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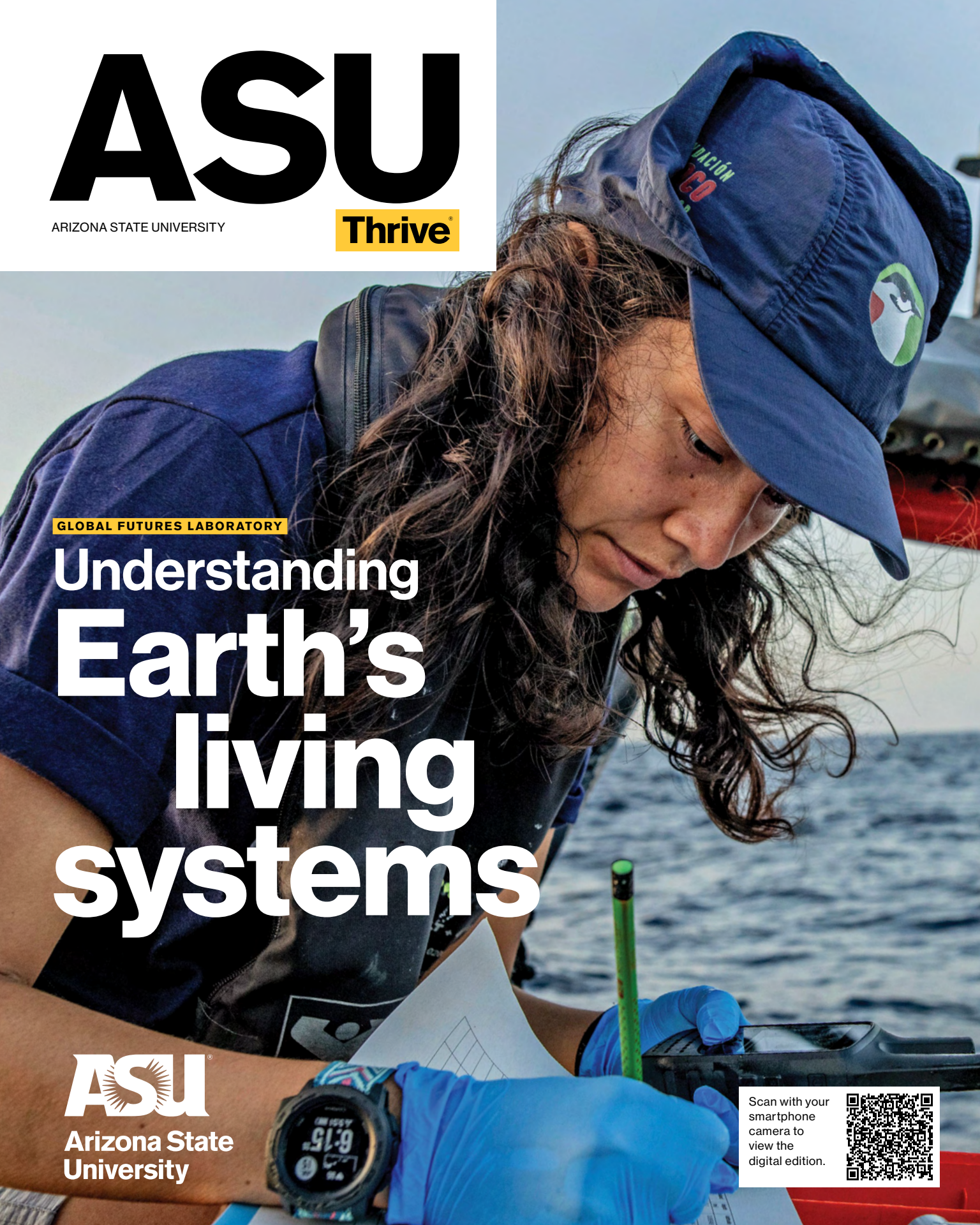
ARIZONA STATE UNIVERSITY

Thrive®



GLOBAL FUTURES LABORATORY

Understanding Earth's living systems

Arizona State University

Scan with your smartphone camera to view the digital edition.


Repeatedly ranked
#1
innovation
ASU ahead of MIT and Stanford
— U.S. News & World Report, 10 years, 2016–25
sustainability
ASU ahead of Stanford and Cornell
— Association for the Advancement of Sustainability in Higher Education, 2 years, 2023–24
global impact
ASU ahead of MIT and Penn State
— Times Higher Education, 5 years, 2020–24
ASU
asu.edu/rankings

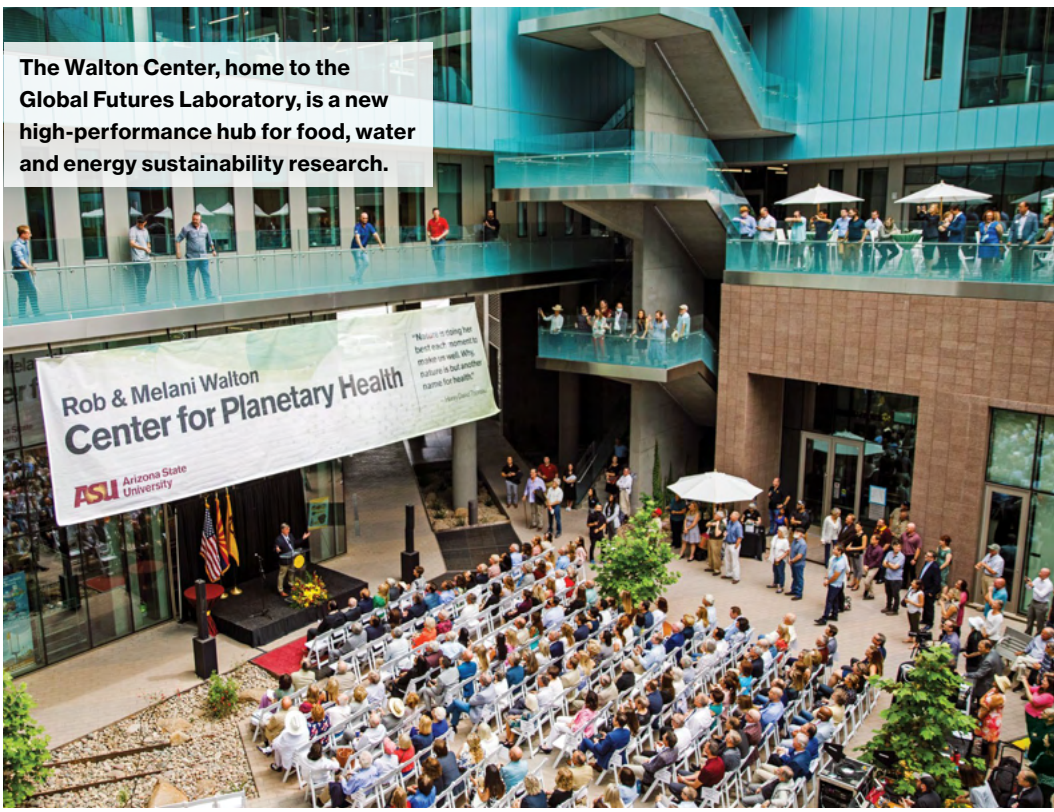
Peter Schlosser
Vice president and vice provost of ASU's Julie Ann Wrigley Global Futures Laboratory®

A planet under pressure

In 2024 alone, wildfires turned skies dark and ashy from Canada to New York, hurricanes unleashed deadly floods across the Southeastern U.S. and record-breaking heat waves pushed athletes to their limits at the Paris Olympics. In Mecca, Saudi Arabia, extreme temperatures during the Hajj pilgrimage led to mass casualties. A cyclone battered Northern Ireland, while wildfires in Southern California consumed tens of thousands of acres, displacing communities and destroying critical infrastructure.

These climate extremes mirror economic ones. Supply chains are unraveling, resource scarcity is deepening and geopolitical tensions — fueled by war and instability — drive energy and food prices to staggering highs. At the same time, deforestation, mass extinction and sea-level rise due to melting ice sheets and glaciers are accelerating, destabilizing the systems sustaining life on Earth.

This is not a distant threat. It is happening now. And the cost of inaction is survival itself.



The Walton Center, home to the Global Futures Laboratory, is a new high-performance hub for food, water and energy sustainability research.

