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INSIDE: CONSERVATION NEWS, SCIENCE AND INSPIRATION

# worldview



**GREEN SCENE:** The upper reaches of Tanzania's Zigi River support unique species like the two-horned chameleon.

## Water for All

IN TANZANIA'S USAMBARA MOUNTAINS, AGRICULTURAL RUNOFF, household pollution and gold panning are taking a toll on the Zigi River—and jeopardizing water security for communities throughout the watershed, including the coastal city of Tanga. The Nature Conservancy and its partners are helping farmers learn techniques to reduce erosion and adopt sustainable crops like cinnamon and cloves, which will increase their revenues, protect forest habitat for endemic species and safeguard the water supply long term. The Tanga Water Fund is one of 16 water funds TNC is developing in Africa. "We believe water protection is everyone's business," says Fred Kihara, water funds director for TNC Africa. —KIRSTEN WEIR

© ROSHNI LODHIA

**FLOCK TOGETHER:** U.S. bird populations are declining in every habitat except wetlands.



# State of the Birds

**BIRDS ARE IN CRISIS: THE UNITED STATES and Canada have lost 3 billion breeding birds since 1970, according to a report by the North American Bird Conservation Initiative. Seventy species are at a tipping point, fluttering toward extinction.**

Bird populations have plummeted in virtually all landscapes, victims of habitat loss, invasive species, climate change and disease. Nearly half of the bird species that live only in Hawai'i are believed extinct, and one-third are endangered or threatened—including four species of honeycreepers, petite forest birds with huge significance to Native Hawaiian culture. The Nature Conservancy's forest preserves are among the last bastions for those iconic songbirds. "TNC has been dedicated to helping the native Hawaiian honeycreeper survive in its only home," says Ulalia Woodside Lee, state director for TNC in Hawai'i and Palmyra.

The report points to one conservation success: Many waterfowl populations have increased, proving that decades-long investments in conservation policy and habitat restoration (see "Duck Stamps," page 52) can result in dramatic gains. —K.W.

BY THE NUMBERS

# 1,700

**Acres of forest adjacent to the Patoka River National Wildlife Refuge in southwestern Indiana purchased by TNC earlier this year.** The acquisition connects more than 20,000 acres of habitat for approximately 46 species of conservation concern, including federally endangered Indiana bats.

# 43

**Miles of land connected by TNC in December across two forested state game tracts near Pennsylvania's Shohola Township.** The nature corridor, located downstream from Shohola Lake, supports Central Appalachian species such as owls, woodpeckers and herons. The parcel has been transferred to the Pennsylvania Game Commission but remains open to the public.

# 32,000

**Acres of forests, lakes, rivers and wetlands protected by TNC in Michigan's Keweenaw Peninsula in December.** The Conservancy will keep the land open to the public for outdoor recreation, while protecting the species that live there, such as gray wolves, migratory songbirds and raptors. —LINDSEY LILES

© DAVID WILLIAMS/BIA/MINDEN PICTURES. OPPOSITE: © TREY INGRAM

# VOTING FOR THE OUTDOORS

U.S. citizens are getting outside more than ever recorded before. But they're also prioritizing our planet at the polls by passing legislation that supports conservation on public lands. Here, we present a report on the nexus between conservation and recreation in the great outdoors.

## GET OUTSIDE with TNC

**842** Preserves With Public Access

**3** Million People Visit TNC Preserves Each Year

Find nature near you at [nature.org/preserves](https://nature.org/preserves)

## Outdoor Participation TRENDS

**+26%**  
New and Returning Outdoor Participants

**164M**  
People Participated in Outdoor Recreation in 2021

Increasing Diversity in Outdoor Participants

## Most Popular Outdoor Activities

Participants in the U.S.

**58.7M**  
Hiking

**45.9M**  
Camping

**52.4M**  
Fishing

**64.5M**  
Running

**51.4M**  
Biking

## Nature Unites Voters

Last November, voters passed 17 ballot measures—led by TNC state programs and a coalition of partners—totaling more than \$7 billion for conservation, including the four highlighted here.

