



# Conservation *by* Design

A Strategic Framework for Mission Success

{ 20th ANNIVERSARY EDITION }



**NATURE SUSTAINS US**

A Micronesian fisherman harvests triggerfish with a gill net. Around the world, the fates of people and nature are inextricably bound.

# We stand for nature, in all its *diversity.*



The Nature Conservancy stands for nature, in all its diversity, and our mission compels us to be ever more ambitious in the scope, scale and pace of our work. With this clear purpose at our core, we innovate, learn and adapt.

Two decades ago, we codified the Conservancy's conservation vision and collaborative, science-based approach in the first edition of *Conservation by Design*. The purpose was to guide staff and partners with "a common set of analytical methods to identify the biodiversity that needs to be conserved, to decide where and how to conserve it, and to measure our effectiveness."

Since then, *Conservation by Design* has unified conservation efforts around the world by providing a common language and consistent approach across the diversity of systems, cultures, geographies and communities in which we engage. Furthermore, it has been crucial in setting a broader global conservation agenda that drives policy, advocacy and philanthropy.

But the world has changed over the past 20 years. We are in a century that will be defined by a growing human population, and this era will see hard-earned conservation gains erode unless we stabilize the climate and find better ways to meet increasing demands for energy, food and other resources.

This edition of *Conservation by Design* honors and builds on our successful history and evolves our approach and methodology to meet the challenges of the 21st century.

Place-based conservation is our heritage and continues to be a cornerstone of our work. But we must amplify our local protection, restoration and management efforts so that they have an impact beyond each place. How might conservation of a wetland inform national policy or foster a larger relationship with a government agency or a business? How could sustainable forestry innovations in Indonesia inform practices in Canada? How might combining access to health care with sustainable fishing practices in Tanzania help show the way forward for sustainable

fisheries in more of the world's oceans and lakes? *Conservation by Design* now explicitly includes consideration of such connections as part of its methodology.

We embrace the realization that the plights of people and of nature are inextricably linked. All of life on Earth depends on healthy, intact, fully functioning natural systems. Human well-being is both a desired outcome of conservation and a motivator for all sectors of society to unite in a common goal of securing our shared home. We protect nature for its own intrinsic value and for the myriad ways it supports and enriches our lives.

Finally, learning and sharing knowledge are central to achieving our mission, and we hold ourselves accountable to an evidence-based approach. Managing an expanding portfolio of projects around the world requires responsibility for measuring what works and what does not and for advancing success to other places. Most important, we learn from the wide diversity of people with whom we work, draw on lessons and knowledge from the global conservation community, and contribute our own innovations in advancing our shared purpose.

Some see the challenges facing the natural world in the coming decades as daunting. I see them as challenges that we are increasingly equipped to face and solve. This is the time to muster the skills, intellectual capital and core values that have defined us over time to lead a way forward.

A handwritten signature in black ink that reads "Mark R. Tercek". The signature is written in a cursive, slightly slanted style.

**MARK R. TERCEK**  
President and Chief Executive Officer  
The Nature Conservancy

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We envision a world where the diversity of life thrives, and people act to conserve nature for its own sake and its ability to fulfill our needs and enrich our lives.

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The fate of nature and the fate of people are tightly bound. Today, as society struggles to provide enough energy, food, water and other resources to sustain a growing population, solutions are often found at nature's expense. Resources are depleted, habitats are degraded, and untold and invaluable plants and animals are lost to extinction. In turn, a damaged environment can exacerbate food and water shortages and unhealthy living conditions and increase vulnerability to floods and storms.

The Nature Conservancy strives to break this vicious cycle—and to create a *virtuous* cycle. Only by transforming the relationship between people and nature can both nature and people thrive. In fact, protecting nature also can help address pressing social and economic challenges.

Creating a virtuous cycle requires complementing our traditional strengths in natural sciences with expertise in engineering, economics, political

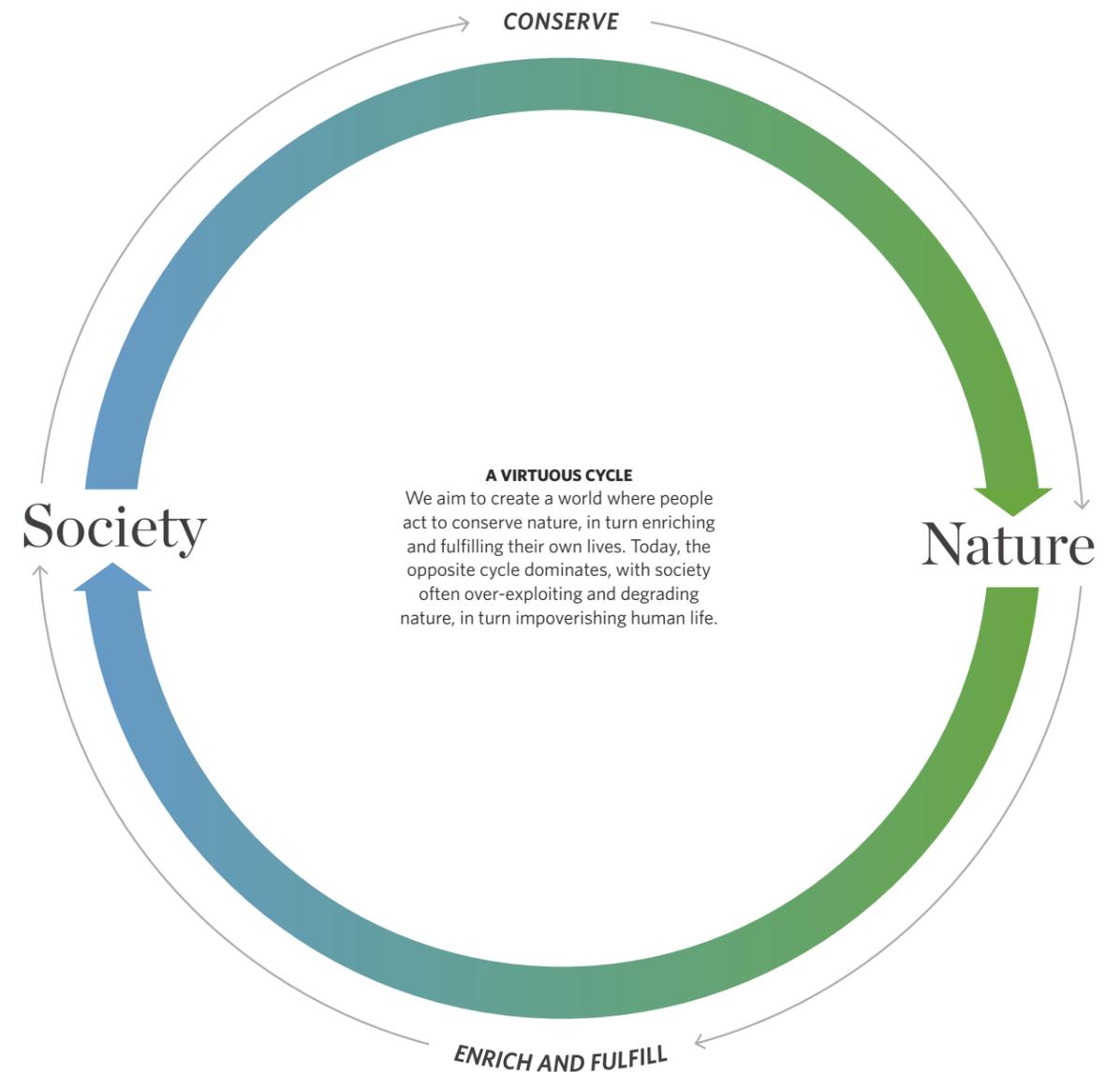
science, psychology and other social sciences, as well as incorporating voices and experiences that span human differences in gender, background, culture and knowledge systems.