Julie Ann Wrigley Global Futures Laboratory
Arizona State University

globalfutures.asu.edu

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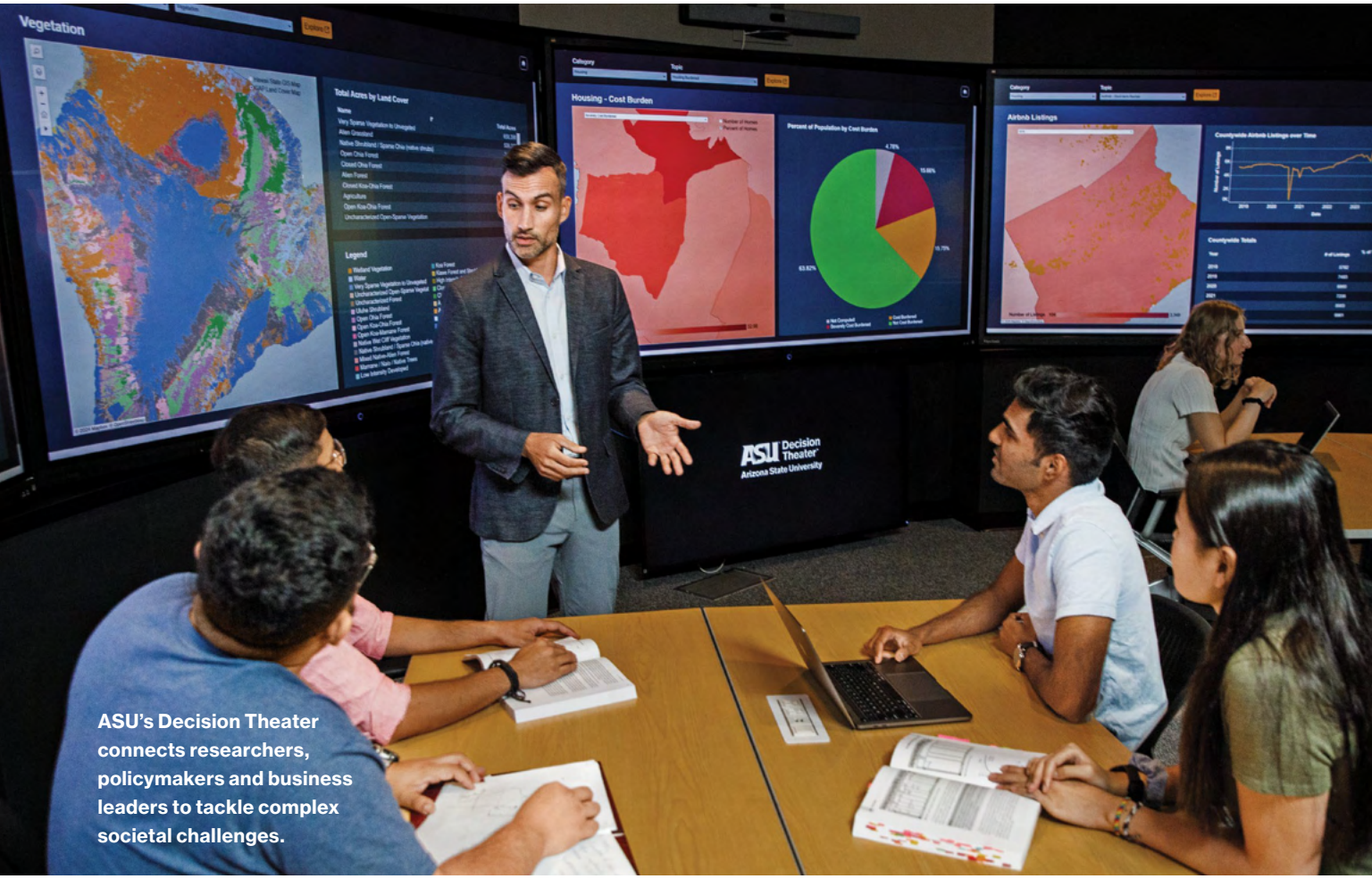
Cover: PhD student Paola Sangolqui conducting an experiment on ocean water in the Galapagos Marine Reserve.



ASU's Decision Theater connects researchers, policymakers and business leaders to tackle complex societal challenges.

The power to shape what comes next

Humankind is one of nearly 10 million species known to science. Yet, we are the only species capable of overexploiting the very systems that sustain all life on Earth. We have pushed our planetary systems to a breaking point. If we can create this crisis, we also have the power to solve it.

The Julie Ann Wrigley Global Futures Laboratory at ASU is a prototype of the University for the Future of our Planet, designed to confront the interconnected crises of climate change, water scarcity, biodiversity loss and energy transitions through centers and institutes dedicated to discovery, a college, a solution service and an engagement space for co-creating solutions with stakeholders and global networks.

The Global Futures Laboratory launched the Water Institute, bringing together global experts to address everything from wastewater equity to the policies that will define water security for generations. We created Energy Forward, an initiative connecting researchers, industry leaders and policymakers to power the energy transformation, and designed to establish the next generation of sustainable, resilient energy systems. And through the Southwest Sustainability Innovation Engine, we are accelerating transformative technologies, driving economic opportunity and tackling energy, water and air challenges across the American Southwest.

The next generation of leaders

Responding to the present challenges requires a new kind of leadership that understands the connections between climate, water, energy and societal will and turns that knowledge into action.

That is why ASU requires all incoming students to engage with sustainability as a foundational part of their education. This is not just about learning — it's about preparing future leaders to drive meaningful change. Whether studying conservation, oceans, human health, food systems, complex systems or global supply chains, students develop the systems-level perspective essential for leadership.

Knowledge alone is not enough. At ASU, students don't simply

ANDY DELISLE/ASU

Greg Asner, director of the Center for Global Discovery and Conservation Science, and Robin Martin, associate director of academics for the School of Ocean Futures, investigating a coral reef in Hawai'i.

study sustainability — they shape policy, negotiate solutions and drive real-world impact. Students work alongside scientists, policymakers and industry leaders to solve real planetary challenges, from climate adaptation to circular economy strategies through programs and tools like the Decision Theater, the Global Futures Impact Scholars Program and sustainability policy labs.

The choice before us

The greatest threat isn't climate change — it's believing we can't change it.

We stand at the precipice of profound transformation. Entire industries — trillion-dollar industries — are waiting to be built. We have more knowledge now than ever before. The next economy will be driven by those who rethink energy, reinvent food systems and redesign supply chains for a circular and prosperous world. The question is not whether change will come, but whether we will shape or be shaped by it. The choice is clear: Embrace change as opportunity rather than sacrifice.

At the Global Futures Laboratory, we see these solutions taking shape daily. From achieving carbon removal breakthroughs to engaging with Indigenous knowledge systems, we are proving that a just and thriving planet is possible and within reach.

The time for inaction has passed. The time to build is now.

About Global Futures Laboratory

The Julie Ann Wrigley Global Futures Laboratory at ASU represents the urgent belief that we can and must make a meaningful contribution to ensuring a habitable planet and a future in which well-being is attainable. The Global Futures Laboratory is the world's first institution of its kind dedicated to the health of the planet and its inhabitants. It is built upon the deep expertise of ASU and leveraging an extensive network of partners for an ongoing and wide-ranging exchange across all knowledge domains to address the complex social, economic and scientific challenges spawned by the current and future threats from environmental degradation. This platform positions a new world headquarters for an international array of scientists, scholars and innovators and lays the foundation to anticipate and respond to existing and emerging challenges and use innovation to purposefully shape and inform our future.

For more information visit globalfutures.asu.edu.

GREG ASNER/ASU

Protecting residents of mobile homes

It's now illegal for landlords in Arizona to prevent residents from installing cooling measures on their mobile homes thanks to research by the Knowledge Exchange for Resilience at ASU. The center worked with residents of mobile homes for over five years to address their extreme heat vulnerability. This population accounts for about 30% of indoor heat deaths in any given year despite comprising just 5% of all Maricopa County housing.

The team, led by Patricia Solís, collected data that helped inform the new law. It went into effect immediately as an emergency action signed by Gov. Katie Hobbs.

Learn more at resilience.asu.edu.

"We did the math and, sure enough, there are many reasons that people who live in mobile-home parks are more vulnerable to extreme heat."

— PATRICIA SOLÍS, EXECUTIVE DIRECTOR OF THE KNOWLEDGE EXCHANGE FOR RESILIENCE

The summer of 2024 was the hottest on record for Phoenix.

A robot that sweats and walks like a human

ANDI is the world's first indoor-outdoor breathing, sweating and walking thermal manikin. Because he can mimic the thermal functions of the human body, researchers can safely test different scenarios involving extreme heat.

Using the manikin, "we're trying to develop a very good understanding of how heat impacts the human body so we can quantitatively design things to address it," says Konrad Rykaczewski, associate professor in the School for Engineering of Matter, Transport and Energy, and principal investigator.

Learn more at semte.engineering.asu.edu.

Extreme heat researchers honored

ASU researchers are at the forefront of extreme heat mitigation. They not only educate the public, but provide actionable steps to reduce the impact of extreme heat. For example, an ASU cohort from the Knowledge Exchange for Resilience and ASU Heat Ready introduced legislation to protect mobile-home residents and created informational brochures for outdoor workers to protect themselves from dangerous conditions.

MaRTy, a mobile weather tool that can measure variables like air temperature and humidity, helps members of the cohort collect data related to extreme heat research.

It's for those reasons that the American Association of Geographers recognized Patricia Solís, David Hondula, Jennifer Vanos, Ariane Middel and Melissa Guardaro with the 2024 American Association of Geographers Media Achievement Award. In addition to actively influencing the public policy landscape in Arizona, their work has been featured on "NBC Nightly News," the "Today" show, "Good Morning America" and other high-profile outlets.

Discover more at resilience.asu.edu.

DEANNA DENT/ASU

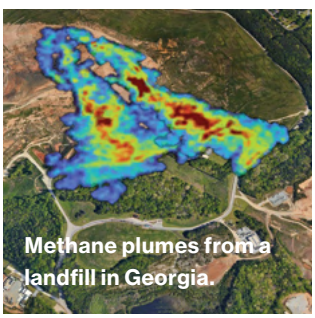
First-ever study finds methane superplumes from US landfills

In the most comprehensive assessment of U.S. landfills to date, ASU scientists, in collaboration with Carbon Mapper, discovered that landfills release high volumes of methane and are responsible for a disproportionately large share of pollution.

The data is publicly available to stakeholders, including waste management companies, governments and the public at large. The research team says the data empowers municipalities to make informed decisions that maximize methane capture.

The study, published in Science, used ASU's Global Airborne Observatory, part of the Center for Global Discovery and Conservation Science, and another aircraft to reveal methane plumes not detectable by walking surveys using handheld detectors.

Learn more at links.asu.edu/superplumes.



Methane plumes from a landfill in Georgia.