**01:** A \$4.2 billion bond act will fund land and water protection and aim to reduce the impacts of climate change.

**02:** A \$1 billion property tax levy will maintain and expand a 70,000-acre network of parks, trails and natural areas.

**03:** A sales tax will generate \$100 million for land and water conservation in one of the state's fastest-growing regions.

**04:** A \$20 million bond will conserve rural working lands and protect valuable water sources like the Guadalupe River.





# Triumph in Bristol Bay

EPA action defends the world's largest wild salmon fishery from proposed Pebble Mine

**MILLIONS OF WILD SALMON RETURN TO THE WATERS OF ALASKA'S** Bristol Bay every summer. For the Yup'ik, Dena'ina and Alutiiq people, whose ancestral ties to these lands and waters span millennia, the tradition of gathering to harvest wild salmon is a cherished inheritance.

Yet for the last two decades, a proposal to build what might have been the largest open-pit mine in North America threatened that traditional way of life and jeopardized the headwaters of Bristol Bay. At stake were some of the last wild salmon runs on Earth, along with a thriving commercial fishing industry worth \$2.2 billion a year, an intact ecosystem of lakes and streams, and diverse wildlife including wolves and brown bears.

For more than 10 years, The Nature Conservancy conducted scientific research to help support local efforts to halt the mine proposal. In January, in response to a 2010 petition from Bristol Bay Indigenous groups, a federal scientific review and a public process that included 31,000 TNC supporters, the Environmental Protection Agency vetoed the mine by exercising Clean Water Act protections.

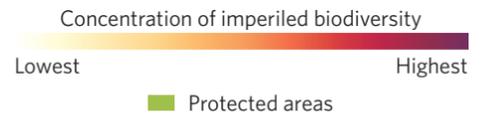
The EPA action is one milestone in ongoing Indigenous-led efforts supported by TNC to create lasting change in Bristol Bay. "The communities in the Bristol Bay watershed will continue efforts at implementing legislation to permanently protect the vital watershed," says AlexAnna Salmon, president of the Igiugig Tribal Village Council in southwestern Alaska, "while leading the way in sustainable community development."