This edition of *Conservation by Design* distills these evolving insights into three principles.

**Valuing nature for our sake, as well as its own, strengthens conservation and society.**

Nature not only has intrinsic value; it is of enormous value to people. But too often, the benefits people derive from nature go unnoticed, and, as a consequence, efforts to improve human life marginalize nature, exploiting biodiversity and those people who depend on it most directly. Development need not always sacrifice natural capital or the viability of the planet.

The Conservancy has long recognized the imperative of enabling people to live productively and sustainably while conserving biodiversity. We now





commit to prioritizing conservation solutions that both benefit biodiversity and improve people's lives, and in so doing make conservation relevant to everyone.

Such solutions do not always exist; at times our mission requires us to conserve nature without promise of immediate economic or material benefit. In such cases, we ensure that conservation is not gained at the expense of vulnerable people. Our portfolio of work balances the needs of nature and people differently from place to place so that we achieve advances for both around the globe.

***Advancing systemic change means getting more out of our place-based work.***

The problems we face are immense, and the pace of change staggering. Every action we take must be designed to have the largest possible impact. We encourage innovation and experimentation at local and global scales to identify the kinds of actions that can drive systemic change. The places where we engage can be proving grounds for bold new conservation solutions, demonstrating approaches that can serve as models to be applied elsewhere. In all our work, we strive to take our conservation impacts to scale—by design.

***We must harness the power of evidence—our collective conservation experience and knowledge.***

Better access to knowledge of what works for conservation—and what doesn't—will hasten systemic change. We place special emphasis on fostering, using and exchanging the evidence base that underpins the conservation strategies being deployed around the world—the intellectual capital of the entire conservation movement. We aim to cultivate a global knowledge network fueled by and synthesizing what is learned from our experimentation and innovation on the ground, and from the broader conservation community, indigenous groups, corporations, universities, governments and other knowledge holders.

**NATURE FOR NATURE'S SAKE**

Wilderness areas such as West Virginia's Dolly Sods protect tremendous ecological diversity. Central to The Nature Conservancy's vision is conserving nature for its own sake, as well as for ours.



**MISSION** The mission of The Nature Conservancy is to conserve the lands and waters on which all life depends.

**VISION** We envision a world where the diversity of life thrives, and people act to conserve nature for its own sake and its ability to fulfill our needs and enrich our lives.

**VALUES**

**Integrity Beyond Reproach** We will meet the highest ethical and professional standards in all of our organizational endeavors, and, in doing so, we hold ourselves accountable to our mission and to the public.

**Respect for People, Communities and Cultures**

Enduring conservation success depends on the active involvement of people and partners whose lives and livelihoods are linked to the natural systems we seek to conserve. We respect the needs, values and traditions of local communities and cultures, and we forge relationships based on mutual benefit and trust.

**Commitment to Diversity** We recognize that conservation is best advanced by the leadership and contributions of men and women of diverse backgrounds, beliefs and cultures. We recruit and mentor staff to create an inclusive organization that reflects our global character.

**One Conservancy** Our strength and vitality lie in being one organization working together in local places and across borders to achieve our global mission. We value the collective and collaborative efforts that are so essential to our success.

**Tangible, Lasting Results** We use the best available science, a creative spirit and a nonconfrontational approach to craft innovative solutions to complex conservation problems at scales that matter and in ways that will endure.



{ *The Basics of* }

# Conservation *by Design*

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Guided by *Conservation by Design*, The Nature Conservancy envisions the future; sets priorities; develops strategies; delivers tangible, lasting conservation results; and evaluates those efforts and outcomes to improve conservation as we learn. The adaptive management cycle that has long served as the core of *Conservation by Design* has been modified to reflect the interdependence of social and natural systems, and to support our vision of creating virtuous cycles between people and nature within those integrated systems.

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**ROOTED IN EVIDENCE**

Sharing lessons about grassland ecology and grazing issues learned on an Argentinian sheep ranch can have global implications for sustainable management of grasslands.

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## Components of Our Approach

Historically, The Nature Conservancy has used separate analyses to identify where we should work (for example, ecoregional assessments) and how we should accomplish that work (for example, Conservation Action Planning). As our strategies become more diverse and complex and as our need to create systemic change in a dynamic world grows, *Conservation by Design* aims to integrate and broaden these analyses. We introduce the components of *Conservation by Design* below, along with a new evidence-base concept that is relevant throughout the approach.

### Identify Conservation Challenges and Goals

We initiate the approach by identifying the most pressing challenges to nature and the ecosystem services it provides to people in the context of a socioecological system.

We use a *situation analysis* to reveal specific connections between people and nature and to allow exploration and understanding of the political, socioeconomic, cultural, institutional and ecological context in which we aim to advance conservation. Engagement with a wide variety of stakeholders and partners and reflection on existing evidence are critical at this stage and may reveal unexpected linkages within the system or new opportunities to elevate connections between nature and human well-being. Any new learning can be fed back into the evidence base, informing future efforts in similar systems. A central product of this analysis is a conceptual model that illustrates critical positive and negative relationships within the system.

Situation analysis informs goal setting and generates ideas for how place-based work and strategy-driven work can complement each other. High-level biodiversity conservation goals are set at this stage. At the same time, we use the situation analysis to seek opportunities to advance goals of human well-being that complement and are connected to our conservation goals—for instance, by improving food or water security, reducing climate risk, or fostering alternative livelihoods.

### Map Strategies and Places

After identifying the most pressing conservation challenges, we develop strategy and opportunity maps that help us create strategy-specific portfolios: the set of actions and places that rise to the challenges of the system. Whereas earlier versions of *Conservation by Design* separated and treated sequentially the questions of where and how to work, we now address these questions together. We prioritize the combination of strategies and places that will allow the Conservancy to have the greatest impact on biodiversity and ecosystem services.

