreational resources.

The case studies illustrate the importance of communicating such multiple benefits so as to build enduring community support for these initiatives. By communicating research results, for example, conservation NGOs can remain in close touch with their public, private, nongovernmental, and academic partners, thus enabling further progress. At Scenic Hudson, for example, by recognizing residents' concerns about clean water, healthy food, and flood safety, the organization was able to develop language that connected land conservation to those priorities. When speaking with farmers, the organization framed land management solutions to focus on benefits to the farmers' bottom line instead of talking abstractly about carbon.

Focus on Long-Term Strategic Intent and Measurable Outcomes

Climate change is a complex phenomenon, and its potential consequences differ widely in time and space, requiring long-term strategic thinking and a focus on measurable outcomes. Each of the initiatives profiled in this report followed a discernable strategic intent, and each has identified tangible outcomes that have marked their success to date and will guide their future endeavors.

Ant Financial, working with NGOs including the See Foundation and the Paradise Foundation, set an early example among Chinese financial services firms by encouraging sustainable lifestyle choices among its clients. Deploying a strategy based on "gamifying" sustainable behavior, it has achieved remarkable,

measurable growth. The Ant Forest initiative has brought more than a half-billion individuals into the program since 2016, planted some 220 million trees, and protected more than 420 square kilometers (100,000 acres) of land including sensitive habitat for endangered species. Its strategic challenge going forward will be to sustain customer growth and continue to substantially grow its conservation footprint.

Brendan Foran, chief executive officer of Greening Australia, has similarly ambitious strategic goals. As explained in Chapter 5, Greening Australia aims to protect more than 60,000 hectares (150,000 acres) in 2030, more than 10 times the level reached in 2020. In addition, it aims to sequester some 3,300,000 tonnes (3,630,000 tons) of carbon in 2030, a figure more than 50 times larger than in 2020. Foran has explained that such ambition is in line with the scale of the climate challenge worldwide.

While Ant Financial and Greening Australia have targeted very rapid growth, other initiatives such as Site Wind Right and the Open Space Institute have pursued more patient strategy development over the course of decades. Site Wind Right has taken 20 years to become a nearly national program. OSI's land protection strategies have evolved over the past 50 years from a focus on New York suburbs in the 1960s to a focus on the entire Appalachian corridor, from Georgia to Maine and beyond in the 2020s. Whether such strategies take a few years or many decades to mature, they all aim to meet quantitative targets and set a strategic example for peer organizations in their home countries and around the globe.

Sustain Collaboration

While the scale and scope of the initiatives profiled in this report vary from case to case, not one has reached strategic targets without collaboration. Collaborations may occur across land parcel boundaries, sectors, and areas of expertise from finance to remote sensing. Col-

laborating effectively is a key success factor for land trusts and conservancies aiming to achieve ambitious goals at the scale necessary to make headway in addressing climate change. By accessing cross-cutting knowledge and resources, developing trust and relationships with key partners generates greater efficiencies and impact than one organization could achieve alone.

The land trusts that joined the Partnership for Gulf Coast Land Conservation shared knowledge and access to resources, which reduced costs and leveraged funding from multiple federal agencies and other sources. The consortium in Vermont includes nonprofit, academic, and private sector members—Vermont Land Trust, University of Vermont, Cold Hollow Carbon, Spatial Informatics Group, and The Nature Conservancy—with a deliberately horizontal structure that harvests deep expertise about forests, carbon, rural economic development, and landowner values.

In Baltimore, the diverse regional partnerships that NeighborSpace forged with Morgan State University, local landscaping businesses, and local nonprofits through the Baltimore County Green Alliance served to mobilize volunteers, generate funding through open space fees, and build community support for park sites. As the Golden Gate Parks Conservancy and its Cutting Green Tape initiative demonstrates, establishing landscape-scale networks and partnerships allows organizations to make an impact at scale on climate-related challenges such as wildfires that are not bound by jurisdictions or boundaries. And through its support of a dynamic group of land managers, scientists, and public policy advocates, Scenic Hudson is accelerating the implementation of natural climate solutions on working and managed farms, forests, and wetlands throughout the northeastern United States. Importantly, leaders in each of these examples intentionally reached out to community members of diverse cultures and ethnicities to participate in and help shape strategy and target outcomes.

