



# Center for Biodiversity Outcomes Annual Report 2021

**ASU** Center for  
Biodiversity Outcomes  
Arizona State University

A woodpecker with a bright red crest and dark body is perched on a tree trunk. The background is a clear blue sky with some green leaves visible. The text 'We envision a world' is overlaid in white on the lower part of the image.

**We envision a world**

**where the diversity of life on Earth  
is valued and sustained for the benefit of all**

Our mission is to enable  
**discoveries and solutions**

to sustain Earth's biodiversity  
in a time of rapid biophysical,  
institutional and cultural change.

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Access this report online at [biodiversity.asu.edu/about](https://biodiversity.asu.edu/about)

## Letter from the founding director

Dear Friends:

What a year! The global pandemic reminds us firsthand of the results of unsustainable consumption, ineffective policies and poor regulation. More species of plants and animals are threatened with extinction now than at any other time in human history. The consequences of the decline of nature aren't restricted to wildlife — they extend to people. Nearly 80 percent of 18 categories for “nature's contribution to people,” identified in the 2019 IPBES Global Assessment, have declined. These “ecosystem services” provided by biodiversity include things like nutrient cycling, carbon sequestration, pollination and agricultural productivity.



Protecting biodiversity ensures the resilience of agriculture as it intensifies to meet growing demands for food production. And food security depends on healthy pollinator populations. Diverse and abundant populations of bees are associated with higher rates of production in crop species. Biodiversity is the foundation for our economy and wellbeing, yet it is declining at unprecedented rates.

At present, our main challenge is not trying to figure out what's wrong, it's about deciding to take action to address the problem. The science is clear about the biodiversity crisis and we have options for solutions. We can start by looking to experience to figure out what works to conserve biodiversity.

**“CBO is committed to an inclusive process that brings people together to solve our nation's biodiversity challenges.”**

By acknowledging that biodiversity is the foundation of social and economic systems, we can begin to mainstream the value of biodiversity. CBO is leading the way on this solution. Innovative financing and financial markets for biodiversity are promising approaches to measure and value biodiversity. Building bridges between governmental and non-governmental sectors will promote the growing sense of corporate responsibility that is rapidly emerging.

In coming years, CBO will take a leadership role in creating a National Biodiversity Strategy (NBS) for the US. A NBS will focus and coordinate

government response to the biodiversity crisis. We will also take a leadership role in international conservation, from issues like wildlife trafficking to mitigating plastic pollution.

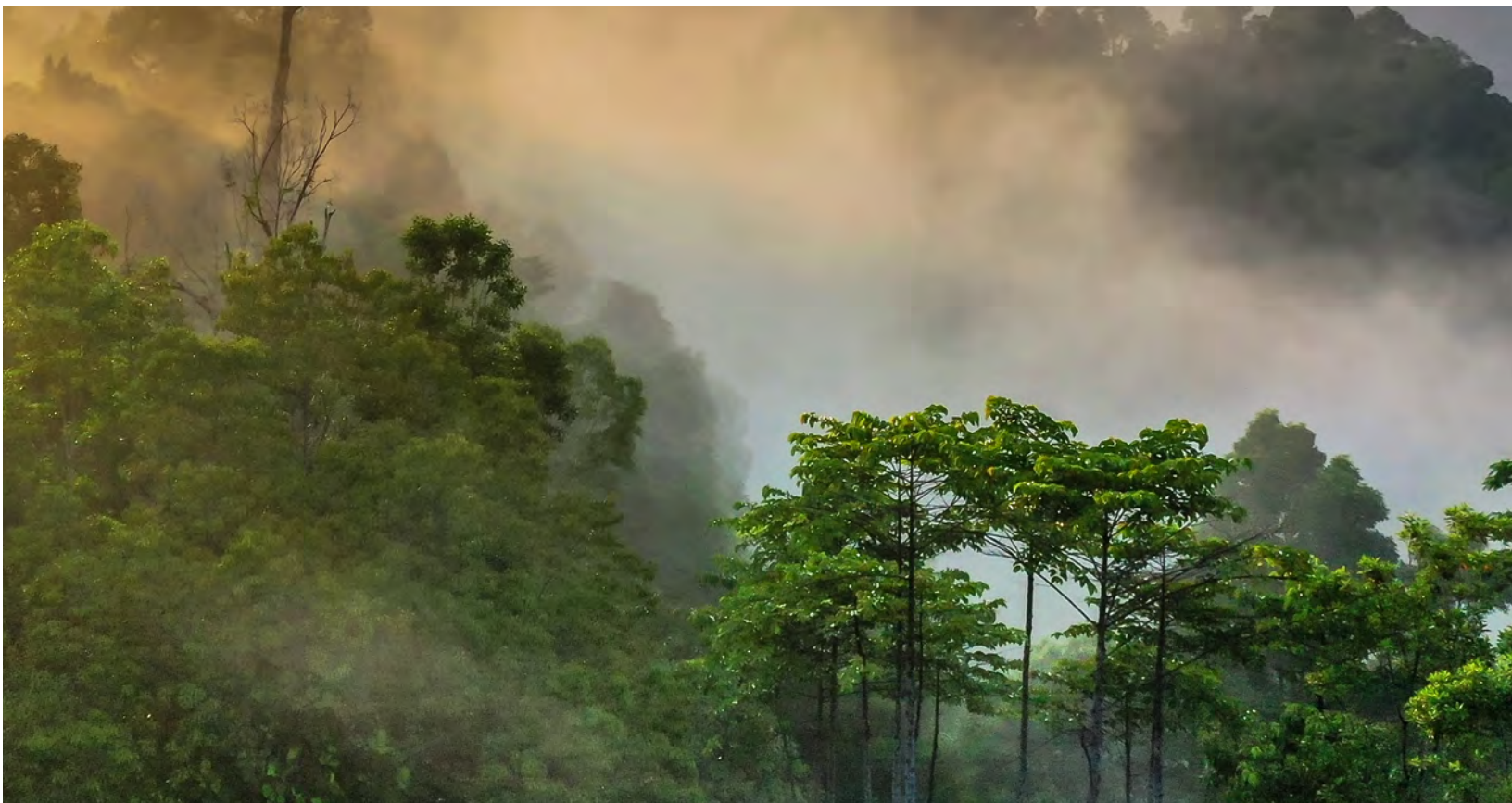
CBO is committed to an inclusive process that brings people together to solve our nation's biodiversity challenges. A long history of discrimination has led to clear patterns of injustice and inequity in access to nature. Committing to building a diverse workforce makes science & scientists better prepared to address the growing challenges to biodiversity.