To identify priority strategies and places, we first draw the causal links between possible actions and the plausible consequences for nature and people. There are many opportunities for conservation to save species and provide value to society, but these connections will not always play out in the same way or for the same people. One strategy may bolster a threatened species and create jobs for indigenous communities, another may restore critical habitats and provide higher crop yields, and yet another may protect intact ecosystems but reduce access for local communities to harvest needed resources. Mapping these opportunities and trade-offs helps identify specific changes we can expect in both nature and human well-being.

We synthesize and review existing evidence to ensure that the most promising strategies are considered and to identify the risks of untested strategies. We use strategy and opportunity maps to help determine where each strategy can be most effective for nature and people, how much impact each strategy can have, and whether we are best suited to use that strategy to achieve the impacts we seek. Finally, a major advance in this era of *Conservation by Design* is a consideration of how local-scale and broader, sometimes global-scale needs connect when we select strategies and places. We ask whether the Conservancy can have enough impact to make a difference, and we choose those strategies and places where we can contribute to systemic change.



#### ADAPTIVE MANAGEMENT CYCLE

During each phase of the cycle, managers draw on and contribute to the evidence base for conservation, building intellectual capital and advancing conservation efforts well beyond The Nature Conservancy's own.

### STRENGTH IN NUMBERS

At The Nature Conservancy's Virginia Coast Reserve, researchers from the Center for Conservation Biology band peregrine falcon chicks. The Conservancy's partner engagements are structured to capitalize on the strengths of other organizations and institutions.



### Define Measurable Outcomes

To focus and drive our strategies, we must clearly define desired outcomes for nature and human well-being, in both the near and the long term. When implementing tried-and-true strategies—restoring shellfish reefs, for example—the evidence base can help benchmark realistic and achievable goals. Other times we may take calculated risks, testing a new strategy in a proof-of-concept project. For such projects, we must be more rigorous in examining the existing evidence base to understand the strategy's likely impacts, costs, benefits and, ultimately, its return on our investment. In both situations, defining measurable outcomes allows us to gauge the effectiveness of our strategies and to propel our learning.

### Take Action

The Conservancy works at multiple scales, in an extraordinary diversity of systems and through diverse partnerships. Conservancy projects, in their growing complexity and novelty, increasingly serve as proof-of-concept experiments where we test new strategies, evaluate their feasibility, and learn about their risks and costs. In every engagement, it is critical for the Conservancy to revisit the evidence base underpinning the strategy, ensuring that our projects and partnerships are structured and adaptively managed as efficiently as possible, that we proceed on sound logic, and that our experiences strengthen the evidence going forward.

### Measure and Adapt

Since the inception of *Conservation by Design*, the Conservancy has been committed to measuring progress. Doing so now is more important than ever as we more explicitly seek to demonstrate the impact of conservation actions on and for people.

In the past, measures of success often entailed tracking biodiversity metrics on parcels of land we managed or had purchased. Now, measures might include not only field data but also evidence published by others, interviews, remotely sensed satellite data or even social media posts. Put another way, monitoring and adapting in the era of global challenges and big data go well beyond the work of a handful of Conservancy staff members and now require capturing and assessing evidence generated not just by the Conservancy but also by the global community.

We use the existing evidence base to streamline our monitoring designs, focusing efforts and resources where our understanding of outcomes is weakest. From these tailored monitoring efforts and the

lessons we learn at each stage of planning and action, we adapt our own management, building on what works best and contributing to the greater evidence base for conservation. The frequency with which we re-examine evidence depends on the uncertainty surrounding our conservation interventions. In one case we might revisit the evidence every year; in another, it might be 10 years after the initiation of the program.



### Fostering, Using and Exchanging an Evidence Base for Conservation

As a science-based organization, we place a premium on evidence. In this edition of *Conservation by Design*, we highlight evidence as an essential element of our science-based approach. The business of conservation now spans complex strategies and interventions—from buying land to creating tax incentives or designing corporate engagements or youth programs. Knowledge of what works in these strategies and what does not is created by our work on the ground and by the explorations and actions of other relevant actors around the globe. This knowledge allows us to take successful conservation actions to scale and to understand the risks when testing innovative approaches. We call this knowledge the evidence base for conservation.

Today, this evidence base is essential for creating systemic change with limited resources, yet it is weak. We seek to formalize our role as a convener of conservation evidence, as an innovator that continues to grow this evidence base, and as a critical exchange hub where our lessons are shared with the world and our work is enhanced by the lessons learned by others. We can then use the evidence base to build our own intellectual capital, and we can contribute our own learning to advance broader efforts.



{ *Conservation by Design* }

## In Action

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The Nature Conservancy applies science to all areas of its work—whether land acquisition or management of a marine protected area, conservation finance or government affairs—and at all scales, from local to global. With this edition of *Conservation by Design*, we introduce three analytical advances that are broadly useful across the spectrum of Conservancy activities: evidence-based assessment, situation analysis, and strategy and opportunity mapping. These can be brought into projects at any stage to enhance the connections between people and nature and to improve conservation outcomes. The following case studies illustrate how these advances play out in real contexts.

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### **MONITOR AND CALIBRATE**

A scientist in Chile checks traps for *Dromiciops gliroides*, a small marsupial, as part of his work to compare the habitat suitability of eucalyptus plantations and native forests. Focusing monitoring efforts on the least-known parts of a conservation equation allows us to understand and clearly articulate the outcomes of our work.