—DUSTIN SOLBERG

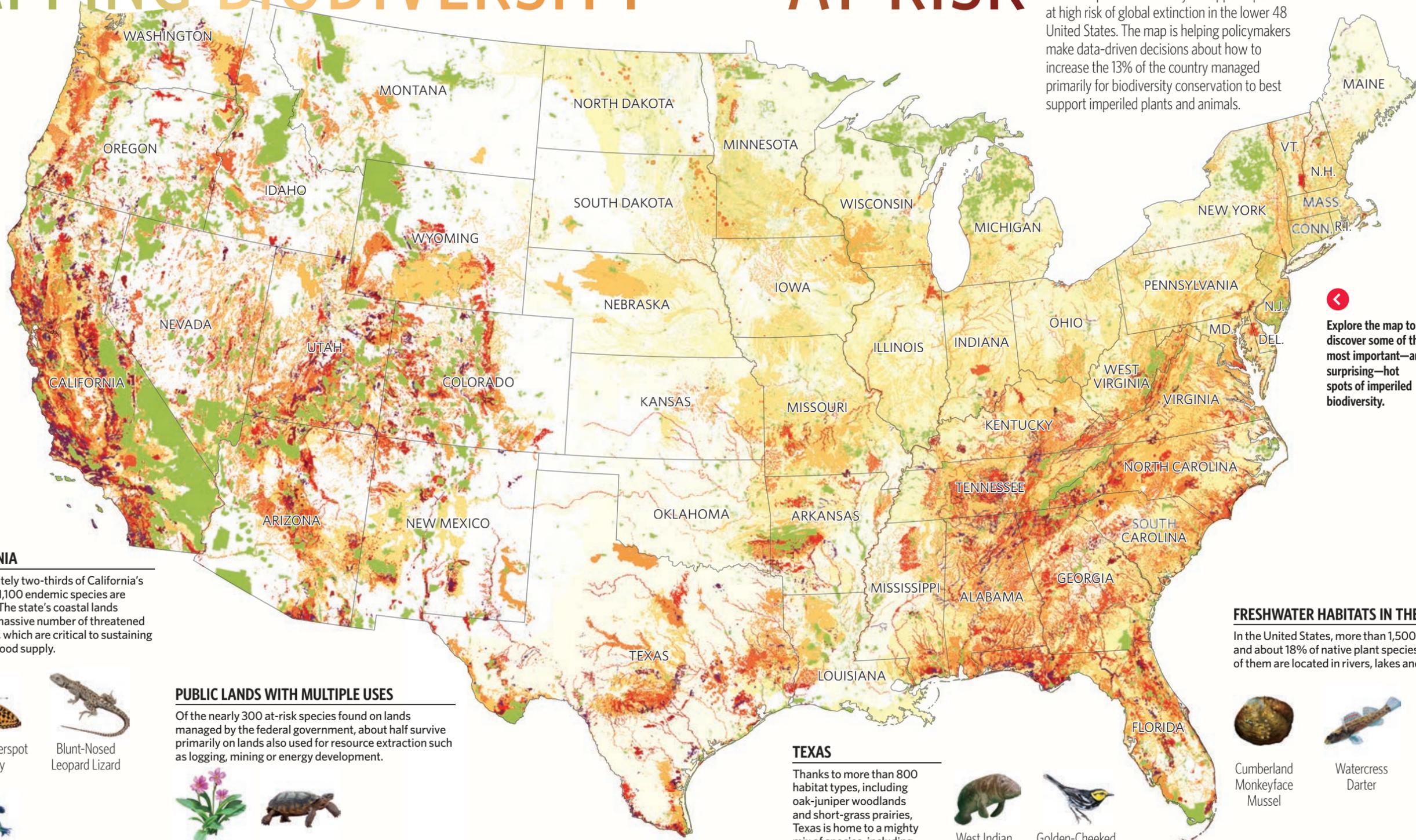
© JASON CHING

**NORTHWEST WONDER:** The proposed Pebble Mine, recently vetoed by the EPA, would have damaged salmon habitat (right) in Alaska's Bristol Bay watershed, including Iliamna Lake (opposite).

# MAPPING BIODIVERSITY AT RISK



A map from NatureServe, in partnership with The Nature Conservancy and other groups, identifies places most likely to support species at high risk of global extinction in the lower 48 United States. The map is helping policymakers make data-driven decisions about how to increase the 13% of the country managed primarily for biodiversity conservation to best support imperiled plants and animals.



Explore the map to discover some of the most important—and surprising—hot spots of imperiled biodiversity.

## CALIFORNIA

Approximately two-thirds of California's more than 1,100 endemic species are imperiled. The state's coastal lands support a massive number of threatened pollinators, which are critical to sustaining the global food supply.



## PUBLIC LANDS WITH MULTIPLE USES

Of the nearly 300 at-risk species found on lands managed by the federal government, about half survive primarily on lands also used for resource extraction such as logging, mining or energy development.



## TEXAS

Thanks to more than 800 habitat types, including oak-juniper woodlands and short-grass prairies, Texas is home to a mighty mix of species, including the endangered golden-cheeked warbler.



## FRESHWATER HABITATS IN THE SOUTHEAST

In the United States, more than 1,500 freshwater invertebrates and about 18% of native plant species are imperiled—and many of them are located in rivers, lakes and wetlands in the South.





Q & A

Q:

### Can crabs scare up a stronger oyster?

Lee Smee, senior marine scientist at the Dauphin Island Sea Lab in Alabama, is trying to help young oysters survive long enough to build sturdier oyster reefs. To do that, he's spooking them with one of their fiercest predators: blue crabs.