ASU's leadership includes convening and coordinating the work of organizations across the Southwest.

A sustainable and prosperous future for the Southwest

From building the nation's largest non-lithium battery facility in Florence, Arizona, to addressing evaporation of Colorado River water, NSF Engines: Southwest Sustainability Innovation Engine, or SWSIE, is protecting clean water sources and developing clean energy solutions.

The ASU-led multi-institution collaborative tackles challenges, like the desertification of Utah's Great Salt Lake and record-breaking heat in Arizona, while also jump-starting economic opportunity in the Southwest. As part of this, SWSIE is providing startup funding to eight companies working on solutions such as reducing water usage in the semiconductor process and developing more efficient concrete.

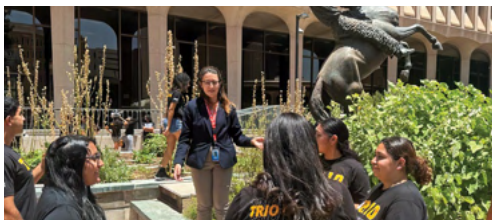
Supported by the National Science Foundation, the program aims to unite academic, community, nonprofit and industry partners to rapidly develop solutions-inspired research and safeguard U.S. competitiveness in key areas.

Find out more at swsie.asu.edu.

"These startups emerged from a competitive selection process due to the promise of their technologies, which stand to advance new industries and future-proof existing ones."

— BRIAN SHERMAN, SWSIE CEO

CARBON MAPPER; SAMANTHA CHOW/ASU



The City of Phoenix Office of Sustainability and ASU's Sustainable Cities Network awarding scholarship funding as part of an annual sustainability challenge.

Global Futures leads city sustainability program

The city of Phoenix chose ASU's College of Global Futures to take over leadership of its Student Council Sustainability Officers Program in February. SCSO was created 11 years ago to develop sustainability leaders, improve civic engagement and embed sustainability on school campuses.

These sustainability officers focus on enhancing their campuses by implementing sustainable practices at their schools. The program currently supports 30 schools of roughly 40,000 students ranging from K–12 and including public, private and charter schools.

The College of Global Futures will continue to work with schools and students with the aim of expanding to other school districts and developing workshops, scholarship opportunities, coursework, workforce development and pathways to degree programs.

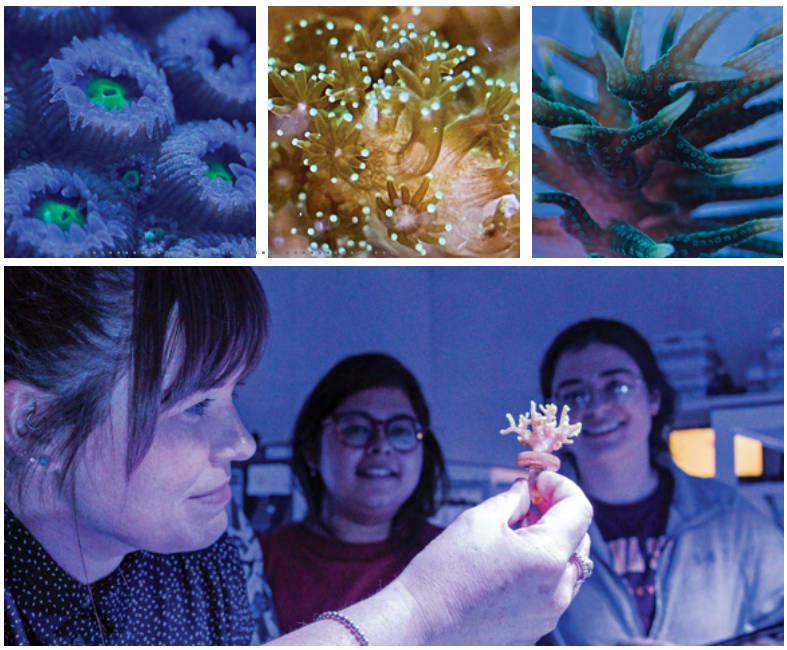
Discover more at collegeofglobalfutures.asu.edu.

"Students and youth voices are vital to furthering sustainability in our schools, as well as in our communities, like Phoenix, and across Arizona."

— ANNE REICHMAN, DIRECTOR OF THE SUSTAINABLE CITIES NETWORK

Under the seas with coral researchers

For people looking to stay up to date with science subjects and discoveries, "SciShow" on YouTube may be just the Complexly product they're looking for. A new episode of the show features different ways ASU researchers are advancing coral reef restoration, from Hawai'i to Bermuda. The episode, "Three Weird Ways Science Is Saving Coral Reefs," brings to life published works and real-world research and efforts from three School of Ocean Futures faculty: Greg Asner, Liza M. Roger and Yvonne Sawall.



ASU Professor Liza Roger and her team study the symbiotic relationship between corals and single-celled algae to develop treatments that mitigate cellular stress and help maintain symbiotic equilibrium.

Scan the QR code to watch the episode

Check out the latest from ASU's Global Futures Laboratory at globalfutures.asu.edu/news.

CITY OF PHOENIX; LIZA ROGER, SAMANTHA CHOW/ASU

The Garden Commons reconnects people to where food comes from, while supporting and producing a sustainable food system.

NEW SOLUTIONS

Changing the way the world solves problems

It's possible to solve the world's toughest problems, but it requires fresh approaches. At ASU, researchers and their partners in the community and around the world bring innovative ideas together and work toward shared goals. The results are surprising discoveries, unlikely connections and solutions that benefit all life on Earth. Learn how scientists are:

- Designing plastics that won't damage the environment
- Protecting endangered wildlife
- Building a stronger water future for Arizona and beyond
- Combating extreme heat
- Preserving biodiversity
- Creating sustainable food systems

It's all a move, says Global Futures Laboratory Vice President Peter Schlosser, to bring traditionally isolated university research into a future of collaboration and rapid innovation.

Read more at research.asu.edu/changing-the-world.

EMMANUEL PADILLA/ASU

“Students will have the unique opportunity to experience the origins of coffee and to understand the journey from seed to cup.”

— DAVE WHITE, DIRECTOR OF ASU’S GLOBAL INSTITUTE OF SUSTAINABILITY AND INNOVATION

BREWING CHANGE

Students to study coffee sustainability in Costa Rica

A new study abroad program through the School of Sustainability lets students immerse themselves in Costa Rican culture and learn about global coffee sustainability firsthand at Hacienda Alsacia — the first Starbucks-owned-and-operated coffee farm.

The program also highlights the challenges facing the industry due to climate change. In addition to exploring research by Starbucks on creating scalable solutions that could be implemented across the coffee belt, students experience a behind-the-scenes tour with experts in coffee sustainability, plant their own coffee tree, enjoy a coffee tasting and tour important natural and cultural sites.

Find out more at links.asu.edu/costa-rica-starbucks.

DAVE WHITE/ASU

ASU and parters unite to strengthen water resilience in Arizona

Developing an AI tool to educate the public on water issues and setting up a statewide network to support water-insecure communities are early accomplishments of the Arizona Water Innovation Initiative.

The multiyear program's purpose is to rapidly accelerate and deploy new approaches and technology for water conservation, augmentation, desalination, efficiency, infrastructure and reuse.

"The Arizona Water Innovation Initiative [strengthens] water resilience while enhancing economic competitiveness, supporting high-value job creation, and recruiting and retaining leading industries," says ASU President Michael M. Crow.

The project was made possible through an investment from the state of Arizona with support from the Virginia G. Piper Charitable Trust.

Visit azwaterinnovation.asu.edu to learn more.

Securing Arizona's water future requires a multipronged approach.

LAURA MCGEARY/ASU

ASU president debuts on TIME100 Climate list

TIME editors named ASU President Michael M. Crow to their inaugural 2024 TIME100 Climate list. It includes leaders across a range of fields, from business to education.

Since 2002, Crow has transformed the university into a powerhouse of climate-related action. ASU established the nation's first School of Sustainability in 2006, two years after founding the Global Institute for Sustainability and Innovation. Both programs were cornerstones to the creation of the Julie Ann Wrigley Global Futures Laboratory in 2019.

Crow says the TIME100 Climate honor "is a welcome recognition of our university's unique approach and impact."

Learn more at schoolofsustainability.asu.edu.

Students visited a rice field to understand AI's impact on traditional farming.

Students explore AI in future of work and society in Japan

The "Japan–U.S. Global Leadership Program in the Age of Artificial Intelligence" hosted by Hiroshima University brought together students and faculty to foster globally competent leaders who can navigate AI's societal benefits and risks. As part of the study abroad program, 12 students from the College of Global Futures and the Thunderbird School of Global Management worked to integrate AI across sectors like agriculture, health care, community service and government policies, with a focus on Japan's society.

The program emphasized the dual nature of technological advancements and their profound impacts on humanity through lectures, workshops, company visits, field trips to local attractions and cultural learning experiences in Hiroshima.

Discover more at collegeofglobalfutures.asu.edu.

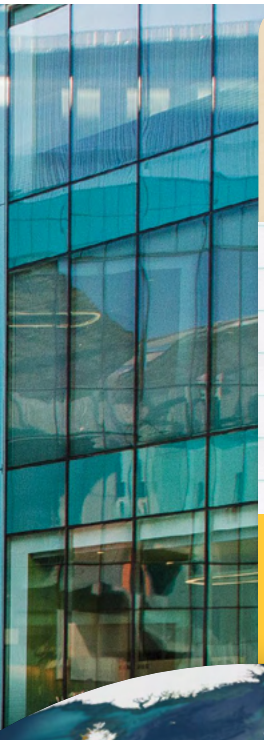
"The program aspires to develop leaders who will shape a new society that harmoniously coexists with AI."