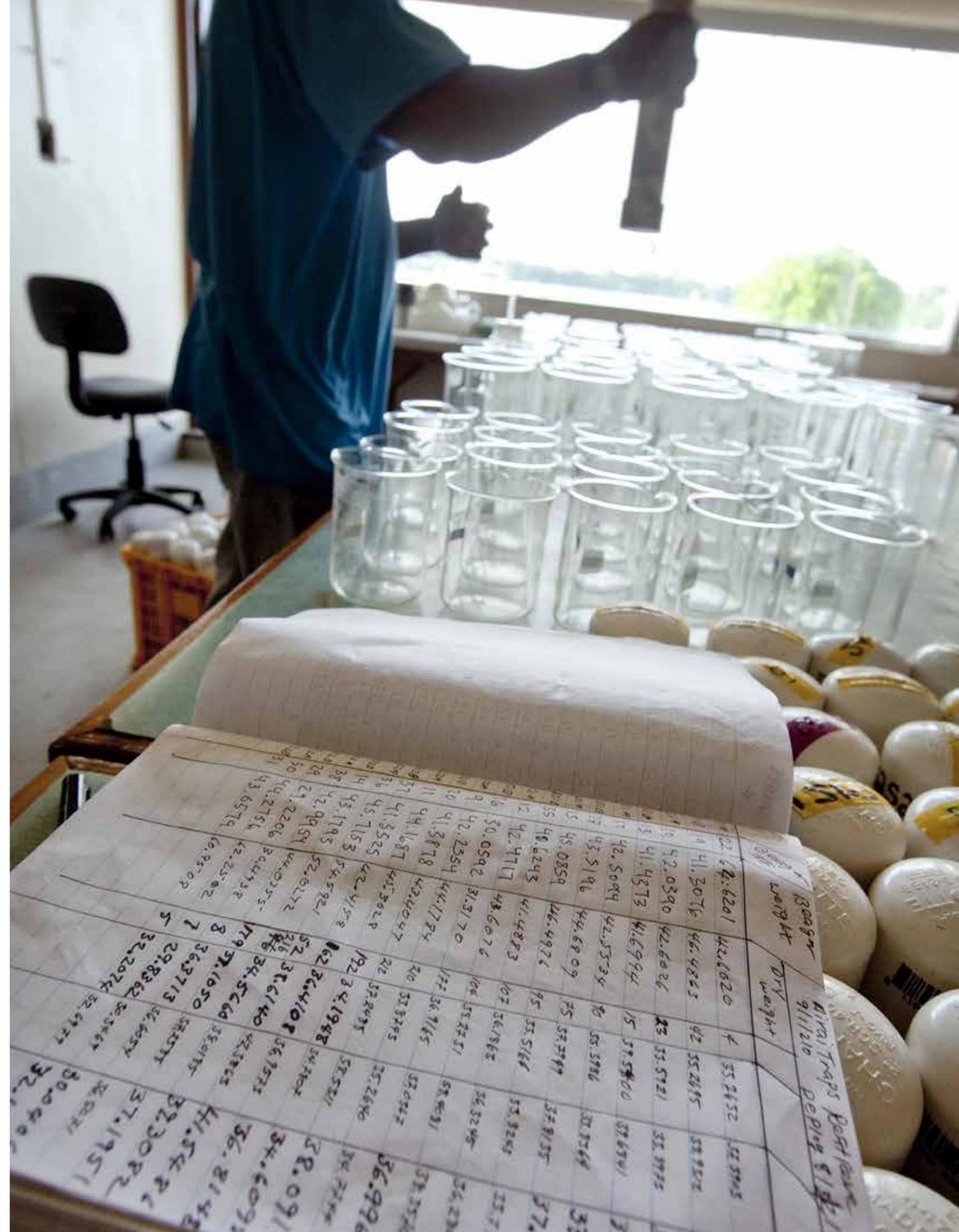
## EVIDENCE-BASED ASSESSMENT

### DATA-DRIVEN

A marine researcher at the Palau International Coral Reef Center studies sediment levels to help determine the role that sedimentation is having on the decline of Palau's coral reefs. A rigorous review of evidence ensures effective conservation strategies.

Knowledge of what makes for successful conservation is continually evolving. An understanding of core ecological and socioeconomic processes, as well as of how those processes respond to changing climates and management, is critical to our success.

To capture and act on the best available knowledge from all sources, we use evidence-based assessments to review existing knowledge throughout the *Conservation by Design* adaptive management cycle. When identifying conservation challenges and goals, we consider all likely major drivers of change in a socioecological system. As we map strategies and opportunities, a rigorous review of evidence ensures that we think broadly about possible solutions, draw clear links between possible actions and outcomes, and consider necessary enabling conditions, as well as potential positive and negative impacts of our strategic choices. When defining measurable outcomes, we calibrate our expectations based on what similar approaches have achieved elsewhere. We focus monitoring efforts on parts of the conservation equation that are least known so that we understand and can clearly state the outcomes of our work for both people and nature. Throughout the entire management cycle, we capture and share knowledge, ensuring that learning from our own actions contributes as much as possible to the evolving evidence base for conservation.



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## Papua New Guinea

*Efforts to stop deforestation in Papua New Guinea demonstrate how knowledge from diverse sources can be harnessed through an evidence-based assessment, helping to prioritize investments.*

### CONSERVATION CONTEXT

In Papua New Guinea, small-scale agriculture is a major source of forest degradation and thus a major threat to biodiversity. At the same time, communities living in forest areas face challenges in meeting their basic needs. Community-based natural resource management was considered as a strategy for stemming forest loss and enhancing community well-being. The strategy includes identifying important places to engage communities, supporting community-based forest planning and developing incentive structures for effective community conservation.

### INNOVATION

A conceptual model was created that describes the causal pathways between Nature Conservancy activities and desired outcomes (see figure on pages 20 and 21). The strength of evidence for each causal link along these pathways—some known to work well and some less established—was assessed and color-coded. Assumptions and evidence associated with each link were summarized. This synthesis and its presentation allowed managers to easily view and interpret a lot of information, while making the bigger picture clear and easy to follow.

### STEMMING FOREST LOSS

An ornithologist searches for the terrestrial display courts of Wahnes's parotia on Papua New Guinea's Huon Peninsula. Efforts to counter forest loss and degradation in the country were bolstered by an evidence-based assessment.

### IMPACT

This evidence-based assessment allowed managers to rapidly appraise the strength of the science behind the strategy, as well as the assumptions involved. It was clear in this case that for later steps in the strategy, less was known about whether the activities the Conservancy supported would result in the desired outcomes. The lack of evidence suggested that for these activities, the Conservancy would need to invest in greater research and monitoring to understand the actual outcomes of the strategy. Such information is useful for determining funding needs and annual work plans.

Seeing the entire conceptual model in an easy-to-follow format also allowed project teams, managers and other stakeholders to see how a range of activities contributed cohesively toward the desired outcome. Assessing the evidence base for multiple strategies in a region allows rapid appraisal of the relative strength of each strategy. In this case, the decision was made to move forward with community-based forestry management and to focus monitoring on the later stages of the work.