As several cases highlight, strong partnerships and leadership by the private sector can make rapid growth possible. In China, Paradise Foundation International is working closely with Ant Financial to support the rapid growth of the Ant Forest initiative. Greening Australia has signed an agreement to engage CBRE Australia, a global real estate services provider, to help source 330,000 hectares (815,100 acres) of land by 2030 via a combination of lease, license, or ownership to meet Greening Australia's tree planting targets.

The collaborative strategies profiled in this report are often characterized by strong management and well-articulated organizational structures and accountability. In the Site Wind Right initiative, for example, multiple state chapters of The Nature Conservancy coordinated with scientists from dozens of universities and research institutes to build a biodiversity risk layer for a mapping tool, and a core project team working out of TNC's Midwestern offices in Minneapolis coordinated compilation of the layer. Similarly, the Open Space Institute's Resilient Landscapes Initiative involved training and engaging some 120 conservation organizations that were asked to work on "climatized" conservation plans. In addition, the Resilient Landscapes Initiative coordinated and contributed to protecting land across several Appalachian subregions stretching from Georgia to Maine.

An active, centralized hub managed by ambitious, articulate leaders was key to the growth and effectiveness of the California Landscape Stewardship Network (CLSN). In helping to invent and advance CLSN's Cutting Green Tape initiative, Sharon Farrell and her team at the Golden Gate National Parks Conservancy have patiently, persistently catalyzed an effort that is now transforming landscape stewardship practices across California and beyond. They have positioned the Conservancy as a linchpin in the design, implementation, and proliferation of partnership models and impact.



Solar panels in the Hudson Valley, New York. Photo: Scenic Hudson

Share Advances in Science, Technology, and Financing

Land trusts and conservancies can grow engagement, build support, shape strategies, and measure and illustrate outcomes by leveraging increasingly sophisticated and customizable tools and technologies, scientific insights, and financing platforms.

Technologies such as geospatial information systems (GIS) and remote sensing are often the backbone of efforts to prioritize and plan for nature-based solutions. The Nature Conservancy's intensive analysis and data collection for the U.S. wind belt exemplify how layering data on wind resources, biodiversity, and infrastructure allowed project partners to identify areas of potential biodiversity conflicts with renewable energy development across 17 states.

On a smaller scale, a cornerstone of NeighborSpace's work is a project called Portals for Our Partners, which creates websites for all park sites in Baltimore County, no matter their size. The websites enable community

associations to share information about their parks, volunteer opportunities, community needs, and meeting times, and to generally build broader engagement and awareness among park users and the parks' neighbors.

Increasingly, technology adds muscle strength for civic organizations striving to address climate-related challenges. Through sophisticated algorithms and a mobile payment application, Ant Forest is engaging hundreds of millions of people through a game-like platform to protect carbon-rich forests. This tech-enabled, bottom-up approach is building support, changing behavior, and financing conservation at a huge scale. Similarly, Cold Hollow Carbon has bundled smaller land parcels into a single, marketable source of carbon credits, an initiative that points the way for carbon market aggregations emerging around the globe, from Australia and Africa to northern Europe and China. Pioneering advances in conservation science are also helping to drive innovative civic sector initiatives related to climate change. Mark Anderson's work on resilient landscapes helps the Open Space Institute to focus increasing investment in climate corridors that

will offer key refuges for biodiversity across continental-scale landscapes as air and water temperatures continue to rise. Similarly, BirdLife International's use of precision observation techniques—including radar, sonar, and remote sensing technologies—informs measurably effective policies on when wind turbines should pause to avoid disturbing major bird migrations.