— SHINJI KANEKO, EXECUTIVE VICE PRESIDENT FOR GLOBAL INITIATIVES AT HIROSHIMA UNIVERSITY

WHY ASU IS TACKLING THE WORLD'S MOST PRESSING CHALLENGES

"We must rethink what we eat, rethink trends, fads, technology, transportation, the whole of manufacturing and consumerism. At the same time, the Earth will have to feed 9 billion people and humanity will need to preserve what remains unspoiled of nature."

— ANDRI MAGNASON, "ON TIME AND WATER," 2019



A prototype of a university for a thriving world

The Julie Ann Wrigley Global Futures Laboratory, an unprecedented initiative of scope and scale, is tackling some of the most important and complex problems of our time

The challenges for our world's health and the future of humanity and other life-forms command urgency — and the university is accelerating its wide-reaching collaborative work to help keep the planet and its infinite network of complex systems not only habitable but healthy. In 2019, ASU established the Julie Ann Wrigley Global Futures Laboratory as a first-of-its-kind initiative designed to find actionable solutions to the most challenging issues facing global society and our planet.

The laboratory is ASU's response to the growing awareness that conventional approaches to sustainability, responsible innovation, conservation and planetary wellness are not adequate. Instead, designing a thriving future requires a holistic approach defined by uncompromising transdisciplinary research and open collaboration among universities, businesses, policymakers and the wider public. In many ways, the laboratory can be conceived as a university within a university, says ASU President Michael M. Crow. Its mission consists of diagnosing social and environmental maladies, developing new ways of acquiring data from all components of the Earth's systems, understanding problems to ensure they are properly prioritized, and ultimately prescribing both treatment and ongoing proactive regimens that minimize harm while maximizing planetary and societal wellness.

"The Global Futures Laboratory is an entity that focuses on how the world might look in the future and imagines pathways that will keep it a place worth living in," says Peter Schlosser, the laboratory's vice president and vice provost. "That means a world that is habitable and leaves options for the next generation to shape their lives according to their desires."

The laboratory also adds numerous dedicated resources to solving Earth's greatest challenges, attracts new partner organizations, acts as a single voice with policymakers and functions as a robust center of knowledge and learning about Earth's health.

A global force

ASU named the most impactful U.S. university in addressing the U.N.'s 17 sustainable development goals

#1

university in the U.S. for sustainable practices

In the Global Futures Laboratory

754

dedicated scientists and scholars

1,200+

students working toward undergraduate and graduate degrees at the College of Global Futures

4,000

students across ASU taking Global Futures courses

SOURCES: TIMES HIGHER EDUCATION, ASSOCIATION FOR THE ADVANCEMENT OF SUSTAINABILITY IN HIGHER EDUCATION, ASU

Hundreds of the best and brightest minds

Students work side by side with 754 Global Futures Scientists and Scholars, a pan-university network of faculty and researchers from programs that include the Global Institute of Sustainability and Innovation, the Water Institute, Energy Forward, the Southwest Sustainability Innovation Engine, the Humanities Lab, the Center for Negative Carbon Emissions, the Swette Center for Sustainable Food Systems and more than 70 other centers, initiatives and programs. Together, they explore a staggering range of issues such as water scarcity, biosystems, food security, health systems, Indigenous knowledge, future cities and more.

The heart of the Global Futures Laboratory is the Walton Center for Planetary Health on the Tempe campus, a $200 million facility hosting more than 500 faculty and 1,200 students. The Walton Center is the largest research building on ASU's campuses with 70,000 square feet dedicated for both wet and dry labs outfitted for disciplines that include sustainability, engineering, biology and robotics. While the building serves as the laboratory's headquarters, ASU's Global Futures work extends far

beyond those walls and engages partners across ASU's campuses, out in the field and around the world.

"When people walk into that building, I want them to see that they're moving into a space dedicated to the Anthropocene, this new era shaped by human activities," Schlosser says. "I want them to recognize the urgency of the moment and see hope in the people at work across collaborative spaces. This building is a physical center for those who work on how to get us back onto a trajectory of global wellness."

Transdisciplinary solutions

Sally Kitch, founding director of the Humanities Lab, was one of the earliest adopters of a holistic approach to integrated humanities, social science and bench science and finding ways to help solve complex challenges through a multidisciplinary approach.

Collaboration among natural scientists, social scientists and humanists is part of what makes the laboratory unique. And for many of the researchers, it's also the reason they think ASU will succeed in creating solutions to humanity's and Earth's problems where others have failed.

"Getting to the root of these problems is not just about finding technological fixes, it's about changing human beings' relationship to the planet and to one another," Kitch says. "All these problems — social justice, environmental and health problems — are all very interconnected. You need the humanities in there so we can act quickly and with wisdom."

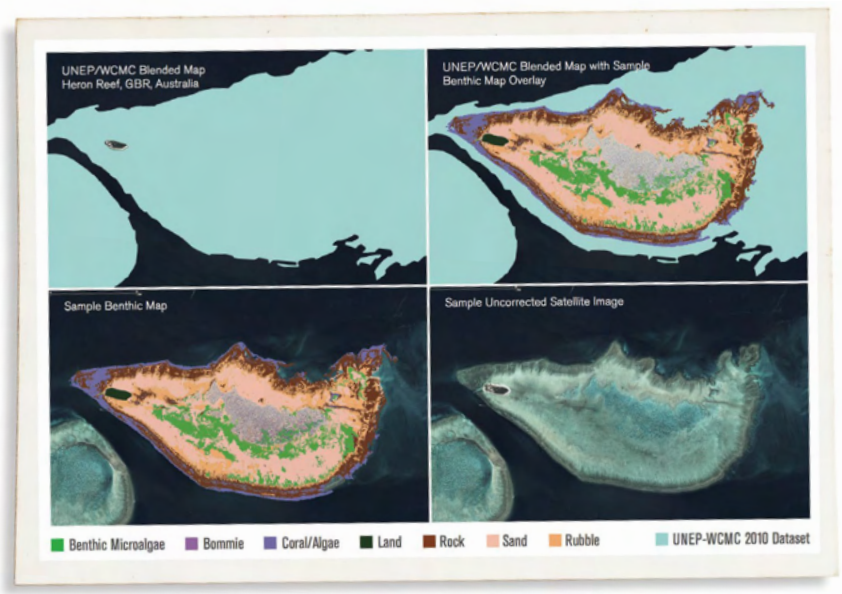
"When you couple the science-based efforts at BIOS to our efforts led by Greg Asner in the Pacific, a clearer picture of the overall ocean dynamics and health will begin to come into full view."

— MICHAEL M. CROW, PRESIDENT OF ASU

Data and knowledge for improving outcomes

A major part of the concept of the Global Futures Laboratory is hundreds of dedicated scholars and scientists across multiple disciplines gathering knowledge and data about how the planet functions across various systems. This is essential for creating wellness solutions and interventions that create positive outcomes.

One of the laboratory's early innovations was the Allen Coral Atlas, a first-of-its-kind web-based coral reef resource tool that allows scientists and policymakers access to essential data. Delivered by an international team of researchers



The Allen Coral Atlas shows detailed coral reef health in a way never before available at scale.

GREG ASNER/ASU

including Greg Asner, the director of the Center for Global Discovery and Conservation Science at ASU, in partnership with Vulcan Inc., Planet and The University of Queensland, it leverages satellite data and field research to track coral reef health around the world. Prior to the Allen Coral Atlas, data had never been available at this scale.

In the Atlantic Ocean, the ASU Bermuda Institute of Ocean Sciences, a premier research institute studying ocean processes, is building on more than a century of work. ASU BIOS is ideally situated to study the highly interlinked, complex problems related to the future of the planet and will put students on the cutting edge of ocean science.

"When you couple the science-based efforts at ASU BIOS to our efforts led by Greg Asner in the Pacific, a clearer picture of the overall ocean dynamics and health come into full view," Crow says. "We expect that this new partnership will be a huge benefit to all Earth scientists seeking a clearer and more concise view of the 'state of the planet.'"

With these types of knowledge and data, researchers also can help prioritize actions. One of the many examples of the work of ASU Knowledge Exchange for Resilience is led by Director Patricia Solís. The team focuses on how to reduce heat-related illnesses and deaths, starting in Arizona with solutions that can translate elsewhere. In early 2025, the team learned that for the first time, heat deaths went down in the Phoenix metro area, and the center was credited with helping with this outcome, including the passage of Arizona state legislation protecting mobile-home owners.

"We empower and equip students to be agents of change — for building vibrant futures for people and the planet."