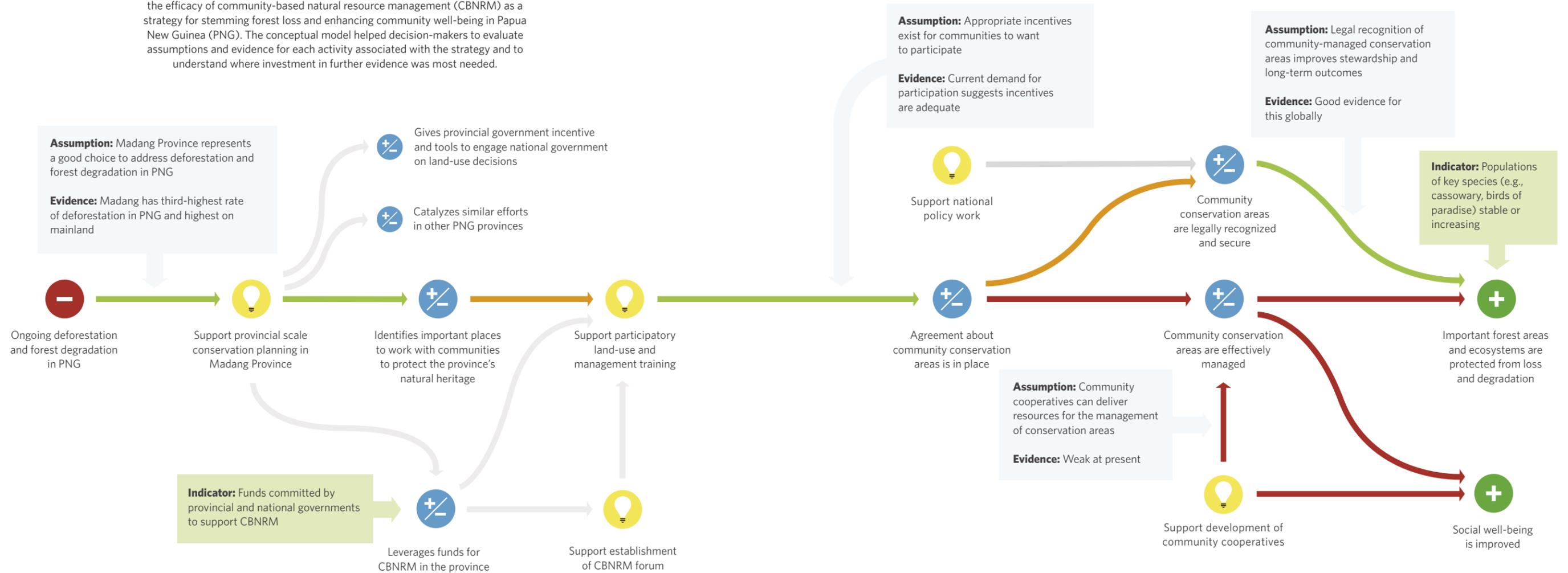
### SUMMARY

This is a good example of how evidence from diverse sources can be synthesized and used to inform assessment of the risks associated with a strategy. Further, the clear and concise presentation of the logic model of the strategy, and of its assumptions and evidence, helped managers and other decision-makers choose the most important investments in monitoring and research.

{ Fig. 3 }

**ASSESSING COMMUNITY-BASED NATURAL RESOURCE MANAGEMENT**

Nature Conservancy scientists created a conceptual model to help assess the efficacy of community-based natural resource management (CBNRM) as a strategy for stemming forest loss and enhancing community well-being in Papua New Guinea (PNG). The conceptual model helped decision-makers to evaluate assumptions and evidence for each activity associated with the strategy and to understand where investment in further evidence was most needed.



(This simplified reproduction includes several examples; the original includes assumptions and evidence for each causal link.)

**KEY**

	Outcome		Good
	Conservancy activity		Could be better
	Desirable state		Priority to improve
	Undesirable state		Evidence not assessed

## SITUATION ANALYSIS

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### HUMAN CONTEXT

A young woman gets a small business loan in the village of Katumbi, in Tanzania, where The Nature Conservancy and partners are collaborating to address community development issues, habitat protection, fisheries management and freshwater protection. Understanding the full context of conservation efforts includes considering socioeconomic factors and compels a transdisciplinary approach.

A situation analysis describes the context in which we hope to create conservation outcomes and facilitates the identification of the most pressing challenges facing nature and people. Situation analyses have long been an important analytical step for conservation planners seeking to develop a mechanistic understanding of the systems in which they work. The complexity of systems today, however, and our desire to ensure that our work results in self-perpetuating virtuous cycles mean that we need to strengthen how we use this method. Specifically, we must expand our consideration of the connections between nature and people, as well as the drivers of change. Familiar methods such as biodiversity mapping and threats assessment can be used to describe the status of nature. To more fully characterize the socioecological system, maps of development priorities and ecosystem services, policy and regulatory analyses, stakeholder analyses, and value-chain analyses may be needed to identify important public sector connections, influential points of engagement, and potential roles of corporations and other market players. These additional methods from the social and economic sciences will enrich and improve our situation analyses.

An example from Tanzania illustrates the insights gained by more fully exploring the social context when assessing a conservation situation.

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{ Fig. 4 }



{ SITUATION ANALYSIS: CASE STUDY }

## Tanzania

*Looking to conserve forests in Tanzania for chimpanzees and a host of other species, The Nature Conservancy found the need to expand its situation analysis beyond species and threats to explore the social context and the complex interconnections between people and nature.*

### CONSERVATION CONTEXT

Lake Tanganyika holds 17 percent of the world's fresh water and is home to 250 species of endemic fish. The Greater Mahale Ecosystem, including Mahale National Park and the village forestland surrounding the park, is home to 1,800 globally endangered chimpanzees.

This remote area also counts 590,000 people living in extreme poverty. With large families, low prevalence of modern contraception and high unmet needs for family planning, population growth places enormous stress on food security, on people's health and on natural resources, resulting in poverty, land and watershed degradation, and adverse human health outcomes.

### INNOVATION

A basic conservation situation analysis was done, informed by a threat-mapping exercise; existing and new data on the status of various species, including chimpanzees; and consideration of existing protected areas. The threat mapping identified human population growth as a major issue, and this is where the situation analysis went beyond what is commonly done in conservation assessment approaches. Digging in to understand why and how population growth is affecting villagers, as well as chimpanzees and the ecosystem as a whole, dramatically expanded the view of the conservation situation.

A baseline social and economic assessment was conducted with 450 households to better understand the living conditions of local people, the challenges they face, and how they interact with and depend on nature in this complex system. In addition, a cultural site assessment identified areas in the region held in high value by local residents, and a health facility assessment further probed what arose as a major local concern: female reproductive health. Finally, a climate-change vulnerability assessment asked how people and nature are likely to fare under future climate conditions.

### IMPACT

This situation analysis resulted in a much deeper understanding of the interconnected social and environmental challenges. The research found that more than 50 percent of the people in these communities are under the age of 15, emphasizing the high local reproductive rates resulting from poor access to contraception and health facilities. The research also revealed that 95 percent of households farm and that governance is poor, with 66 percent of people saying they have no voice in local village government.

With this information, the Conservancy built a new set of partnerships to address the core causes of both social and environmental stress in the region. Through the Tuungane project (Swahili for "let's unite"), the Conservancy, Pathfinder International and Frankfurt Zoological Society are implementing a regional, integrated approach to address population, health and environmental concerns. The project supports strategies that address each of the major issues identified through the situation analysis: forest conservation, fisheries management, income generation, village governance and reproductive health. Integrating programs around health, livelihoods and conservation builds community self-reliance and enables a more resilient environment and society, particularly in areas where degraded natural resources result in food insecurity.

### SUMMARY

As a result of the situation analysis, the Conservancy saw the need to engage different partners, built a broader suite of interventions and was able to set informed project goals. Progress toward these goals can now be measured against the 2011 baseline. Expanding beyond the initial narrow conservation focus to encompass the breadth of social and economic issues has created a much better chance of achieving conservation success.