Advances in remote sensing, artificial intelligence, mapping, genetic analysis of wildlife migrations, and financial platforms will certainly continue, leading to more effective ways to protect land and life on Earth in the coming decades. Encouraging international exchanges of these initiatives motivates others who are working on entrenched challenges, leading to still more invention.

Create Durable, Adaptable, and Replicable Initiatives

DURABILITY

The climate crisis will inevitably persist for decades or even centuries. Civic sector initiatives must be durable to address the long-term nature of the challenge. Interpersonal and interorganizational trust are essential to any initiative that's built to last, given the cross-sector collaboration required. Without a strong foundation of trust, One Tam in California, for example, would have never drawn in tens of thousands of volunteers or the wide variety of funders that keeps the coalition vibrant. The same is true for Baltimore's NeighborSpace, the many partners that restored the River Havel, and even the consumers who entrust Ant Financial to redeem their points to plant and nurture forests and habitats across China.

Durability also depends on the continuity of funding and leadership over time. This report does not explore the many well-meaning projects that have disappeared due to insufficient capital or lack of strong leadership over time. Unsurprisingly, such narratives are common.

ADAPTABILITY

It can take many years, and sometimes several decades, to propose, develop, test, refine, build support for, and take stock of land-based solutions to climate change. Spending the necessary time to build local or regional tools or innovations can be painstaking work, but it is crucial in validating concepts that may then be acted on quickly and efficiently. This was the case for The Nature Conservancy's Site Wind Right effort, which began in the Flint Hills in Kansas and western Oklahoma. Over years of consultation and information gathering, a small group of TNC staff and partners developed the idea of mapping where to locate wind power across the Great Plains.

Scenic Hudson offers another example of how an organization, in addressing climate-related problems, can hone a specific model that may then be scaled up and adopted more broadly. Its work developing a sea-level rise mapping tool is now embedded in state-level policy in New York; previously, the state could not evaluate the impacts of sea-level rise during environmental review. And across the world, the group Greening Australia demonstrated that time spent on finding a solution can help an organization broaden its thinking and make a bigger, quicker impact. In 2020, Greening Australia's land protection and management activities sequestered about 60,000 tonnes (66,000 tons) of carbon, but its annual target for 2030 is 50 times that amount.

REPLICABILITY

Water funds exemplify how an organization can disseminate innovative natural climate solutions. The seed of the water fund concept sprung from within The Nature Conservancy, where key staff worked with local partners in Quito, Ecuador, to set up the world's first water fund in 2000. The organization is now widely recognized as the go-to source of expertise on this innovation. Through a dedicated Water Funds Toolbox and the support of networks such as the Latin American Water Funds Partnership, TNC built on



its model's early success and introduced the formula to more than 30 cities around the world (24 in Latin America alone) by 2021.

The Site Wind Right example drew the interest of conservation peers across the globe. Markets such as China, India, and Argentina may adapt and develop the effort to include siting tools for solar energy facilities.

Similarly, the restoration of the Lower Havel River is inspiring potential emulation within the European Union and beyond. Hydrologic engineering firms around the globe are learning from the river rehab and considering replicating and adapting it. Sharing and implementing best practices across nations and continents can take considerable time and patience. The payoff, however, is making progress toward mitigating and adapting to climate change on our home planet.

A water fund supplies the sprawling city of Bogotá, Colombia, with fresh water. Photo: Starcevic/Getty Images

CHAPTER 8

Recommendations



Sunrise over New England mountain ranges.

Photo: Ken Canning/Getty Images

Land trusts and conservancies of all sizes and capacities are clarifying how to fight climate change through land conservation and stewardship. Policy makers and decision makers are considering how to address climate-related impacts in communities, states, and regions. Funders and donors are seeking to invest in projects and initiatives that offer effective, lasting solutions for reducing carbon emissions and improving climate resilience.

The case studies in this report demonstrate that many civic sector organizations—collaborating with partners in the public, private, and academic sectors along with Indigenous and tribal peoples—are developing powerful and pervasive climate-related solutions. Collectively, they are protecting vast expanses of land and engaging hundreds of millions of individuals.