We are at a crossroads, and the signs are clear which direction we should take. While the challenges that face us personally and globally, are complex, this is the time for hard work and hope. Our work has never been more important - for biodiversity, and, ultimately, for humanity.



**Leah Gerber**

Founding Director, Center for Biodiversity Outcomes  
Professor, School of Life Sciences



# meet the team

## Faculty leadership



**Leah Gerber**  
Founding Director



**Gwen Iacona**  
Assistant Director for  
Conservation Investment



**Beth Polidoro**  
Assoc. Ctr. Director of  
Biodiversity Valuation  
and Assessment

## Staff



**Susanne Hinrichs**  
Administrative Assoc.



**Alice Letcher**  
Project Manager



**Anahi Mendez**  
Mgr., Communications  
and Business Ops.

## Research faculty



**Katie Cramer**  
Assistant Research  
Professor



**Candice Carr Kelman**  
Assoc. Ctr. Director of  
Conservation Solutions



**Danica  
Schaffer-Smith**  
Assistant Research  
Professor

## ➔ THANK YOU!

Our deepest appreciation goes to all the students, volunteers, colleagues and consultants who helped advance our strategic goals in fiscal year 2021.

## Postdoctoral research scholars



**Rachel Fovargue**



**Steffen Eikenberry**

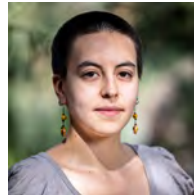
## Student workers



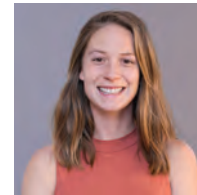
**Arielle Amrein**



**Christopher Barton**



**Camilla Guerrero-Pineda**



**Erin Murphy**



**Paola Sangolqui**



**Katie Surrey-Bergman**



Learn more: [biodiversity.asu.edu/people](https://biodiversity.asu.edu/people)

# our approach

## Actionable science

Our primary objective is to mainstream biodiversity in decision-making by advancing initiatives in education, research and partnerships to:

- **Train the next generation of biodiversity conservation leaders**
- **Bring biodiversity to the core of the world's decision-making**
- **Transform biodiversity investments and decision-making**

Our approach engages three dynamically integrated fields: education, research and partnerships. Through our actionable science model, we bridge academia and stakeholders to produce biodiversity conservation science that informs decision-making at local, national and global scales.



Figure 1. Actionable science model

As we implement our actionable science model, we study ourselves to increase our success rate and provide as a scalable model that other institutions can apply across the globe.



## Our strengths

We offer a unique set of tools and resources that allow us to partner with various sectors, including other academic institutions, to address some of the most pressing biodiversity conservation issues of the 21st century.