— MIKI KITTILSON, DEAN OF THE COLLEGE OF GLOBAL FUTURES

Honoring Native knowledge and youths' wisdom

Researchers affiliated with Global Futures also are having an impact around the world through the inclusion of Indigenous knowledge systems. The university has hired Indigenous scientists, and directly listens to and works with Indigenous groups and other stakeholders. An example of this are projects such as a podcast hosted by School of Sustainability professor Melissa Nelson and Biomimicry Center director Sara El-Sayed, where they celebrate and explore the diversity and beauty of Native seeds, soils and Indigenous foods. The commitment to learning from Indigenous people is also central to the 'Ākoʻakoʻa Reef Restoration

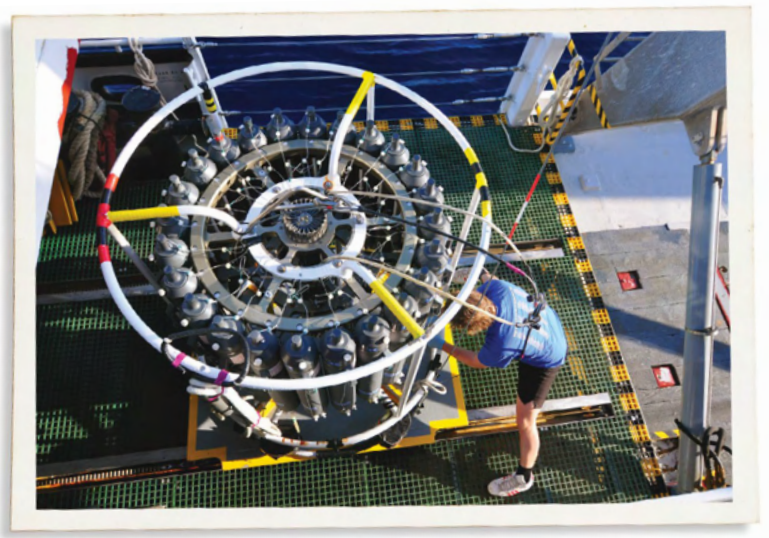
Leah Gerber (right), professor and director for the Center for Biodiversity Outcomes, conducting research on humpback whales with graduate students and collaborators in Hawai'i.

LEAH GERBER/ASU

Program. It is fusing cultural leadership, multimodal education, advanced science and government service to communities of corals and people on Hawai'i Island.

Another key focus is creating opportunities for students to make an impact. The laboratory's approach supports students in pursuing research that has real-world outcomes now and far into the future — their own and their future grandchildren's and beyond.

"If you put a team of students together and give them the freedom and support to design something that is a step toward changing policy, that's a whole different learning experience," Kitch says.



The Bermuda Atlantic Time-series Study has collected data on the physical, biological and chemical properties of the ocean every month since 1988.

Plotting a course to a thriving future

The Global Futures Laboratory embraces students from across the university and partners and stakeholders from around the world. Miki Kittilson, dean of the College of Global Futures, says the curriculum focuses on cultivating skills students need to work on challenges that require a holistic understanding of complex systems.

"Learners have the opportunity to be on the front lines of addressing the greatest challenges of our time," Kittilson says. "To address the grand challenges, ASU programs provide new approaches to learning, drawing on a variety of different fields to see systems. We empower and equip students to be agents for change — for building vibrant futures for people and the planet."

Many of ASU's efforts on providing the next generation with knowledge and skills to solve complex problems around conservation are led by the College of Global Futures, which now encompasses five schools, including the nation's first School of Sustainability, joined by the School for the Future of Innovation in Society, School of Complex Adaptive Systems, School of Ocean Futures and now the School of Conservation Futures.

There are still many unknowns, but this comes with the territory of creating an entirely new model for how universities engage with the era's most pressing problems. What is certain, however, is that this ambitious institution would never have been possible without the university's commitment to fostering academic work with real-world impacts and its decades-long support of sustainability and transdisciplinary research.

"The increasing number of global climate and societal events we are witnessing proves that urgency is one of the major messages that we have to convey to ourselves, to our partners and to the world," Schlosser says. "But the next 10 years also present an opportunity unlike we have ever seen before. We are leading the way by pursuing what we think is necessary, but the world needs to decide to act. The world needs more global futures laboratories. We cannot do it alone. Together, we create hope." ■

Join us

We partner with leading institutions around the world to achieve a critical mass of intellectual resources to address these challenges: **globalfutures.asu.edu**.

"Everything we're doing right now is centered on engaging with communities to co-develop new technologies and new approaches to protect sea turtles and improve fisheries sustainability."

— JESSE SENKO, ASSISTANT PROFESSOR IN THE SCHOOL OF OCEAN FUTURES AT ASU

Field testing with fishers helps Senko develop new technology.

LIGHTING THE WAY

Solar-powered buoys help fishing communities save endangered sea life

The solar-powered buoy, an invention pioneered by School of Ocean Futures Assistant Professor Jesse Senko, could help the problem of ocean bycatch, which is when marine creatures get unintentionally trapped in commercial fishing nets.

When attached to a net, the light emitted from the buoys deters non-target sea life from approaching, with reductions ranging from 55% to 70% for sea turtles and from 70% to 95% for sharks and rays.

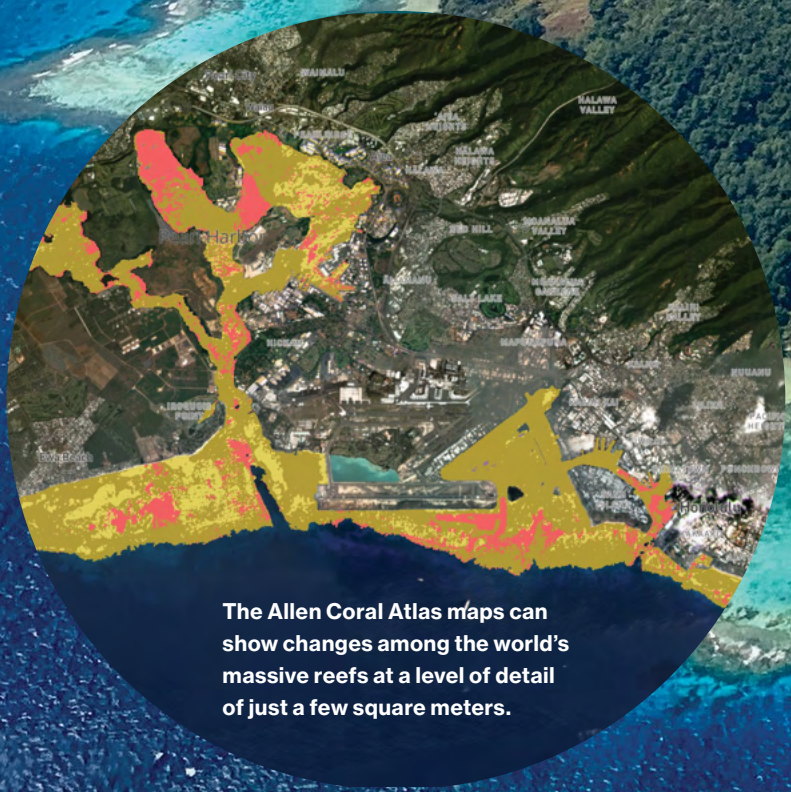
Still, Senko continues to make the buoys even more effective and affordable for fishers. For example, he redesigned the buoy to be half the size and a third of the cost of the original and partnered with small fishing communities in Jalisco and El Pardito, Mexico, to conduct field studies. His community-minded approach to conservation, along with new funding from Schmidt Marine Technology Partners, Oceankind, the Disney Conservation Fund, and a $100,000 Theodore Roosevelt Genius Prize from the U.S. Fish and Wildlife Service, may allow commercial viability for the buoy in as little as two years.

Within the next 10 years, Senko wants to develop a “smart” buoy that will be able to detect which species are around a net and automatically adjust light color and intensity to deter certain kinds of marine life.

Discover more at oceans.asu.edu.

LINDSAY LAUCKNER/FOR ASU

Creating a road map to a



The Allen Coral Atlas maps can show changes among the world's massive reefs at a level of detail of just a few square meters.

MAP BY ALLEN CORAL ATLAS

By mapping the biodiversity of our Earth, ASU is helping identify how to stem the dual crises of biodiversity loss and climate change

balanced planet

When Greg Asner looks out at the world from one of the countless locales he's visited through his work mapping the planet's coral reefs and coastal forests – he's been all over, from the Brazilian Amazon to the Andes Mountains, Borneo to Madagascar, and beyond – he doesn't just see the species of a region.

GREG ASNER/ASU

"My brain works on evolutionary time," says Asner, director of ASU's Center for Global Discovery and Conservation Science. Even looking onto the bay outside his laboratory's window in Hawai'i, he sees past its current form beyond the reefs right under the water's surface to the history of Hawai'i's isolation and formation that helped bring about the thousands of species that live only in those reefs.

"I can kind of see it back in time and why it was unique, and I can do that anywhere on the planet," he says.

Asner combines that worldview with Earth-mapping technology. Satellite imaging and geospatial data can reveal ecosystems' details as they exist today — all the animals and plants that live in a certain place. Through Asner's on-the-ground research and engagement with local residents and the integration of Indigenous knowledge and experiences, he can explain why it's so crucial to save that land.

The ʻĀkoʻakoʻa coral reef nursery is the largest of its kind.

"The more [healthy and thriving] species that naturally occur in an area, the better that ecosystem is able to absorb shocks, threats and disturbances."

— BETH POLIDORO, ASSOCIATE PROFESSOR OF ENVIRONMENTAL CHEMISTRY, ASU CENTER FOR BIODIVERSITY OUTCOMES

"That's how I, and the [Global Safety Net] team, view the planet's surface," he says.

The Global Safety Net is a blueprint for saving areas of Earth essential for biodiversity and climate resilience, and the first estimate of the total amount of land area requiring protection to address the dual crises of biodiversity loss and climate change. Teams at the ASU Julie Ann Wrigley Global Futures Laboratory identify: Where, exactly, should we put our efforts to save the most species and mitigate the worst of climate change?

Why biodiversity matters

In 50 years, from 1970 to 2020, we've lost an estimated 73% of the world's wildlife populations on average, according to the 2024 World Wildlife Report. A United Nations report, co-authored by Leah Gerber, director of ASU's Center for Biodiversity Outcomes, found that Earth's biodiversity is declining at a rate unprecedented in human history.

According to the 2024 IUCN Red List of Threatened Species, there currently are more than 166,000 species on the list, with more than 46,300 of those species threatened with extinction. That biodiversity loss has huge impacts on humans.