The following recommendations provide general guidance for stakeholders in the private and public sectors seeking to help civic organizations implement natural climate solutions.

Empower Civic Sector Initiatives That Are Creative and Ambitious in Scope and Scale

As a young adult around the time when the Berlin Wall fell, Rocco Buchta imagined that the Lower Havel River could be restored to provide biodiversity habitat, flood control, and recreational and economic value to the region surrounding Berlin. His vision was tremendously ambitious, creating a plausible future for the Lower Havel watershed that had been virtually impossible to achieve over many prior decades. Buchta, working as an employee of NABU (Naturschutzbund Deutschland, the Nature and Biodiversity Conservation Union of Germany), worked diligently, creatively, and adaptively over the next three decades to realize his vision (Krüger 2006).

Many more women and men like Buchta are affiliated with land trusts and conservancies in more than 100 nations on six continents, harboring similarly ambitious and ultimately feasible ideas. Supporting these visionary individuals is one key to success. Funders and decision makers from the public, private, philanthropic, and academic sectors should encourage boldly creative and ambitious initiatives with the

human and financial capital to meet the challenge of climate change.

Ambition and creativity can help address local challenges as well as large regional problems. Just as Buchta's regional project found funding and political support from the German government, Barbara Hopkins of the Baltimore County land trust NeighborSpace catalyzed a campaign that convinced Baltimore County officials to dedicate "loss of open space" fees to create parks, which also help to manage stormwater and provide other benefits. Ambitious land trusts and conservancies can increase their success with climate change initiatives by collaborating with public officials, colleges and universities, and the private sector.

Invest in Initiatives with Clear Strategies and Measurable Impacts

Successful civic sector initiatives and organizations can often be characterized as works in progress. Each organization showcased in this report can clearly and concisely articulate its mission and strategy. Most of their initiatives include measurable objectives that have been met over time. Amid changing conditions, however, these strategies and objectives also change. Such evolution is necessary, as was the case for the Open Space Institute (OSI) and Greening Australia, both of which have made substantial adjustments over time. They have modified company projects that focused primarily on landscape and biodiversity conservation. OSI's Appalachian Landscapes Protection Fund, for example, now emphasizes carbon sequestration enabled by protecting a parcel of land, complementing more well-established strategies that emphasize biodiversity conservation. Similarly, Greening Australia has expanded its sequestration efforts in recent years, primarily focusing on climate change.

Both of these strategic shifts follow the recommendations of experts from the Intergovernmental Panel on Climate Change and the International Panel on Biodiversity and Ecosystem Services: “The mutual reinforcing of climate change and biodiversity loss means that satisfactorily resolving either issue requires consideration of the other.”

These examples illustrate that launching and communicating about projects that serve more than one purpose—with multiple benefits for communities, biodiversity, and climate—is necessary to build support and durability for natural climate solutions. Practitioners, funders, and decision makers should prioritize investments with multiple objectives including biodiversity protection, climate change mitigation, adaptation-related outcomes, and other economic, environmental, and social cobenefits.

Aim for Broad Collaborations

Each of the case studies in this report met its goals, at least in part, through collaboration among sectors, jurisdictional boundaries, professional disciplines, and diverse cultures, ethnicities, race, and gender. The “all hands on deck” strategy depends deeply on such collaboration.

To promote robust alliances within a project, organizations can solicit diverse partners during the project’s inception; reduce systemic barriers to collaboration such as archaic laws and regulations that prevent national, provincial, and local governments, private sector actors, universities, and civic sector organizations from working smoothly together; and build trust and knowledge among potential partners through joint planning exercises and cross-presentations of works in progress. In light of many national “30 by 30” mandates to protect 30 percent of Earth’s waters and lands by the year 2030, proponents of civic sector projects should enhance collaboration and reduce regulatory inertia, which prevents individuals and organizations

from teaming up to address interconnected regional problems.

