# **UPDATES ON 2020 PROJECTS**

#### **OCEAN RECOVERY RESEARCH POSITION**

\$60,000 (September 2020 - December 2021)

From climate change to pollution to overfishing, ocean ecosystems face a multitude of threats. These stressors have imperiled numerous marine species that are ecologically, economically, and culturally important, and urgent restoration actions are needed. Unfortunately, the science of species restoration in the ocean remains decades behind that of terrestrial and freshwater systems. Last year, in collaboration with the University of California, Santa Barbara, TNC hired a postdoctoral researcher to lead a body of work on ocean restoration and recovery. The team of researchers has produced two manuscripts to be submitted for publication that will begin to fill the knowledge gap in oceans management. The first is a review of aquaculture approaches for conservation purposes, including species recovery, habitat restoration, and offsetting the impacts of fisheries on vulnerable harvested species. The second reviews the differences and similarities between the terrestrial restoration economy and the ocean restoration economy and highlights challenges and opportunities for increasing restoration and recovery of degraded ocean ecosystems.

# POST-FIRE REGENERATION STUDY FOR WESTERN UNITED STATES FORESTS

\$25,000 (September 2020 – November 2021)

A key strategy for addressing climate change is to reduce atmospheric carbon by keeping it locked in trees and soil. Dramatic increases in the size and severity of wildfires, however, threaten carbon stores in many western U.S. forests, and as climate change leads to warmer and drier conditions, catastrophic wildfires could result in the conversion of forests to shrublands and grasslands that have lower carbon storage potential. **Last year, the Science Catalyst Fund invested in research to assess the current and future risk of forest and carbon-storage loss in post-fire landscapes in the West. The study and maps are complete and** will be prepared for publication in early 2022. This research will identify where large-scale restoration projects will have the greatest potential to reduce carbon losses and forest conversion, thereby helping TNC, public agencies, and other conservationists better allocate resources.

# AQUATIC COLLECTION GIFTED TO THE CALIFORNIA ACADEMY OF SCIENCES

\$30,000 (June 2021 - December 2021)



This year, TNC lost a conservation legend. Larry Serpa spent 45 years at TNC as an aquatic ecologist, managing natural areas, surveying properties for rare species, and leading exemplary trips into the field. His fascination with the hard-to-find and overlooked was well known and infectious among his colleagues. Larry's true passion was freshwater ecosystems and the insects that support aquatic food chains. He wanted to know "who lives where" and how the populations of these insects differed across habitat types and geography.

Beginning in graduate school, Larry visited streams across California, collecting specimens and cataloging his finds. Over time, he built what became the largest individual collection of aquatic insects from California, numbering over 190,000 specimens. Larry was meticulous with his data, documenting times, locations, and ultimately identifying over 1,500 individual species, including some that were previously thought to be extinct.

Thanks to his wife and fellow TNC colleague Lynn Lozier, Larry's collection has been donated to the California Academy of Sciences. The academy reports that it is one of the largest collections they have ever received and that its addition makes their institution "easily the biggest and best resource for Western aquatic collections." Collections like these are invaluable for helping scientists understand the natural world and how to preserve it. **Catalyst funding will support the full curation of the collection, which will make it available to scientists and conservationists worldwide.** 



CALIFORNIA conservation science

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# FROM THE DIRECTOR OF CONSERVATION SCIENCE

This past year was yet another reminder of the urgency we face as conservationists to help society chart a course to a more sustainable, resilient, and biodiverse future. Science is essential if we are going to rise to that challenge, especially in the face of such profound and accelerating global change.

Throughout 2021, our science team at The Nature Conservancy (TNC) in California was once again pioneering the frontiers of conservation science and practice, delivering the scientific advances and insights needed to drive our organization's portfolio of transformative conservation strategies.

The Conservation Science Catalyst Fund powers the agility and innovation necessary to keep TNC at the leading edge of conservation. Here we share some of the exciting research—and impact—the fund made possible over the past year. Thank you for your interest in and support for TNC as we work to protect the lands and waters upon which all life depends.

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

#### **CATALYZING SCIENCE FOR CONSERVATION**

To be successful in our increasingly crowded and constrained world, conservation needs cutting-edge science and technology. The 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 provides our science teams with the resources to quickly launch projects in response to emerging opportunities and urgent environmental issues, ultimately accelerating the pace and expanding the scale of TNC's work.

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.



#### **CLIMATE SCIENCE FELLOWSHIP**

\$100,000 (August 2020 - October 2021)

Developing robust conservation strategies in the face of climate change requires an in-depth understanding of how climate impacts are touching down across the world. Beginning in 2018, the Science Catalyst Fund funded a climate science fellow, Dr. Daniel Swain, in partnership with UCLA's Institute of the Environment and Sustainability and the National Science Foundation's National Center for Atmospheric Research. Dr. Swain is helping us-and the world, via his website weatherwest.com-understand the complex interactions of climate, drought, flood, and wildfires, with a particular focus on how these phenomena are changing in a warming climate and how nature-based interventions can reduce risks and improve environmental outcomes. His research directly informs our strategies in forest management, disaster resilience, and nature-based climate solutions.