## STRATEGY AND OPPORTUNITY MAPPING

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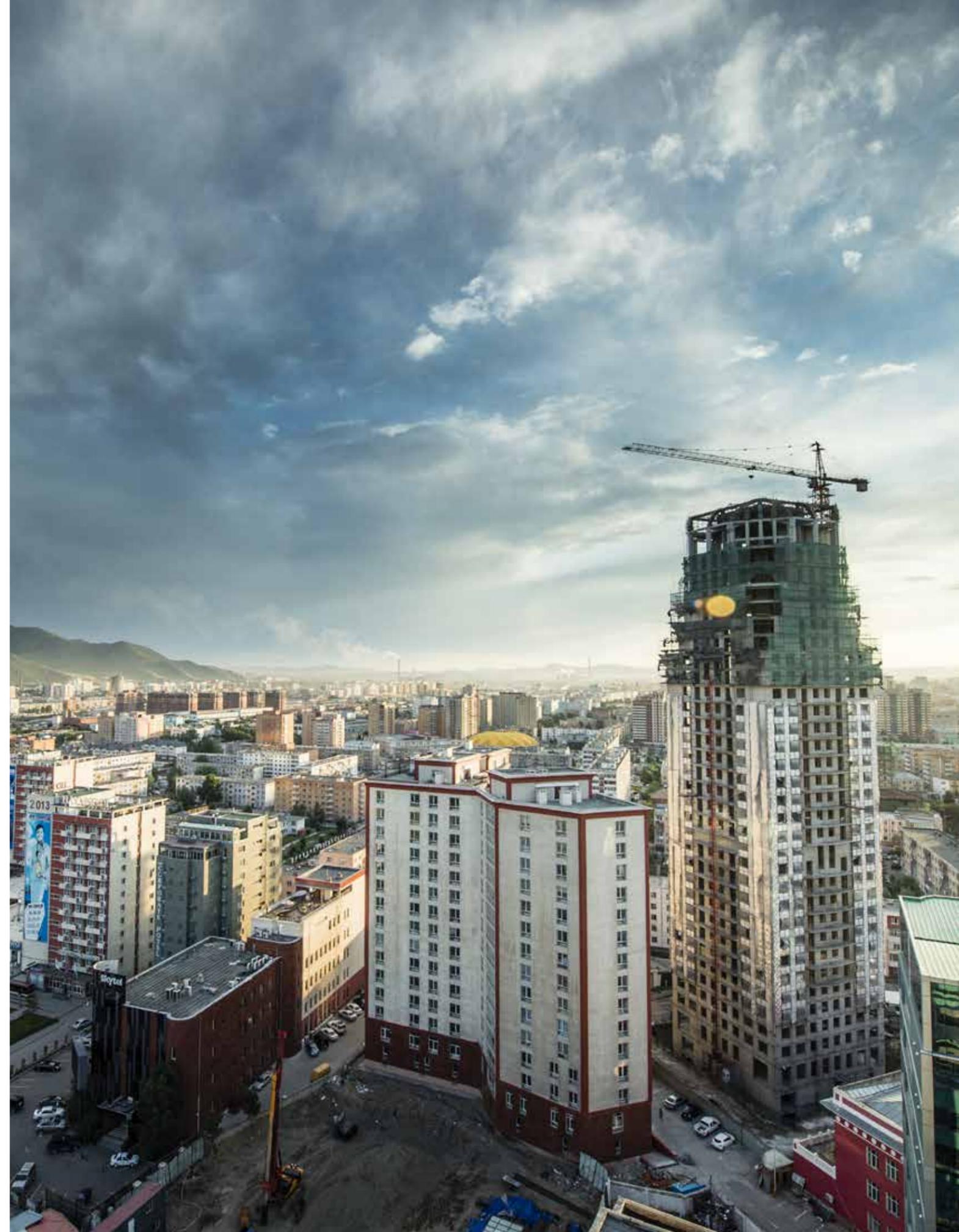
### URBAN CONSERVATION

Mongolia's booming capital, Ulaanbaatar, is representative of global urbanization trends. Adaptive conservation can unite considerations of ecosystem services—the benefits nature provides to people—with biodiversity needs through strategy and opportunity mapping.

Strategy and opportunity mapping allows us to simultaneously assess strategies and places when deciding where and how we work. Such mapping brings together ecological, socioeconomic and other data to show where a conservation strategy—such as acquiring land, managing fisheries or improving infrastructure siting—is likely to produce benefits for nature and where it is likely to benefit people through ecosystem services. It can help identify where the strategy can feasibly be implemented and estimate the amount of benefit that working in those places will provide. The results of such analyses are strategy-specific portfolios of lands and waters—portfolios that can be compared and used to choose strategies where The Nature Conservancy's strengths can create the greatest advances. Whereas traditional ecoregional portfolios tended to map only biodiversity, these strategy and opportunity maps may also be created with data on ecosystem services or benefits delivered to people, identifying opportunities for making a difference in both nature and human well-being. Two examples—one global, one regional—illustrate the power of strategy and opportunity mapping.

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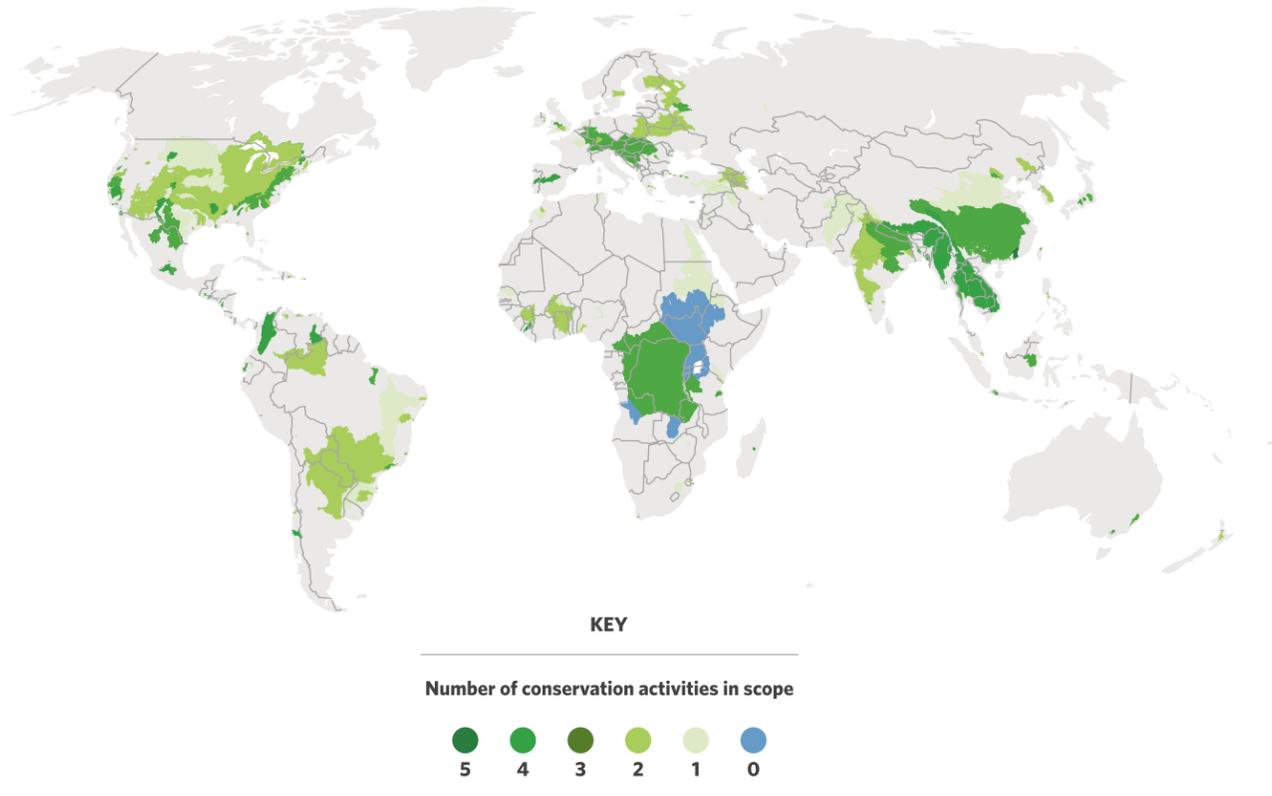
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## Natural Infrastructure to Enhance Urban Water Security

