MEASURING NATURAL BENEFITS FROM GROUNDWATER DEPENDENT ECOSYSTEMS

$40,950 (February 2018 – May 2019)

Groundwater is a critical resource for people and nature, but the ecosystems that rely on groundwater provide important benefits of their own. Groundwater dependent ecosystems (GDEs), can include springs, rivers, wetlands, and terrestrial vegetation communities, which provide habitat for crop pollinators and sequestering carbon. We are accounting for these benefits using an ecosystem services framework to assess tradeoffs associated with groundwater use and management. **With backing from the Science Catalyst Fund, TNC worked with the Natural Capital Project to identify, measure, and map the services GDEs provide.** Scientists explored three ecosystem services: pollination, water quality regulation, and climate regulation. The study revealed that these benefits are widespread across the state, and GDEs store the equivalent of over 790 million tons of carbon dioxide statewide, which is nearly twice as much as California emits annually. The results will be published to help influence groundwater allocation decisions across the state.

Agriculture dominates the San Joaquin Valley, but returning developed land to natural habitat can have equally important benefits.

ONGOING IMPACT FROM A COMPLETED PROJECT

HIGHLIGHT:

Multi-benefit Targeting and Assessment of Strategic Land Retirement

Scientific advancements and products developed with the support of the Science Catalyst Fund are designed to have impact well beyond the life of the project. In 2017, the Fund supported a project titled Multi-benefit Targeting and Assessment of Strategic Land Retirement. **The goal was to analyze how we could "rebalance" an intensively developed agricultural landscape—the San Joaquin Valley—by strategically restoring unsustainable agricultural lands to natural habitat.** TNC's analysis demonstrated that a targeted restoration could improve water sustainability, restore habitat for endangered wildlife, and produce many additional benefits for both people and nature. TNC is now piloting on-the-ground projects with partners to implement the vision, and the scientists who drove the work are currently under contract to produce a book on this innovative idea. A publication of this kind could significantly amplify the impact of the project by helping land managers around the world strategically restore unsustainable agricultural landscapes.

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- THE NATURE CONSERVANCY IN CALIFORNIA -

CONSERVATION SCIENCE CATALYST FUND

2019 Annual Report

FROM THE DIRECTOR OF SCIENCE

The next decade may well be the most important in our conservation careers. Headlines from the sciences make clear that the opportunity to set society and nature on a more resilient and sustainable trajectory is rapidly dwindling. The fates of countless plant and animal species and the well-being of so many human communities hinge on what the conservation community can accomplish in the near, if not immediate, term.

For The Nature Conservancy to rise to this urgent task, we need a robust and nimble science team, working to align the needs of nature with those of people. Our goal is to show that win-win solutions between people and nature are indeed possible, and to scale those victories into a new business-as-usual.

The Conservation Science Catalyst Fund was established to make sure we have the resources to mobilize the science we need to address the unprecedented challenges of our day. The results from our investments over the past year demonstrate the power of that science.

Thank you for your support of this critical work.

—Scott Morrison, Ph.D.
The Victor E. Shelford Director of Conservation Science, California

CATALYZING SCIENCE FOR CONSERVATION

Conservation needs cutting-edge science and technology to be successful in our increasingly crowded and constrained world. The Conservation Science Catalyst Fund supports the bold and innovative science needed to help set a global conservation agenda and position TNC for influence and impact. The Fund empowers our scientists with the resources they need to quickly mobilize productive scientific initiatives, address emerging issues and opportunities, and establish scientific foundations for conservation action—all with the aim of increasing the pace and scale of conservation.

Some of the key scientific questions facing conservation today include:

- How can we enhance nature's resilience in the face of a changing climate?
- How can we leverage emerging technologies to make conservation more efficient and effective?
- How are nature and conservation relevant to people and human well-being?

SCIENCE LEADERSHIP

TNC scientists play a unique role in the conservation science community. We work at the interface of science and practice to elucidate questions that inform critical conservation decisions. We then convene the scientific collaborators we need to address those questions.

The Science Catalyst Fund provides us with resources to incentivize collaboration with leading-edge partners. In turn, our research partners often augment our investment with resources from their own institutions. The resulting collaborative research enterprise frequently continues well past a given project, branching off to address other important questions. A strong network of productive scientific partnerships is an enduring legacy of the Fund.

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ISLAND CONSERVATION SCIENCE FELLOW

$250,000 (May 2019 – June 2021)

Island ecosystems are hotspots for biodiversity—and extinction. They are also inspiring examples of how targeted, discrete management interventions can deliver transformative conservation outcomes. Projects like TNC's removal of livestock to restore ecological balance on Santa Cruz Island have led to significant advancements in the science and practice of island conservation. Restoration of even larger and more complex islands is now possible—and the world is ready to ramp up island conservation efforts. **To help TNC set that broader island conservation agenda, the Science Catalyst Fund is investing in its second Conservation Science Fellow, Dr. Nick Holmes.** Most recently, Nick served as the director of science for Island Conservation, a nongovernmental organization specializing in eradication as a means of accelerating island restoration. Nick's fellowship has fortified TNC's long-standing collaborations with Island Conservation and other partners in this arena, and today, TNC's California Chapter is engaging in major island eradication projects from the Farallones, off the coast of San Francisco, to Midway, in the central Pacific Ocean.