NGOs	Corporations	Governments
<p>NGOs focus on action. Universities focus on learning. Together we create solutions to pressing biodiversity issues. NGOs often lack the time and resources needed to stay abreast of cutting edge scientific research. The center bridges this gap.</p>	<p>The corporate sector has shown increasing commitment to considering sustainability issues over the past decade. However, many companies lack the data, expertise and incentive to rigorously consider biodiversity in operations. We work with companies to ensure they have the expertise to implement effective biodiversity management plans across their core operations.</p>	<p>Sound environmental policy requires not only cutting-edge scientific data and expert analysis, but also the ability to translate that academic knowledge into the real world. The center offers policymakers a range of services that can help them translate science into meaningful policy decisions.</p>

Table 1. How we partner with different sectors to generate science-based solutions to pressing biodiversity conservation problems.

# our values

We embrace the plurality of values that different communities ascribe to biodiversity, ranging from the economic to the cultural, as well as its intrinsic value. This requires a multi-stakeholder, interdisciplinary approach to define the “solution space” for the biodiversity outcomes we seek to achieve.

We align our values with those of The New American University, Arizona State University’s reconceptualization of 21st century higher education. This new concept focuses on the inclusion and success of all its students, as well as social responsibility to the communities ASU serves.

## **ACCESS**

Engagement of stakeholders/decision-makers  
Inclusion and diversity

## **IMPACT**

Focus on human/ecosystem wellbeing  
Solution-oriented

## **EXCELLENCE**

Innovation  
Transdisciplinarity





# focal areas

## Focal areas

Our research, education and partnership initiatives are all framed within the following three overlapping areas:

- **Evidence, metrics and monitoring:** Developing empirical support for measuring impact and evaluating outcomes, training and capacity building for what constitutes evidence and how evidence can be used.
- **Decision science and data tools:** Creating tools to support evidence-based decisions, working with decision-makers on defining needs for knowledge and decision-making structures, conducting research into how to translate knowledge into action.
- **Stakeholder engagement:** Connecting students and faculty with strategic partners, decision-makers and practitioners.

## Topics

We maintain an online inventory of current research projects covering a variety of topics, including:

- Actionable science innovation
- Advancing corporate sustainability and biodiversity conservation investments
- Biodiversity and the United Nations Sustainable Development Goals
- Biodiversity science assessments and decision tools
- Broadening diversity and inclusion in science conservation
- Collaborative governance and biodiversity
- Community-based conservation
- Human-wildlife conflict
- Public engagement in biodiversity science
- Public health and biodiversity





## The year in review

It is difficult to distill all that we have accomplished this year into a few brief paragraphs. Below we highlight noteworthy research, education and outreach activities. Find more information about our activities in the media, publications and events sections of this report, as well as online at [biodiversity.asu.edu](https://biodiversity.asu.edu).



### **ARTHUR L. AND ELAINE V. JOHNSON FOUNDATION**

This research seeks to answer, “How much does it cost to achieve a conservation outcome?” In FY21, we worked towards three primary objectives: (1) creating a web-based decision support tool to allow users (e.g. mid- to senior-level government, foundation and NGO staff) to explore tradeoffs between investment choice and biodiversity loss and use this information to inform national and international funding decisions; (2) amalgamating and synthesizing estimates of conservation investment globally to allow comparison of conservation budget needs with actual expenditure; and (3) compiling conservation cost and benefit data using evidence synthesis methods and develop guidelines to enable these data to be standardized across projects. We continued to explore piloting the conservation investment tool in at least two countries (Colombia and Peru) and working with the International Union for Conservation of Nature (IUCN) to combine this tool with the Species Threat Abatement and Recovery (STAR) Metric.

Learn more: [bit.ly/3IXcGXp](https://bit.ly/3IXcGXp)



### **BAYER**

We are working with Bayer to identify strategies to apply decision science to enhance the efficiency and effectiveness of processes that assess the risk of agricultural pesticides to Endangered Species Act listed species. So far, this work has resulted in a publication in the journal *Conservation Science and Practice* that details the drastic gains in species risk assessment efficiency that could be achieved for California listed plant species by using high resolution Carbaryl usage data in the risk assessment process. Another publication is being prepared that expands this work to confirm that the efficiencies hold across hundreds of pesticide compounds and other listed taxa in California, and then explores the regions of the US where collecting high resolution pesticide usage data is most beneficial in terms of determining that compounds are not likely to adversely affect listed species. The database that we compiled for these studies is now being used to support our ongoing work in developing a ranking metric that identifies the species that are most at risk from pesticide exposure to support decisions about prioritizing review.