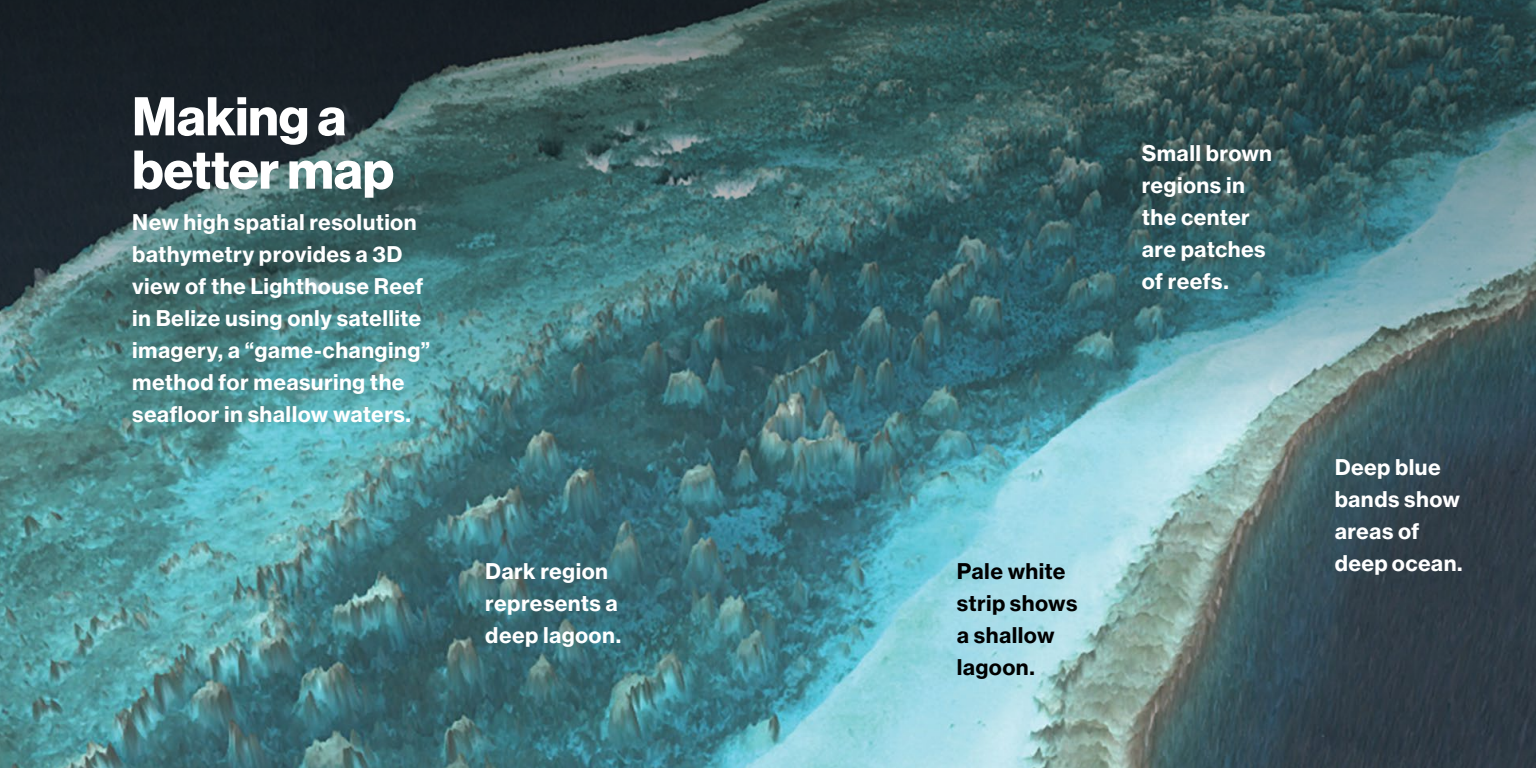
"The more [healthy and thriving] species that naturally occur in an area, the better that ecosystem is able to absorb shocks, threats and disturbances," says Beth Polidoro, an associate professor of environmental chemistry at ASU, involved in the Center for Biodiversity Outcomes and a participant on the IUCN Red List. "We need these healthy ecosystems because they provide ecosystem services for us."

Healthy forests provide clean air; healthy soil is needed for us to grow food; healthy rivers maintain water quality.

ASU works around the globe to help protect biodiversity. Paola Sangolqui, '24 MS in biology, is dedicated to updating zoning around the Galapagos Islands — home to many species not found anywhere else on Earth.

Sangolqui is a third-year PhD candidate who works with Gerber in the Center for Biodiversity Outcomes and grew up on the islands. The Galapagos are especially vulnerable to invasive species, Sangolqui says, and protecting the area's biodiversity is important for the study of evolution and ecology and crucial to the livelihoods of the local population, 80% of which depends on nature-based tourism.

MAIANA VILLEGAS/ASU



The Arizona connection

Although biodiversity may conjure images of far-off places, it is vital to Arizona and the Southwest. The Sonoran Desert, covering 100,000 square miles across Arizona, California and Mexico, is the most biodiverse desert on the planet, home to more than 2,000 plant species, over 350 bird species, 60 mammal species and up to 1,000 species of native bees.

Losing the plants whose roots protect the Colorado River could destabilize a freshwater system that supplies drinking water to 40 million people and nearly 5.5 million acres of farmland. The loss of bees means losing their pollination services for countless other species. Bulldozing wild land as urban sprawl expands can mean losing wildlife forever.

In Arizona alone, researchers from the Global Futures Laboratory have identified 66,000 square miles, or about 59% of the state's land, as critical for preserving biodiversity and ecosystems. Crucial areas also extend out west: In Utah, nearly 59,000 square miles, or 69% of the land; in Nevada, more than 95,000 square miles, or 86% of the state's land; and in California, 82,000 square miles, half of the state's land. The mountains, deserts and canyons that span these states are unique ecosystems and crucial habitats for thousands of species.

Working across departments

Even though Asner is based in Hawai'i, he was inspired to come to ASU and start the Center for Global Discovery and Conservation Science, he says, because of how the sustainability mandate through President Michael M. Crow isn't hyperbole — it's real.

"The university is trying to play a role beyond standard academia, forging and influencing communities up to U.N.-level decision-making," he says.

ASU's conservation efforts stretch beyond that center. Its work to protect critical biodiversity areas reaches across departments, like to the School of Mathematical and Statistical Sciences, where Steffen Eikenberry is a clinical assistant

Oceans by the numbers

1 billion

People report sea life as an important source of protein

$375 billion

Contributed by reefs annually to the global economy in the form of food, coastal protection and tourism

$1 million

The annual economic value of some reefs per square kilometer

SOURCES:
THE NATIONAL INSTITUTES OF HEALTH, UN ENVIRONMENT PROGRAMME, THE NATURE CONSERVANCY

professor. Eikenberry uses math to quantify environmental problems like consumption and land use.

"The climate crisis and biodiversity crisis are twin crises fundamentally driven by consumption throughout the world, primarily the rich world," he says.

But how do you quantify that, and how do you find out the most important things to change in order to solve those crises?

"If you want to say anything, you have to do the math," he says.

Cross-departmental work for an issue as big as biodiversity is important because of the unique expertise everyone brings to the table.

Global Futures Scientists and Scholars collect a diverse array of data from an African savanna in Botswana.

The importance of Indigenous knowledge

More than one-third of the lands identified as biodiversity hot spots by ASU are communally held by Indigenous peoples, and ASU's campuses across Maricopa County sit on ancestral territories, including the Akimel O'odham (Pima) and Pee Posh (Maricopa) Indian communities.

While historically institutions and researchers have gone onto Indigenous lands and dictated what to do, at ASU, Indigenous peoples are an active part of exploration of the challenge and development of the solutions from the outset.

That's especially true when it comes to biodiversity work. Indigenous peoples account for 6% of the global population, yet manage 80% of the world's remaining biodiversity.

"Indigenous peoples know they come from ancestral lands and waters, even if some migrated to different territories. They have a deep kinship and responsibility for the health of their diverse landscapes," says Melissa Nelson, professor of Indigenous sustainability in ASU's School of Sustainability.

"What's Indigenous in Africa is going to be completely different from what's Indigenous in North America, Mesoamerica, Pacific Islands, the Arctic, etc. We are place-based peoples, and so our very concepts of indigeneity are going to completely differ, and no one person can speak for any others.

"There's finally now an interest by Western science and others about Indigenous knowledge systems, because there are memories and histories in the sciences and stories that go back thousands of years about climate change, about cataclysmic events, about how to live sustainably and self-sufficiently within your home ecosystem."

In protecting oceans, Cliff Kapono, an analytical chemist and an assistant professor and member at the Center for Global Discovery and Conservation Science, isn't the kind of researcher who spends all his time in the lab. He is also a professional surfer and a Hilo native of Hawai'i. Those experiences, combined with his scientific education, give him and in turn, ASU, a unique perspective on the places he's trying to protect.

Understanding the ocean depths

Mapping coral reefs has become easier and more comprehensive, thanks to researchers like Asner and fellow Global Futures Senior Scientist Robin Martin, a biochemist and remote-sensing expert, both of whom are also faculty with ASU's School of Ocean Futures, one of five schools within the College of Global Futures.

The pair are working with a global collaborative that includes the Anthropocene Institute, Planet and Vulcan, Inc. to create and maintain the Allen Coral Atlas, among the most detailed maps of coral reefs ever devised. It uses a unique suite of advanced technologies including new ultra-high-resolution satellites calibrated using ASU's custom-mounted lab on

DAVE WHITE/ASU

board a Dornier 228 turboprop aircraft, dubbed the Global Airborne Observatory, and artificial intelligence on the ground. But the research is not academic.