**Q: The Gulf of Mexico has lost much of its historic oyster reefs—reefs that have protected its shorelines from erosion, filtered water and provided habitat for other species. You're helping conservationists change that, including at a mile-long Alabama reef where TNC helped plant oysters last June. But first you exposed those oysters to blue crabs.**

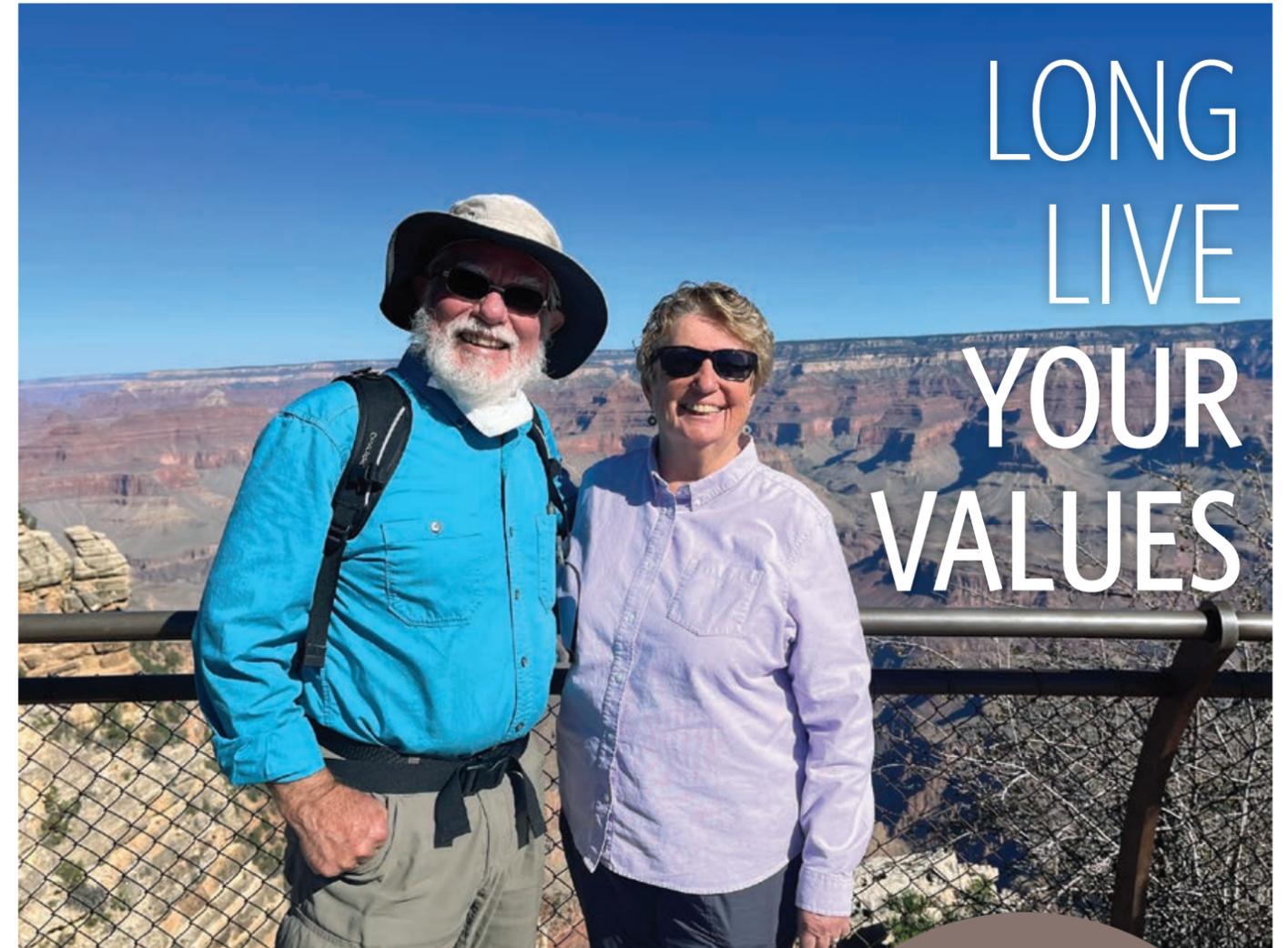
**Why?** Previous work has found that oysters respond to blue crabs and other predators by building heavier, stronger shells. We knew that some type of chemical from the crab triggered the oyster response, and we thought that it was likely in the crab urine.