To ensure their efforts are inclusive, organizations should work closely with local and Indigenous communities to find common ground. Good-faith collaborations can set new precedents and chip away at long-held distrust and inequities and ultimately to protect vast—and sometimes sacred—landscapes.

Share Advanced Science, Technologies, and Financing Techniques

Case examples in this Policy Focus Report repeatedly underscore the advantages of applying cutting-edge science, technology, and financial engineering to civic sector projects that provide climate change solutions. The Open Space Institute’s Resilient Landscapes Initiative leveraged science developed by Mark Anderson to set precedents in land conservation strategy. The Nature Conservancy’s Site Wind Right project harnessed the fast-growing sophistication of GIS technologies to develop unprecedented maps of biodiversity risk spanning the entire midsection of the United States. And the Cold Hollow Carbon project spearheaded by the Vermont Land Trust pioneered carbon credit aggregation techniques that may be replicated by forest landowners across the Northern Forest of New York and New England.

Civic land conservation organizations around the world should continue to push the frontiers of precision conservation, financial structuring, and conservation science—and to share their advances with international colleagues. All sides that share technology gain insights and motivation from such ongoing dialogues. Much can be learned when fresh minds adapt innovations to fit their local, regional, and national circumstances.

Support Resilient, Adaptable, Replicable Initiatives

Good science, collaboration, and strategy can be for naught without sustainable financial resources and a dedicated, loyal staff that can withstand months or even years of setbacks. The ongoing COVID-19 crisis has made clear that extraneous forces may disrupt even the best-devised strategies. Stable financing and strong management appear to have allowed the Ant Forest project, for example, to continue gaining substantial consumer interest and momentum in planting forests and protecting land.

Similarly, even well-established organizations such as the Open Space Institute require flexibility, adjusting their plans from time to time to adapt to changing conditions. OSI has increasingly emphasized climate change–related issues in the past decade, becoming a prominent funder and conservation leader not only in New York, New Jersey, and New England, but across the entire Appalachian range.

Finally, civic sector organizations need to share their best ideas with colleagues if the land trust and conservancy communities are to become global leaders in climate change solutions. The Latin American Water Funds Partnership has excelled at helping to propagate its model across most of South America. Indeed, the Water Fund model is now being deployed in places as far apart as Portland, Maine, and Cape Town, South Africa.

Public, private, and civic sector decision makers and partners should continue overseeing and collaborating on projects that protect land and provide climate change solutions. In doing so, these funders and decision makers can monitor and guide such projects to ensure that they maintain sustainable financial and human resources and strategic flexibility, and are willing to help replicate successful operating models.

All these recommendations are feasible and beneficial. If well implemented, they offer powerful momentum for civic sector organizations that strive to provide climate change solutions. In the evolving struggle to rein in and cope with climate change globally, all sectors must join forces to find solutions that are sustainable, replicable, and reliable.

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From the Ground Up

How Land Trusts and Conservancies Are Providing Solutions to Climate Change

As communities worldwide make protecting the climate a priority, land trusts and conservancies of all sizes and capacities are seeking greater clarity in addressing climate change through land conservation and stewardship. Policy makers and decision makers are considering how to confront climate-related impacts in communities, states, and regions. Funders and donors are seeking to invest in projects and initiatives that offer durable, lasting solutions for reducing carbon emissions and improving climate resilience.

This report—written by James N. Levitt, a global expert and educator in land conservation, and Chandni Navalkha, an international leader in sustainable management of land and water resources—offers numerous case examples of successful initiatives. It also provides the following guidance for stakeholders in the private and public sectors looking to build the capacity of civic organizations to implement natural climate solutions:

- Empower civic sector initiatives that are creative and ambitious in scope and scale.
- Invest in initiatives with clear strategies and measurable impacts.
- Aim for broad collaborations.
- Share advanced science, technologies, and financing techniques.
- Support initiatives that are resilient, adaptable, and replicable.

