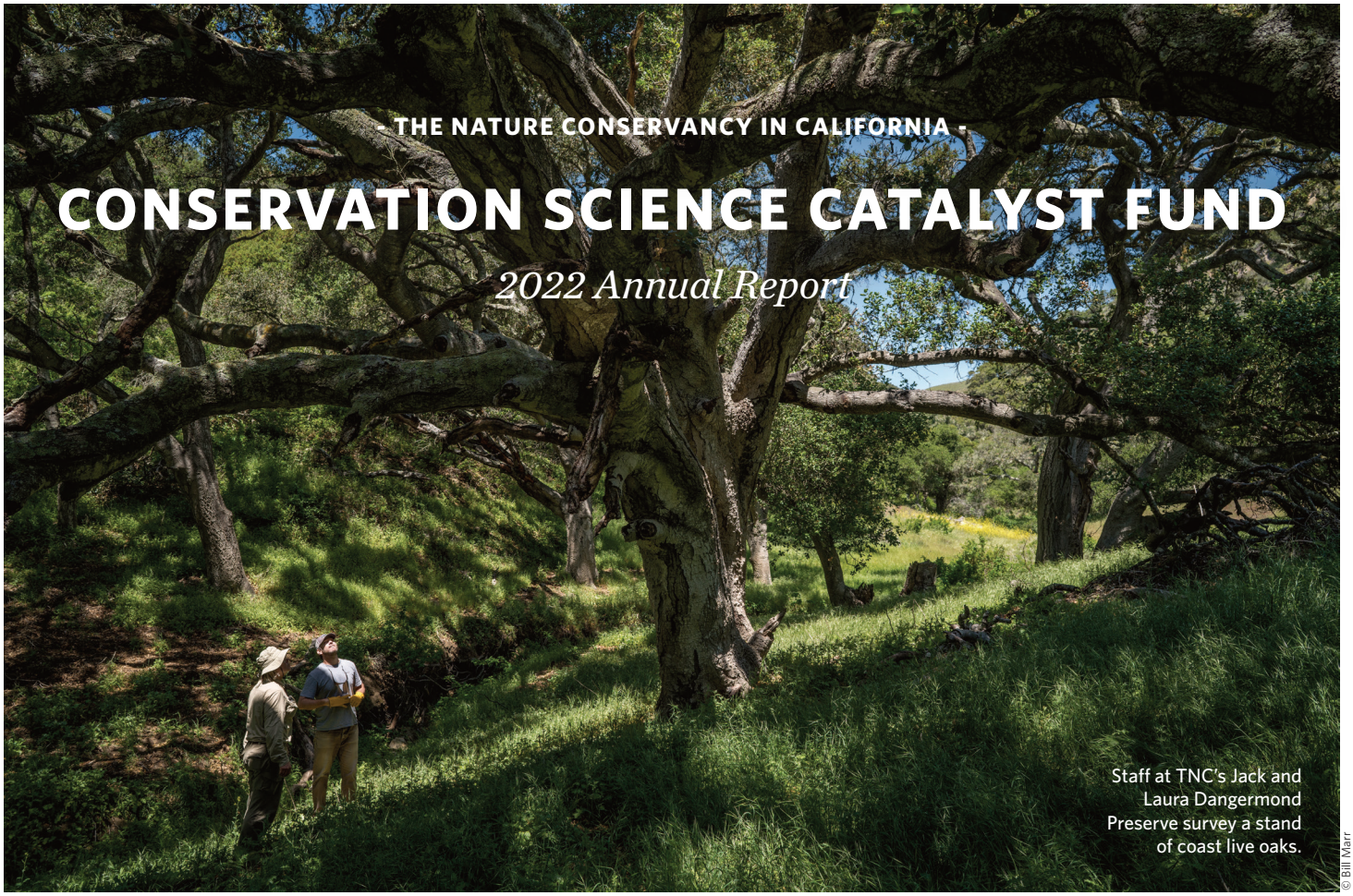

Staff at TNC's Jack and Laura Dangermond Preserve survey a stand of coast live oaks.