**Q: Why would oysters need stronger shells?** In Alabama, the natural populations have gotten so low that there are areas where there's not enough oyster larvae in the water to get a reef going. So we grow oysters in a nursery, but when we put them [on reefs] they all get eaten. So, we said, can we pre-adapt them in some way?

**Q: That's where crabs, which eat these oysters, come in. You raised the oysters in tanks with caged crabs in them—the oysters could sense a predator was near without actually being in danger. Why not just add crab urine to the tanks?** Crabs have an opening on their face near each eye that they release urine from. They actually squirt it at each other during fights. But it takes us, like, half a day to get 20 milliliters of crab urine. And we need 600 or 700 [milliliters] for a two-month project to get them to grow.

**Q: Now you're looking into the chemical makeup of that crab urine. How come?** If we know what the molecules are [that affect the oysters], we can make a "scary potion" that oyster nurseries could add to their tanks to harden their oysters and improve survival. —JENNY ROGERS

© DANIELE SIMONELLI



# LONG LIVE YOUR VALUES

Kurt and Paulett Liewer in front of the Grand Canyon on a Legacy Journey in AZ. © Sherrie Beal/TNC

As scientists with NASA, Kurt and Paulett have an appreciation for The Nature Conservancy's science-based approach to solving the climate and biodiversity crises. Naming TNC as a beneficiary in their trust has enabled them to create their own legacy for nature. **Find out how you can protect nature for future generations by making a gift through your will, trust, retirement plan or life insurance policy.**

*"We're grateful for the work TNC does with government agencies who protect the environment—and delighted that our legacy support will make an impact."*

KURT AND PAULETT LIEWER,  
LEGACY CLUB MEMBERS

(877) 812-3698    legacy@tnc.org    nature.org/bequestgift

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# Achievement in the Amazon

A massive new protected area in Ecuador conserves crucial freshwater resources for nature and people

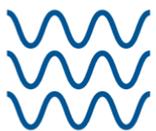
**IN 2018, MEMBERS OF THE A'I COFÁN** Indigenous group in the Ecuadorian Amazon filed a lawsuit against the government to revoke more than 50 mining concessions that could pollute the community's main source of water. In January, after years of collaboration, Ecuador's government—in partnership with The Nature Conservancy—established a nearly 250,000-acre water-protection area that will protect the Aguarico River and more.

The Aguarico, Chingual and Cofanes water-protection area spans a range of ecosystems from tropical rainforests to high-altitude páramos and evergreen montane forests. Like all water-protection areas, it is designed to conserve water sources that are key for human consumption, food scover-

eighty and sustainable development in local communities. Approximately 3,000 people live inside the water-protection area, and the catchments provide water to an additional 80,000 people downstream. The newly secured territory also connects four other protected areas in Ecuador, creating a biological corridor that will safeguard more than 1,000 plant and animal species, including iconic and endangered Andean bears and Andean tapirs.

"The water-protection area is an innovative mechanism," says Maria Cristina de la Paz, watershed conservation coordinator for TNC in Ecuador. "We are committed to having bodies of water step [out of] the shadow and be seen as important ecosystems." —LL

**CLIMB ON:** A new protected area in Ecuador safeguards Andean bears like this mother and cub.



### WATER POWER

The Ecuadorian Amazon plays an important role in the diversity and distribution of aquatic species—including 80% of the country's freshwater fishes.