Nancy Knowlton, former Sant Chair for Marine Science at the Smithsonian Institution, describes the Allen Coral Atlas' mapping techniques as able to "really transform our ability to understand what's happening [to coral reefs] essentially in real time over the entire globe, and nothing like that's been possible before."

The Center for Global Discovery and Conservation Science is able to use the data from the atlas to work with local groups to operate coral "nurseries" in the ocean such as the ʻĀkoʻakoʻa Reef Restoration Program on Hawaiʻi Island and anticipates leveraging the observatory to see if corals grown in the nurseries and seeded on damaged reefs are growing successfully. The Global Futures Laboratory also has a coral nursery operated by Liza Roger that is set up within the Walton Center for Planetary Health on the ASU Tempe campus.

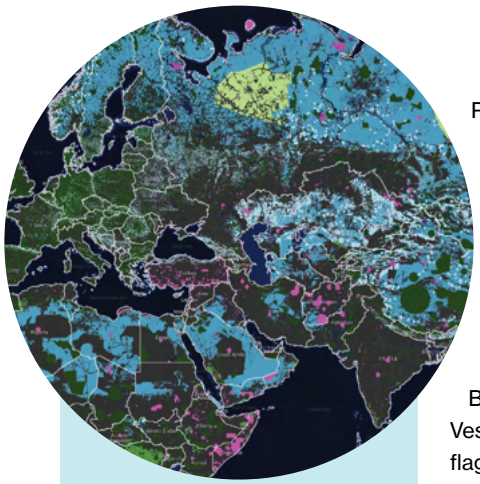
It's a direction ASU President Michael M. Crow is happy to see. He describes the traditional academic approach as "rigid, siloed thinking" while ASU has created instead a culture that's "about the understanding and the solution, not about the protection of the discipline." It is this exact approach that has been central to the establishment of the School of Ocean Futures, founded under its current Director Susanne Neuer, with active laboratories in the Pacific and Atlantic oceans.

ASU faculty and researchers in the Atlantic Ocean are also applying decades of discovery practice and conservation efforts at the ASU Bermuda Institute of Ocean Sciences, originally founded in 1903 and merged with ASU in 2021. ASU BIOS is the home of the Research Vessel Atlantic Explorer, a U.S. flagged ocean class vessel in the U.S. Academic Research Fleet, as well as long-term research projects like the Bermuda Atlantic Time-series Study that has conducted monthly collections of physical, biological and chemical properties of the Atlantic since 1988.

Having a research station with the legacy and robust facilities that ASU BIOS provides at the point of one of the world's northernmost coral reefs and at the western mouth of the Sargasso Sea, one of the world's most diverse open-ocean ecosystems, allows researchers and students from ASU, as well as other institutions from around the world, access to singular insights and perspectives.

"Interdisciplinary science has long been the spirit and centerpiece of the research programs at ASU BIOS," says Craig Carlson, ASU BIOS' newly named president and CEO.

"Analogous to the dynamic interactive environment of being at sea on a research vessel, ASU's School of Ocean Futures and BIOS's collaborative teams embrace real-time adaptive strategies to tackle critical challenges in marine science. An approach that leads to discoveries and solutions." ■



The Global Safety Net, a global blueprint for a livable planet, uses a first layer for already protected areas such as national parks and wildlife sanctuaries. Second, are rare species sites that need to be protected immediately. High biodiversity areas are third. Regions with large mammals, continuous intact wilderness and climate stabilization areas complete the mapping. Together, they total 50.4% of the planet.

Explore Earth's biodiversity hot spots by video

Get a new perspective on Earth at globalsafetynet.app.

Want to contribute to help save these biodiversity hot spots? Donate through the ASU Foundation and specify it's for GDCS at asufoundation.org.

“Conservation action works – this is what the science clearly shows us.”

— CLAUDE GASCON, CO-AUTHOR AND DIRECTOR OF STRATEGY AND OPERATIONS AT THE GLOBAL ENVIRONMENT FACILITY

PROTECTING SPECIES

Proven conservation success can be scaled up for impact

ASU-led research provides the strongest evidence to date that not only is nature conservation successful, but that scaling up interventions would be transformational for halting and reversing biodiversity loss. These findings are crucial, as more than 46,000 species are currently documented as being at risk of extinction.

The co-authors conducted the first-ever meta-analysis of 186 studies from the past century that looked at the impact of a wide range of conservation interventions globally, compared with what would have happened without those interventions. Researchers found that conservation actions improved the state of biodiversity or slowed its decline in the majority of cases – 66% – compared with no action taken at all.

Moving forward, the study’s co-authors call for more rigorous research that looks at the impact of action versus inaction for a wider range of conservation interventions.

Learn more at sols.asu.edu.

Protected areas and Indigenous lands were shown to significantly reduce both the deforestation rate and fire density in the Brazilian Amazon. Deforestation was 1.7 to 20 times higher and human-caused fires occurred four to nine times more frequently outside the reserve perimeters compared with inside.

Colombia's Andes Mountains are home to an interconnected web of life.

PRESERVING BIODIVERSITY

At home in the wild

Way up in the Andes Mountains in Colombia, wax palms stretch their towering, skinny trunks into the sky. Colombia has more than 200 species of palms, but wax palms are special. They're the tallest palm in the world — reaching up to 200 feet — and they are only found here, in the cloud forests of the Andes.

María José Sanín, an ASU assistant professor in the School of Mathematical and Natural Sciences and a senior global futures scientist, grew up in the region and has studied the wax palm since 2007. Her research explains what factors contribute to the wax palm's population origin, such as mountain and river drainage evolution, and decline, such as deforestation and human use.

That survival is important not just for the state of the wax palm itself, but for the health of the entire cloud forest ecosystem. Plants "are the fundamental blocks of ecosystems, producing energy for all elements along food chains," Sanín says.

Find out more at newcollege.asu.edu/smns.

FEDERICO RIOS

ASU alumni are making an impact. From city government to corporate leadership, they're working in every sector of society to make the world a more sustainable place.

Sustainability leadership IN action

Global Futures alumni at the forefront of thriving futures

Michael Hwang brings sustainability leadership to big business. As director of sustainability GTM strategy at Microsoft, he works within the supply chain to provide solutions, tools and partnerships to achieve the company's goal of becoming carbon negative by 2030.

Before joining Microsoft, Hwang returned to ASU to pursue an Executive Master of Sustainability Leadership in 2021. Working with School of Sustainability professors, Hwang, then a senior supply chain responsibility program director at Intel, successfully petitioned executive management to invest more resources into the tech giant's sustainability program.

Using specific ROI numbers for the changes in Intel's supply chain that made it more sustainable helped him secure his job at Microsoft upon graduation and move into a higher-level position.

THE ECO BUSINESS STRATEGIST

Michael Hwang

Microsoft, director, sustainability partner, go-to-market strategy, '14 MBA, '21 Executive Master of Sustainability Leadership

JILL RICHARDS/FOR ASU

Future sustainability professionals get a leg up thanks to leaders like Dunia Namugayi. A vice president of sustainability at VOX Global, a public affairs firm, she mentors ASU College of Global Futures students in the Frasier Global Mentorship Program.

Namugayi loved that at ASU, sustainability was being studied scientifically. As a graduate student, she learned to understand complex issues around sustainable development and climate change, absorbing knowledge from talks held by experts and on-the-ground research on wave ocean energy while studying abroad in Trinidad and Tobago.

It's a program, Namugayi says, that's directly engaged with the sustainability industry and provides students with the skills to be workforce-ready.