FROM THE DIRECTOR OF CONSERVATION SCIENCE

California provides a tremendous experimental arena for applied scientists to develop and test ideas for increasing the pace, scale, and effectiveness of conservation. To that end, our TNC scientists across the state are focused on the science needed to inform, influence, and inspire conservation—not just in California but around the world.

This report highlights some of our Conservation Science Catalyst Fund investments over the past year. Some projects aimed to build tools needed to support complex decision-making, for example, in managing river flows and adapting transportation infrastructure to emerging climate realities. Others advanced new approaches to more traditional conservation science, like BioBlitzes to rapidly fill knowledge gaps and conservation genomics to help target restoration efforts. And some projects got out ahead of conservation challenges we see on the horizon, framing the problem and informing the dialogue to come, as with our lithium analysis and climate science fellowship.

Each of these diverse projects aims to tackle an urgent conservation challenge in a manner that is both timely and scalable. The Science Catalyst Fund makes this work possible. 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

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.

Scientist Jennifer Carah collecting data at various locations in the Garcia River Forest, near Boonville, California.

NEW PROJECTS: 2022

EXPERT BIOBLITZ AT THE AMARGOSA HEADWATERS

$27,500 (November 2022 – November 2023)

The Amargosa River and associated wetlands occur in the Mojave Desert, originating in Nevada and terminating in California's Death Valley. This largely underground river system creates an archipelago of aquatic and groundwater-dependent habitats that supports one of the most outstanding suites of endemic and imperiled species in the world. Land-use change and decreasing water levels caused by groundwater pumping constitute significant threats to this system. In 2019, TNC acquired the 7J Ranch in the headwaters of the Amargosa River, including 900 acres in fee title and a 280,000-acre grazing allotment on Bureau of Land Management lands. Because these lands are in the headwaters, their management has the potential to impact flows downstream, influencing the overall condition of the river and the biodiversity it supports. **With the support of the Science Catalyst Fund, TNC will lead an Expert BioBlitz* to explore the 7J Ranch and its associated grazing allotment lands to inventory the plants, animals, and natural communities that occupy this critically important reach of the river.** This information will improve not only management of this significant, new TNC preserve, but also the management of biodiversity across the whole system as climate and other conditions change in the region.

A Woodhouse's Toad found during a TNC-led Amargosa Expert BioBlitz.

**An Expert BioBlitz is an intensive field survey within a specific geographic area that involves a team of scientists representing a diversity of disciplines working collaboratively to rapidly generate conservation-relevant data on multiple taxa and resources, and to catalyze ongoing research in the region.*

ASSESSMENT OF OAK STATUS AND TRENDS ACROSS THE CALIFORNIA CHAPTER'S CONSERVATION ESTATE

$60,000 (November 2022 – November 2023)

Oak woodlands are keystone habitats in California, supporting an extraordinary diversity of species. Oak cover and recruitment, however, appear to be declining across TNC's roughly 600,000-acre network of preserves and conservation easement holdings in California (our "conservation estate"), including two of the state's most widespread species, blue oak and coast live oak. Drought, disease, and climate change all have been hypothesized to be contributing to declines, yet, we currently lack a comprehensive understanding of the status of these species. **With funding from the Science Catalyst Fund, TNC and partners will use remote sensing approaches developed at the Jack and Laura Dangermond Preserve to map oak cover changes over the past 10+ years across our California conservation estate**, helping to address current gaps in our knowledge. We also will use conservation genetics to determine the health and resiliency of oak populations to identify source populations to use in restoration where warranted. Given the extent of our conservation estate, our findings will directly inform conservation and management approaches for these species statewide.