*Global scientific efforts have mapped which freshwater ecosystems are most threatened and which cities face the greatest risks to water security. Strategy and opportunity mapping allowed The Nature Conservancy to explore the potential for natural infrastructure investment to help address these joint challenges.*

WATERSHED CONSERVATION OPPORTUNITIES



© URBAN WATER BLUEPRINT/TNC

### CONSERVATION CONTEXT

Freshwater biodiversity and people living in cities face some of the same massive challenges. Freshwater extraction rates have been allowed to rise unchecked, limiting water flows for species living in streams and for people living downstream. Rainfall patterns, altered by climate change, have become increasingly unpredictable, and the watersheds where important biodiversity lives—and urban water is sourced—have been degraded.

Nutrients from excess fertilizer pollute streams and lakes, and this problem will grow dramatically. By 2030, cropland is projected to increase by 10 percent and fertilizer use by a staggering 58 percent. In the past decade, water quality has been further harmed through erosion and sedimentation, as forests have been converted to cropland or rangeland in the source watersheds of nearly half of the world's 500 largest cities.

### INNOVATION

Strategy and opportunity maps bring together data on biodiversity and ecosystem services. Because global freshwater biodiversity maps already exist, the Conservancy focused on adding the much-needed ecosystem service angle. Conservancy scientists worked with the C40 Cities Climate Leadership Group and the International Water Association to develop a global map of source watersheds for 534 large cities and to create a rapid methodology for estimating the opportunity for watershed investment strategies to improve water supply and quality.

Surface-water availability and water-quantity risk were estimated using global hydrologic models. Water-quality analysis focused on three types of contaminants that jeopardize freshwater biodiversity and often create concern for water utility managers: sediment, nitrogen and phosphorus. The team developed five water-quality opportunity metrics, each representing a commonly used conservation strategy for source watersheds: reforestation of grasslands,

implementation of agricultural best-management practices, natural-habitat protection, forest-fuel reduction and restoration of riparian buffers. For each conservation strategy, scientists quantified the opportunity for impact by asking how many hectares' worth of intervention would be required to achieve a 10 percent reduction in contaminants, assuming action was concentrated in the parts of the watershed where it would yield the greatest results.

### IMPACT

The Conservancy now has a global view of where the best opportunities are for watershed conservation activities that also benefit city drinking-water supplies (green-shaded areas on the map).

In addition, the results show that agricultural best management practices are the strategies that hold the greatest potential for creating urban drinking-water benefits globally. This allows the Conservancy and others interested in source watershed conservation to make better-informed choices about which activities deserve investment and where investments will have the highest returns. The next step is to overlay this view with existing maps of where the same watershed activities can improve biodiversity. Such an effort would provide a complete strategy and opportunity map for watershed investments, highlighting where they can most benefit both nature and people.

### SUMMARY

Given the findings of this analysis, the Conservancy is combining these maps with biodiversity data so its global-scale engagements can have the greatest impact. These results translate across scales as well, and information on water quantity and quality risks and opportunities is being used to select priority cities for future source-watershed investments in North America and Latin America.