© JUAN CARLOS VINDAS/GETTY IMAGES. ILLUSTRATION: THE NOUN PROJECT; FAISALOVERS (WATER)



# Tidal Treasures

Seashells have enchanted humans for eons. But there's more to these wave-tossed wonders than meets the eye. Their primary purpose is protection—shells are the exoskeletons of mollusks such as clams, snails and oysters. Made by the secretions of an outer muscle called the "mantle," shells are composed mostly of calcium carbonate and get bigger as the animal grows, maintaining an opening or "aperture" in some mollusk shells just wide enough for its head to poke out. Little is known about the process behind seashells' often-striking colors and markings, but pigmentation and patterning may serve as camouflage. What is clear is the critical role that shells play in coastal ecosystems: They provide shelter for other animals like hermit crabs, nesting materials for shorebirds and stability against beach erosion. —CATHERINE ZUCKERMAN

© MAGGIE ENTERRIOS

# Fresh Start

IT MIGHT BE AMERICA'S CUTEST conservation success story: Endangered Amargosa vole pups have been spotted for the first time in decades in the tiny town of Shoshone, California. Not your run-of-the-mill rodent, the Amargosa vole has such precise habitat requirements that it cannot survive outside two specific outposts along one, 8-mile stretch of the Amargosa River in the Mojave Desert. Those places, Shoshone and Tecopa, are both marshy oases in this largely underground desert river system and provide critical vegetation that shelters the vole.

The Amargosa vole had disappeared from Shoshone until 2020, when a team of UC Davis scientists introduced a population of Amargosa voles from Tecopa. "What's cool" about the new pups, says Sophie Parker, lead scientist for The Nature Conservancy in California's climate program, "is that the vole is reproducing on its own now in more than one location in the wild—that's a big deal." Since the 1970s, TNC has been working with local partners to restore and protect the Amargosa River. Most recently, TNC planted 100,000 trees to protect the river system's wetlands—aquatic refuges upon which hundreds of species depend, including migratory birds, a variety of fish and the region's other endemic icon, the Amargosa toad. —C.Z.

8 INCHES

The average length of an adult Amargosa vole including the tail.



© JOEL SARTORE/PHOTO ARK. ILLUSTRATION: THE NOUN PROJECT; USVA KOT (RAT); RÉMY MÉDARD (RABBIT); SOYGALEM (BAT)

## SPECIES SIZE COMPARISON



Full-grown brown rats are about 18 inches long including their tails.



The average adult eastern cottontail is 16.5 inches long.



The common Mexican free-tailed bat is approximately 3.5 inches long with a wingspan of about 11 inches.

© BRYCE GROARK. ILLUSTRATION: THE NOUN PROJECT; LARS MEERTBERGENS (CORAL)

UNDER THE SEA: The reef ecosystem in Hawai'i supports more than 7,000 marine species.



# Natural Assets

Hawai'i secures an insurance policy for its coral reefs



**Origin Story:** In Hawaiian mythology, coral—or "Ko'a"—is the first being created along with other marine life such as urchins and sea cucumbers, followed by man and woman.

THE NATURE CONSERVANCY HAS purchased an insurance policy on Hawaiian coral reefs—a first in the United States. This policy builds on a model pioneered in Mexico in 2019 for protecting a valuable natural resource that sustains damage just as buildings do in the aftermath of a storm. "Coral reefs protect our shorelines from flooding and wave action and offer so many benefits—we need to make sure we can build them back," says Chana Makale'a Dudoit Ane, community-based program manager for TNC in Hawai'i and Palmyra, who helped spearhead efforts to secure the policy.

Now, when a hurricane or tropical storm damages a reef, it triggers a payout within a week. The amount

depends on the storm's wind speeds and proximity to the reef, with a cap of \$2 million on the entire policy. Detached coral can only survive unmoored in the ocean for about 45 days, so the funds will pay for emergency dive teams to assess damage, remove debris and start reattaching coral using concrete or epoxy.

Ane hopes the concept will be replicated nationwide and beyond to protect reefs and other green infrastructure, but its first U.S. implementation in Hawai'i is fitting. "Native Hawaiians have a spiritual connection to coral reefs, and we see it as our 'kuleana' (responsibility) to protect them," Ane says. "If we care for the ocean, the ocean will care for us." —LL