Nick is also building strategic bridges across TNC programs. He is leading the terrestrial restoration science strategy for TNC's Palmyra Program, including our efforts to enhance the contribution the atoll can make to the conservation of globally imperiled birds. And he is working with TNC's fledgling program in New Zealand to scope a multinational alliance to restore the remote islands of the subantarctic. Closer to home, he is developing the science and partnerships needed to enhance the quality of seabird nesting habitat on the California islands. This fellowship will help TNC leverage its island preserves to set and drive a broader island restoration agenda across, and perhaps beyond, the Pacific.

PARADISE BUFFER PROJECT

$40,000 (October 2019 – April 2020)

Many Californians are living in areas that are unsafe and becoming more dangerous as the climate changes. The 2018 Camp Fire in Paradise, California, was the most destructive wildfire in California's history, killing 85 people and destroying nearly 14,000 homes. Climate-exacerbated disasters are the "new normal," a fact that finally seems to be commanding society's attention. Communities and public agencies are urgently looking for better solutions. We know that ceasing to build new homes in fire-prone areas will reduce risk, but what about community design and configuration, and the possibility of using land-use buffers to reduce wildfire severity within towns? Could compatible land use and open space parks serve to reduce the likelihood of home ignition? **With the support of the Science Catalyst Fund, TNC is exploring the science behind land-use risk-reduction buffer zones around communities.** Land-use buffers can provide both a boundary for urban growth to reduce habitat fragmentation and enable safer communities for people in the face of natural disaster. We are reviewing the scientific literature to see what ideas have evidence and may be implementable. We are also partnering with the town of Paradise's Parks and Recreation Department to explore alternative community redesign in light of the evidence or principles that surfaced in the literature review.

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ASSESSING THE HUMAN HEALTH IMPACTS OF FOREST FIRES

$15,000 (August 2018 – December 2018)

Wildfires have been suppressed for decades across California's Sierra Nevada range, resulting in forests that are thick with fuel such as dead wood and brush, and at risk of large, high-severity wildfires. The consequences for both people and nature can be catastrophic. TNC's forest resilience strategy includes the reintroduction of more low- and moderate-severity fire through practices like prescribed burning. There is, however, concern about air quality and human health impacts resulting from these managed fires. **With Science Catalyst Fund support, TNC worked with Stanford School of Medicine to quantify the health impacts of prescribed, lower-severity fires compared to large, higher-severity wildfires.** The researchers quantified the impacts to the immune responses of children exposed to smoke from prescribed fires compared to the effects of exposure to larger, more intense wildfires. The study showed significantly more harmful effects of intense wildfires, providing important evidence of the human health benefits of active forest restoration, and supporting scaling up forest restoration to reduce fire risk in California more broadly. The results were published in the journal *Allergy,* and the study represents one of the first times TNC scientists have collaborated so directly with the human health community to reveal the human health benefits of conservation-oriented activities. The results of this study are catalyzing significant research into this issue, with Stanford Medical School now leading a charge to more fully study the human health implications of the kind of fires California is experiencing and what can be done.

DEPLOYING "POSEIDON" TO MONITOR FISH STOCK HEALTH

$42,105 (August 2018 – April 2019)

To better understand how fish are faring in a rapidly changing ocean and measure the health of important fish stocks, TNC developed and deployed "Poseidon," a software tool that uses computer vision to record fish length from digital images uploaded by citizen scientists and fishermen. **First successfully applied in the red abalone fishery, the tool was recently deployed in the recreational finfish fishery in Southern California with support from the Science Catalyst Fund.** Along with Scripps Institution of Oceanography and the California Collaborative Fisheries Research Program, TNC worked with volunteer recreational anglers both inside and outside of marine protected areas. An image library and length-based database were developed to test the accuracy of the Poseidon software, and to obtain important fisheries-independent data on size structure of fishes relative to marine protected area boundaries. These data allow fisheries managers to understand the difference between fished and unfished populations and adaptively manage these economically important resources here in California and beyond.

APPLYING EMERGING TECHNOLOGIES TO DIRECT DESERT CONSERVATION

$99,145 (September 2018 – September 2019)

Encompassing 22.5 million acres, California's Desert Renewable Energy Conservation Plan conserves desert ecosystems, while allowing for the development of renewable energy projects in appropriate places. To implement the plan, the Bureau of Land Management and other land managers need information about the location and characteristics of desert springs, so they can manage and monitor groundwater resources. Unfortunately, very little is known about desert springs and the plants and animals they sustain. **With the support of the Science Catalyst Fund, TNC conducted the first-ever botanical surveys of these springs and deployed emerging technologies**—including eDNA (DNA from the environment) investigations, isotopic analysis of spring water, and remote sensing—to investigate the hydrological and ecological characteristics of desert springs. The surveys indicate that more than a quarter of all plant species living in the Mojave Desert are found at springs, which occupy less than 1% of the region's land area. All of our analyses will feed into a comprehensive set of recommendations for long-term spring monitoring in the Mojave Desert.