{ Fig. 6 }

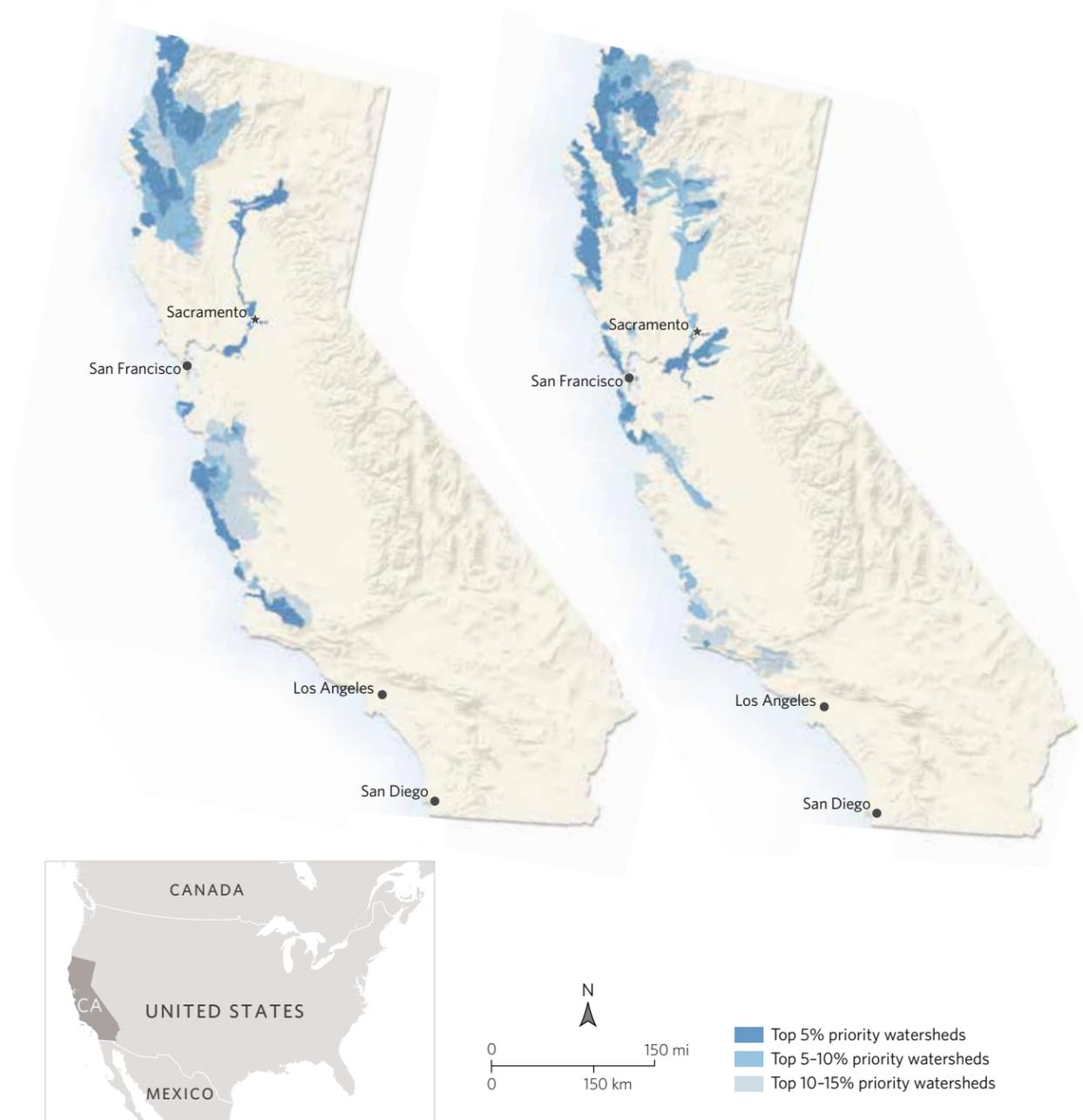
## California SalmonScapes

*Wild salmon are iconic species, with tremendous economic and cultural importance, and they are the focus of much public and private conservation investment in the western United States and Canada. Despite this focus, many salmon populations have been in marked decline for decades. The Nature Conservancy used strategy and opportunity mapping to help assess where different conservation and restoration strategies would deliver the highest return on investment for salmon and other important species.*

### ASSESSING SALMON CONSERVATION STRATEGIES

Strategy: Protect salmon strongholds

Strategy: Restore salmon habitat



### CONSERVATION CONTEXT

Salmon are a conservation priority and also serve as a useful umbrella species. Because salmon traverse and rely on vast interconnected landscapes, waterways and seascapes, successful salmon conservation also helps secure suites of other native species. Their wide-ranging behavior, however, poses significant conservation challenges. Numerous issues need to be addressed to restore healthy salmon populations—and different strategies are possible in different places. For example, one strategy may be to restore degraded instream habitat in forested landscapes. Another might be to remove barriers to fish passage. Yet another might be to invest in active population augmentation using hatcheries. The Conservancy needed an assessment to figure out where investment in these different strategies would deliver the highest returns.

### INNOVATION

The Conservancy categorized conservation strategies to restore salmon runs and then conducted spatial analyses to reveal where each strategy would be best applied. The assessment of each strategy is called a SalmonScape, a map of a portfolio of watersheds representing the best opportunities to restore salmon viability with a given strategy. For example, one SalmonScape map can guide investment in stream habitat restoration; another map shows the best places to invest in a population-augmentation strategy.

### IMPACT

Strategy-specific prioritization has been instrumental in focusing place-based work in California, as well as in identifying and creating opportunities for leveraging that work. The Conservancy uses the SalmonScape maps to help direct public and private resources aimed at restoration. The maps have also been used to help identify and target public and private landowners for outreach and partnership and to estimate potential economic impacts of restoration. The SalmonScape effort was a crucial component of a Conservancy advocacy strategy in California to show legislators and stakeholders how a change in permitting processes for stream-bed alteration could help accelerate salmon stream restoration, which helped lead to the Coho Salmon Habitat Enhancement Leading to Preservation (HELP) Act of 2012.

### SUMMARY

Strategy and opportunity mapping can be a key not only to developing priorities for direct action but also to understanding the broader leverage opportunities for changing policy or practice. Moreover, the maps themselves can help identify and galvanize stakeholders to drive needed change.

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# Conservation *by* Design is a call to action—

a call to use science, collaboration, and the experience and action of the broad conservation community to help transform the relationship between people and nature so that each reinforces and sustains the other.

Through transdisciplinary analysis and respectful engagement of stakeholders, we seek conservation solutions to major environmental challenges. Guiding our decisions and actions are an understanding of the best available evidence and a transparent and rigorous examination of the assumptions embedded in our work. We use the strength of that evidence base to calibrate the appropriate investment in planning and monitoring so as to be most strategic and efficient with limited conservation funds. And through *Conservation by Design*, we strive for all of our work to help drive systemic change for nature and people.

**May this evolution of *Conservation by Design* even further expand, inspire, galvanize and empower the conservation community—and accelerate the conservation of the lands and waters on which all life depends.**

**ADAPTIVE MANAGEMENT** A structured, iterative process of systematically testing assumptions to learn, adapt and improve decision-making in the face of uncertainty. Adaptive management encompasses the design, management and monitoring of a strategy.

**BIODIVERSITY** The variability within and among all living organisms and the ecological complexes in which they occur. Biodiversity includes ecosystem or community diversity, species diversity, genetic diversity, and the ecological and evolutionary processes that sustain it.

**ECOSYSTEM SERVICES** The benefits nature provides to people. Ecosystem services can provide material benefits (such as food, water and employment) or intangible benefits (such as spiritual values and intellectual satisfaction) and can contribute to any component of human well-being.

**HUMAN WELL-BEING** A state of being in which one's needs are met, one can act meaningfully to pursue chosen goals, and one enjoys a satisfactory quality of life. Human well-being is a complex state that can be defined by multiple components, including basic sustenance, health, education, work and leisure, governance, social cohesion, security, and equality.

**INTELLECTUAL CAPITAL** The collective knowledge held by members of an organization that can be used to effect its goals and enhance other types of capital.

**NATURE** Biodiversity and ecosystem services.

**SITUATION ANALYSIS** Systematic assessment of past, present, and/or future economic, political, social and ecological data to identify the status and trends of components and connections in a socioecological system.

**SOCIOECOLOGICAL SYSTEM** A nested, multi-level system emerging from the interaction between humans and the ecological world.

**SYSTEMIC CHANGE** Wide-scale, independent adoption of ideas or processes that alter socioecological systems.

**VIRTUOUS CYCLE** A self-perpetuating, advantageous series of events.

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*Conserving the lands and waters  
on which all life depends.*

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**ON THE COVER**

A member of the Haida tribe performs a fish survey on Prince of Wales Island, Alaska, helping to ensure the state's highest level of protection for salmon streams.

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