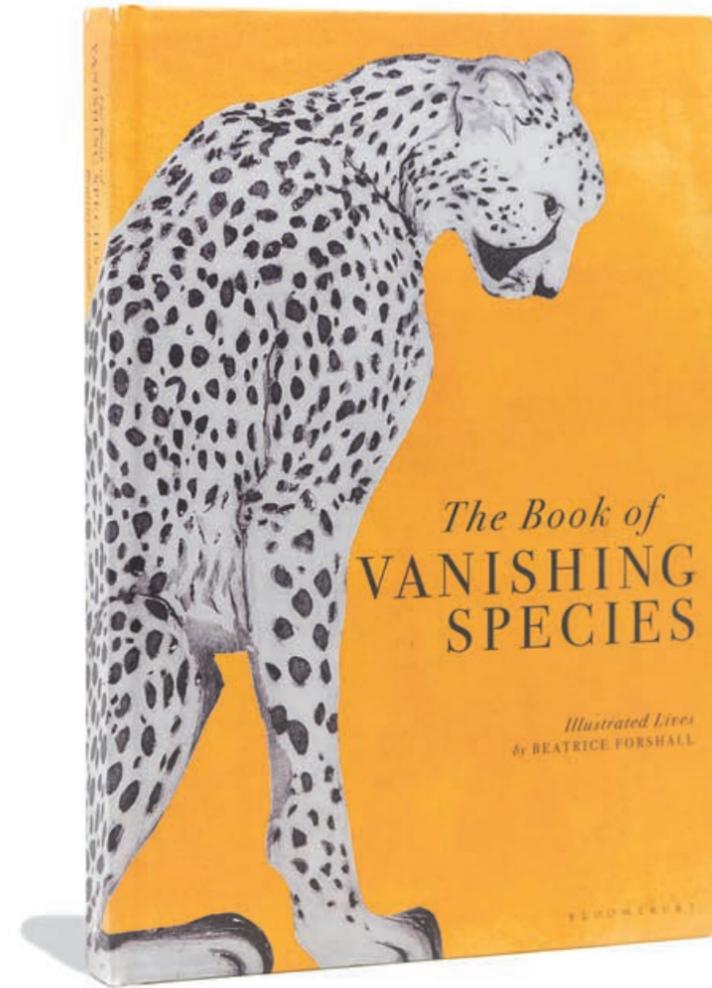


### Desert Flora

SOAPTREE  
YUCCA

A sprawling, shallow root system anchors the soap tree yucca to a dune field in New Mexico's White Sands National Park. The drought-tolerant plant thrives in the nutrient-poor soils of the Chihuahuan and Sonoran deserts, growing up to 30 feet tall. In late spring, bell-shaped blossoms erupt from stalks at the center of the plant's spiny leaves, giving the plant a strange Seussian aspect and attracting its only pollinator—the yucca moth that feeds in the folds of the plant's creamy blossoms. —JENNIFER WINGER

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## Wild Life

The plight of remarkable species on the brink

**WHAT DRIVES EELS TO BREED IN THE SARGASSO SEA? WHY IS A dung beetle so industrious? How did plankton help create our world?** In *The Book of Vanishing Species*, author and illustrator Beatrice Forshall attempts to answer these questions and many more as she outlines the sometimes mysterious but always fascinating lives of the Earth's most at-risk species. Forshall leaves no stone unturned in her quest to illuminate the planet's exquisite web of life, from a snail thriving in the depths of the ocean to the hawksbill turtle hoping to survive a harrowing race to the sea. Although the prose can have an elegiac tone, the call to action is unmistakable: Protect these spell-binding species now or watch them perish. —J.W.

## Mountain Mystery

An environmental whodunit

**SET IN THE MOODY FORESTS** of the Pacific Northwest, Alice Henderson's novel *A Ghost of Caribou* follows wildlife biologist Alex Carter on a new assignment that takes a dark turn. In her attempt to document the existence of the endangered mountain caribou in the Selkirk Mountains, Carter quickly finds herself in the middle of a far-greater mystery involving a missing hiker, a possible homicide and a gathering conflict between a local logging company and protesters angling to save the old-growth forest that could support the elusive species. Whether you're in it for the caribou or the crime, this work of fiction has the right mix of science and suspense to keep you on the edge of your seat. —J.W.