UPDATES ON 2021 PROJECTS

CLIMATE SCIENCE FELLOWSHIP

$100,000 (January 2022 – December 2022)

Since 2018, **the Science Catalyst Fund has 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**. During this period, Dr. Swain has helped TNC—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. Dr. Swain's research has directly informed our strategies in forest management, disaster resilience, and nature-based climate solutions. As a trusted science communicator, he has been quoted frequently in *The New York Times,* the *Los Angeles Times,* and other major media.

SCALING INVASIVE RAT MANAGEMENT TECHNOLOGY

$25,000 (June 2021 – June 2023)

Invasive rats are a major threat to island ecosystems around the world, driving untold losses of biodiversity. To address this threat, conservationists need tools that can work across a variety of ecosystem types and social contexts. TNC teams across the Pacific are engaged in a number of efforts to manage these invasive predators. In the Solomon Islands, northeast of Australia, invasive rats are a pervasive ecological threat, depredating sea turtle eggs and jeopardizing community-based ecotourism that is critical for sustainable livelihoods. **With the support of the Science Catalyst Fund, TNC worked with local partners to pilot the use of self-resetting traps, an emerging technology for controlling and potentially eradicating rats.** This case study will help assess the efficacy of a tool that may provide an invaluable option where more traditional, toxicant-based approaches are not feasible.

MODELING ENVIRONMENTAL FLOWS FOR CALIFORNIA'S RIVERS

$50,000 (July 2020 – October 2021)

Understanding natural flows and patterns of flow alteration is an important first step in improving the management of California's rivers and streams for human and ecosystem benefits. However, because California only has functioning water gauges in 10% of its rivers, it is currently not possible to monitor flows comprehensively across the state. **With funding from the Science Catalyst Fund, TNC and collaborators used machine learning to develop models that would fill this data gap by estimating the natural flows in all the streams and rivers in California from 1950 to the present.** The models performed well when tested against data from gauged watersheds, and TNC has since secured public funds through the California Wildlife Conservation Board to expand their use throughout the state. This work is publicly accessible via the California Nature Flows Database, at rivers.codefornature.org, and serves as a resource for a variety of conservation and water management partners.

The California Natural Flows Database and Web map provides estimates of monthly flows (1950-2015) in all of the streams and rivers in California.

ADAPTING TRANSPORTATION INFRASTRUCTURE TO IMPROVE SOCIO-ECOLOGICAL RESILIENCY

$35,000 (October 2020 – June 2021)

Mountain lions across California depend on connectivity of habitat for their survival.

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 and partners identified the overlap between highways that are vulnerable to weather events and highways that are barriers to wildlife movement.** The resulting analysis, "Going with the Flow: Towards a Climate Resilient and Connected Wildlife and Transportation Network," includes a public Web map and is currently under review by Caltrans and the California Department of Fish and Wildlife. It includes a prioritization of state highway segments for climate and connectivity infrastructure upgrades, with areas of highest priority identified as locations that are at highest risk of post-fire debris flow, are situated in key habitat connectivity areas, and are highly critical to the transportation network. These locations present key opportunities for integrating wildlife crossings into stormwater passage infrastructure, allowing limited financial resources to be targeted to achieve multiple benefits.

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. While the growing demand for lithium presents new challenges for conservationists, the U.S. has an opportunity to implement guidelines from the start that would help minimize the environmental impacts of lithium extraction. To seize this opportunity, **TNC scientists, with funding from the Science Catalyst Fund, published "Potential Lithium Extraction in the United States: Environmental, Economic, and Policy Implications," which outlines the intersection of conservation and lithium extraction in the contiguous United States**. TNC explored opportunities and costs posed by different lithium extraction methods, and the potential threats to lands and waters at potential extraction sites in nine states. The report provides an economic and policy analysis to help understand the broader context of lithium production and develop guidance for promoting less-impactful extraction activities. The report is available at **scienceforconservation.org**.

Lithium mining in Clayton Valley, Nevada.

The Nature Conservancy | CALIFORNIA conservation science
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