#### NEW ISLAND RESILIENCE STRATEGY

Island ecosystems are hotspots for biodiversity-and extinction. They are also inspiring examples of how targeted management can deliver transformative conservation outcomes. With recent scientific and methodological advances, conservationists can now set their sights on dramatically increasing the pace and scale of island restoration efforts. Two years ago, the Science Catalyst Fund enabled us to hire an Island Conservation Science Fellow, Dr. Nick Holmes, to help TNC set that broader island conservation agenda. This year, TNC launched an Island Resilience Strategy with Dr. Holmes as the lead. During 2021, the fund supported two projects emerging from this body of work:

# SCALING INVASIVE RAT MANAGEMENT TECHNOLOGY

\$25,000 (June 2021 - June 2023)

In the Solomon Islands, northeast of Australia, invasive rats are a pervasive ecological threat, predating sea turtle eggs and jeopardizing community-based ecotourism that is critical for sustainable local livelihoods. With support of the Science Catalyst Fund, TNC worked with local partners to pilot the use of selfresetting traps, an emerging technology for eradicating rats and keeping them from repopulating. This includes a public-private partnership with Goodnature, a New Zealand-based company, with whom we are working to refine the hardware and application method in order to scale the use of this powerful tool.

# SCALING CONSERVATION DRONE USE IN ISLAND **ERADICATIONS**

\$44,000 (October 2020 - December 2021)

Tetiaroa Atoll is the most important seabird and endangered sea turtle nesting site in French Polynesia. Because invasive rats pose a major threat to island wildlife there, **TNC is collaborating** with the Tetiaroa Society and a global nonprofit, Island Conservation, to advance a rat-eradication project. This effort is coupled with a research program focused on the causal linkages between the integrity of terrestrial ecosystems, the health of coral reefs, and climate resilience. The research will add to the global understanding of mechanisms for maintaining and increasing island resilience to the impacts of climate change. The Science Catalyst Fund is invested in testing the use of drones to eradicate rats using targeted application of rodenticides, which would provide yet another tool for helping accomplish this mission-critical work.



# **UPSTREAM REMOTE MONITORING OF ENVIRONMENTAL FLOWS**

\$50,000 (July 2020 - October 2021)

We can't manage what we can't measure. Yet, California only has functioning gauges in 10% of its rivers, which means it is not possible to monitor the flows that are necessary to sustain ecological health. But because installing gauges in all of the state's waterways is infeasible, both financially and logistically, TNC is working with software development firm Upstream Tech to develop a technological solution. With funding from the Science Catalyst Fund, we are developing machine-learning models to predict daily flows at locations throughout California. The results have been promising, with initial models able to predict seasonal magnitudes of flows over a five-year period. In the year ahead, we will continue to refine models with the aim of creating a publicly accessible tool that predicts streamflow in all of California's rivers and streams.

### **TRANSPORTATION ADAPTATION**

\$35,000 (October 2020 - June 2021)

Climate change is impacting California's roadways and highways. As extreme weather events increase in frequency, California's roadways are becoming more vulnerable to climate stressors such as post-fire debris flows that occur when destructive fires are followed by intense precipitation. Highways compromised by these stressors threaten people's safety, and many of these same roadways also pose threats to wildlife by creating barriers to animal movement. With the support of the Science Catalyst Fund, TNC partnered with Arizona State University and Southern California Wildlands to identify the overlap between highways that are vulnerable to weather events and highways that are barriers to wildlife movement. The resulting analysis will identify priority locations where infrastructure improvements can address threats to both people and nature.

#### ANALYZING THE IMPACT OF LITHIUM MINING

\$35,000 (July 2021 - June 2022)

To address climate change, the energy and transportation sectors are transitioning away from fossil fuels. Lithium, which is used to make rechargeable batteries for electric vehicles and the storage of electricity produced at solar and wind facilities, is playing a key role in this clean energy transition. The environmental impacts of lithium extraction vary with extraction method and location. With the support of the Science Catalyst Fund, TNC has launched a Lithium Mining Impacts Analysis to investigate the intersection of conservation and lithium extraction in the contiguous United States.

This approach, aimed at getting ahead of a potential threat to conservation, is familiar territory for TNC. With the release of the science-based Mojave Desert Ecoregional Assessment in 2010, TNC scientists identified enough suitable, already-disturbed land in the Mojave Desert to meet California's ambitious renewable energy goals seven times over. That, in turn, enabled TNC to help create regulatory and market mechanisms to drive development away from areas that were most important for ecosystem and biodiversity protection. We thereby demonstrated how a science-based collaborative approach can dramatically reduce the need to trade conservation goals for development goals. In the year ahead, we hope to do the same for lithium, helping the U.S. move toward a carbon-free future in a way that protects both communities and ecosystems.



THE NATURE CONSERVANCY IN CALIFORNIA