THE MENTOR

Dunia Namugayi

VOX Global, vice president, sustainability, '14 MA in sustainability

THE INNOVATION LEADER

Michael Hammett

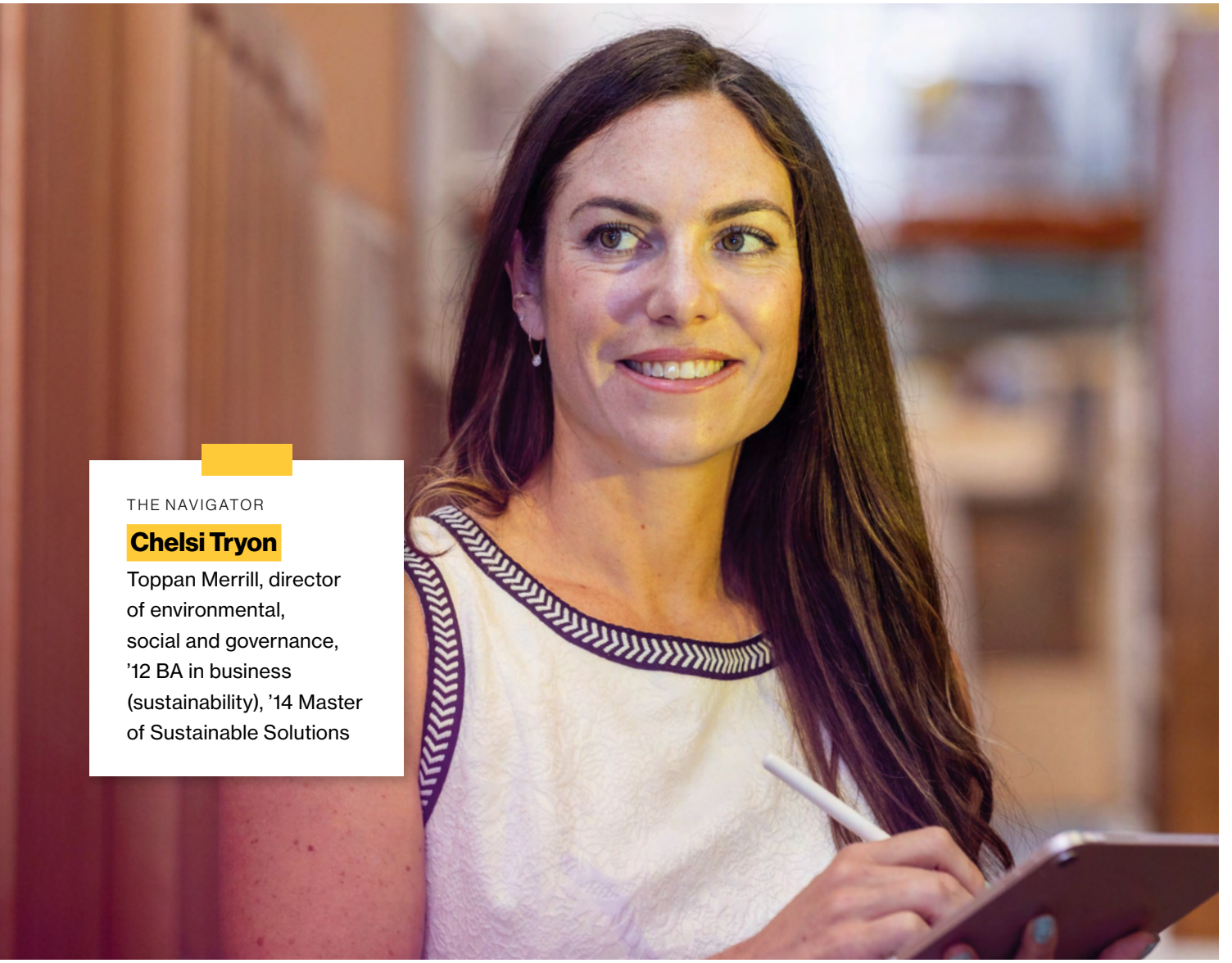
City of Phoenix, director, Office of Innovation, '91 BA in broadcasting, '15 MS in global technology and development

Michael Hammett and the city of Phoenix's Office of Innovation co-create pilot initiatives with other departments to address pressing city issues – ranging from water security to extreme heat resilience. Established in 2021, the office functions as a central hub for innovation, performance management and strategic data use across the city.

After 15 years working in local media, Hammett joined the city of Phoenix as a communications officer in 2006. He eventually returned to ASU to pursue his master's degree.

Hammett's online graduate work focused on international development, technology, equity, human-centered design and sustainability. Hammett says the program helped him view global issues holistically and use what he learned in multiple avenues in his career.

MELISSA LYTTLE/FOR ASU



THE NAVIGATOR

Chelsi Tryon

Toppan Merrill, director of environmental, social and governance, ’12 BA in business (sustainability), ’14 Master of Sustainable Solutions

At Toppan Merrill, a financial reporting and regulatory compliance company, Chelsi Tryon helps clients navigate the ever-changing landscape of sustainability reporting. On a day-to-day basis, she works cross-functionally with almost every department — working with the marketing teams to create materials for the sales department, as well as supporting clients directly.

“For example, a director of investor relations might suddenly be tasked with sustainability reporting, and that’s where we step in,” says Tryon.

Toppan Merrill’s primary services are advisory, which involves helping clients write sustainability reports, and design, which includes formatting, visuals and layout.

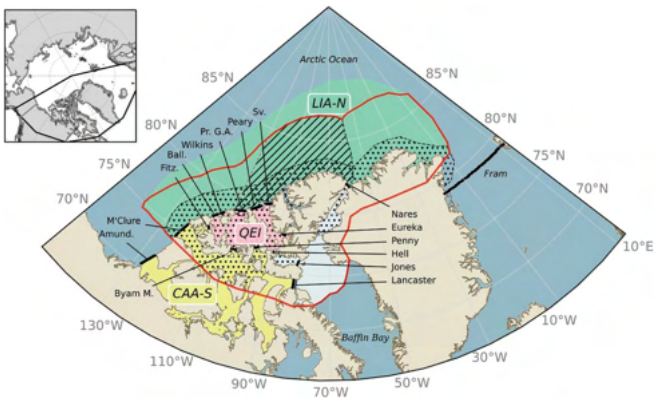
Tryon also applies her expertise to the nonprofit space as part of her role on the board of directors for Stardust. In addition to reviewing strategy and overall operations from a sustainability standpoint, Tryon helps the organization find funding to build a new regional center.

“[I’m] exploring strategies for grant funding to increase our footprint and to enhance our community impact,” she says.

Tryon credits ASU’s School of Sustainability with giving her the tools to approach her work with an adaptive mindset. Through coursework on life cycle assessment, sustainability strategy and systems thinking, she learned to effectively work with priorities of different teams — a skill she uses daily as a sustainability consultant. ■

Learn more at collegeofglobalfutures.asu.edu.

SABIRA MADADY/ASU



The borders of the Last Ice Area are defined in red on the map (left). In 2019, the Canadian government designated a cross-hatched region as the Tuvaijuittuq Marine Protected Area (Tuvaijuittuq means "the place where the ice never melts" in Inuktut). The development of solutions to maintain the quality of the habitat in this area is in partnership with environmental organizations like the World Wildlife Fund and local Inuit communities.

"Originally, we thought that sea ice might persist in this region much longer than the rest of the Arctic."

— STEPHANIE PFIRMAN, DEPUTY DIRECTOR AT THE SCHOOL OF OCEAN FUTURES

TIPPING POINT

Vital habitat for ice-dependent species in danger

A new study published in Nature in January 2025 and co-authored by Stephanie Pfirman, School of Ocean Futures professor, reveals the Arctic's "Last Ice Area" could disappear within a decade after the central Arctic Ocean becomes ice-free during summer, which is expected to occur around mid-century. The region's loss of sea ice was identified using a high-resolution model.

Located north of Greenland, the stability of this ice area is crucial for preserving Arctic ecology. These new simulations reveal that a significant fraction of the remaining thick ice of the Last Ice Area may flow southward through islands of the Canadian Arctic Archipelago, leading to the potential flushing of the sea ice of the Last Ice Area over a decade or so.

Researchers say these findings highlight the urgency of minimizing global warming as even habitats like the Last Ice Area, which have some resilience to changes, are turning out to be more vulnerable than previously projected.

Learn more at news.asu.edu/arctic-ice-study.

Tyler Eglen, ’14 MFA, ’21 MS in global technology and development and a staff member with Walton Sustainability Solutions Service, built the plastic shredder.

> **“This is the first attempt to do the entire process in one location to actualize a regional circular economy.”**
>
> — ALICIA MARSEILLE, SENIOR DIRECTOR OF THE ROB AND MELANI WALTON SUSTAINABILITY SOLUTIONS SERVICE IN THE GLOBAL FUTURES LABORATORY

CLEAN SWEEP

Tiny tech is a pollution solution

How do you keep up to 550 tons of plastic out of landfills each year, which is the equivalent of over three times the weight of the Statue of Liberty? Plastic takes 100 to 1,000 years or more to break down, and left in the environment, it becomes a toxic pollutant that harms ecosystems and poses health risks to humans.

To help prevent this from happening in the first place, ASU, in partnership with the city of Phoenix, Goodwill and Hustle PHX, opened a Circular Plastics Microfactory.

Located at the Goodwill Retail Operations Center in Phoenix, the microfactory processes plastic waste into pellets and uses them to create new products — from faux lumber to skateboards. In addition to preventing the waste from going into landfills, it also reduces greenhouse gas emissions by eliminating the need for shipping recyclable plastics to processing facilities elsewhere.

The microfactory is part of the city’s larger Zero Waste project, which has a goal of diverting 90% of its waste from landfills by 2050.

Learn more at sustainabilitysolutions.asu.edu.

ANDY DELISLE/ASU

Sara El-Sayed and Melissa Nelson explore biomimicry in food production at ASU Garden Commons in Mesa.

ANCIENT INSIGHTS

Biomimicry through an Indigenous lens

A new podcast series invites multiple perspectives to discuss biomimicry, what Melissa Nelson, professor of Indigenous sustainability, describes as “methodology rooted in ancient philosophies that are essential for global futures.”

In the podcast series, Nelson, alongside Sara El-Sayed, director of The Biomimicry Center, share surprising insights with listeners, such as how biomimicry is evolving the language for sustainability and if the field could be a pathway for Indigenous students into STEM fields.

Listen to the series, “Knowledge Symbiosis: Can Biomimicry and Indigenous Science Harmonize,” at links.asu.edu/knowledge-symbiosis.

SABIRA MADADY/ASU


This is our
Moment
Changing Futures
From Arizona. For the world.
At Arizona State University, we believe a better future is possible, and this is our moment to **reshape our relationship with our planet.**
Through Changing Futures, we will deliver bold solutions for a habitable Earth and attainable well-being for all. **Join us.**
A team led by Greg Asner, director of ASU's Center for Global Discovery and Conservation Science, surveys coral reefs growing on sunken warships.
This moment demands partners like you.
Learn more at asuchangingfutures.org.
ASU
Arizona State University

Our planet is talking to us.
The Global Futures Laboratory is listening and working to build a healthier relationship with it. With a holistic, life-systems approach to solving critical resource challenges, we're driving toward a future in which all living things thrive. Join us.

globalfutures.asu.edu/join

ASU
Julie Ann Wrigley Global Futures Laboratory
Arizona State University

Reshaping our relationship with our world