# highlights



## **BIODIVERSITY AND BUSINESS**

A new publication co-authored by ASU Center for Biodiversity Outcomes founding director Leah Gerber in Business Strategy and the Environment titled “Bringing sustainability to life: A framework to guide biodiversity indicator development for business performance management,” illustrates a pathway for the private sector to assess their biodiversity performance and demonstrate responsible management practices. The publication synthesizes steps of common conservation and business decision-making systems and presents a decision framework to support more comprehensive development of quantitative biodiversity indicators for a range of business contexts. Learn more: [bit.ly/2FSqTou](https://bit.ly/2FSqTou)



## **CONSERVATION SOLUTIONS LABORATORY**

The Conservation Solutions Laboratory is a network of conservation and development experts who link research with practice and implementation to generate new knowledge whose mission is to operate as a living lab and conduct engaged scholarship and use-inspired research. In August 2020, [Mongabay](#) released a new opinion piece written by [Conservation Solutions Lab](#) co-founder [Michael Brown](#), along with other affiliated conservation researchers including Assistant Center Director Carr Kelman. The commentary piece, titled “Communities, conservation, and development in the age of COVID: Time for rethinking approaches,” advocates for systemic, long-term solutions to existing biodiversity conservation and sustainable economic development challenges aggravated by the current pandemic. <https://bit.ly/3adWkoA>



## **CONSERVATION INTERNATIONAL**

The Center and Walton Sustainability Solutions Services (WSSS) were awarded a subcontract on a USAID grant received by Conservation International (CI) Peru to scale sustainable business models and foster the growth of environmentally friendly sustainable value chains. Together, we will collaborate with CI and Peruvian partners on the overall assessment of the green investments ecosystem in the Peruvian Amazon, including its baseline and identification of bottlenecks and indicators. The Center will build and test decision support tools to improve investments decision-making processes to enhance conservation and restoration impacts, as well as provide expertise in monitoring and indicators for assessing the performance of the economic development Facility to be promoted by the Alliance.



## **ELECTRIC POWER RESEARCH INSTITUTE**

We continued to work with the Electric Power Research Institute (EPRI) on analyzing compliance costs. Primary objectives for this phase were to compile and analyze pilot compliance cost data to test the costing framework developed in Phase I and to perform an initial exploration of compliance costs within the



electric power industry. In partnership with EPR Center Graduate Research Assistant [Katie Surrey-Bergman](#) and Assistant Research Professor [Gwen Iacona](#) presented a workshop panel titled “Collecting and Reporting on the Costs of Compliance with the Endangered Species Act” at the [110th Association of Fish and Wildlife Agencies Virtual Annual Meeting](#). The workshop was attended by conservation scientists and practitioners interested in minimizing cost hindrances and maximizing efficiency in research. Learn more about the [Conservation Cost Data Portal](#). Learn more at [bit.ly/36o7WEa](https://bit.ly/36o7WEa)



### **ENVIRONMENTAL COMMUNICATION AND LEADERSHIP**

Students continued to apply to this graduate certificate, which we launched in fall 2017 (see promotional flyer and list of approved coursework on pages 24-25). We designed this certificate to train graduate students in science-based fields to communicate their findings to public audiences and decision-makers. We are currently offering this certificate across all campuses. Learn more at [bit.ly/2OMmmG4](https://bit.ly/2OMmmG4)



### **INTERNATIONAL UNION FOR CONSERVATION OF NATURE**

The International Union for Conservation of Nature Red List of Threatened Species is the world's standard for quantifying species extinction risks. It is used around the world to inform policy, planning and conservation action. The Red List includes details on threats to species, their ecological requirements, geographic distribution and information on how to reduce or prevent extinctions. The IUCN Red List of Threatened Species Partnership is a selective group of ten international institutions. ASU is one of only three university partners in the world to join forces in guiding the scope and application of scientific data for global and national biodiversity conservation. Through this partnership, we are devising strategies for species conservation and biodiversity decision-making. This partnership is led by our Associate Director Beth Polidoro.

In October, Associate Center Director and School of Mathematical and Natural Sciences Associate Professor of Environmental Chemistry and Marine Conservation Beth Polidoro delivered a talk to Nature at ASU students on the IUCN Red List training center at ASU. The talk focused on ASU's formal partnership with the IUCN, including our Red List of Species and Red List of Ecosystems assessment activities, as well as our local and global Red List training initiatives.

The center supports an internship program established by Polidoro in which undergraduates are placed with our partner organizations. Through our partners, who include the IUCN, the Phoenix Zoo, the Desert Botanical Garden and other associated organizations, students are afforded available opportunities to engage in local and global conservation work, gaining crucial skills and professional connections. To date, more than 30 students have participated in

this program. Learn more at [bit.ly/2M6cCb8](https://bit.ly/2M6cCb8)

On October 15, the center and the Conservation Innovation Lab hosted a talk by Newcastle University Research Associate Louise Mair, PhD., about the International Union for Conservation of Nature's (IUCN) Species Threat Abatement and Restoration (STAR) Metric. STAR is a novel metric that quantifies the potential contribution that threat abatement and habitat restoration actions could make to reducing global species extinction risk and provides a framework for quantifying the potential contribution of the action targets within the proposed post-2020 Global Biodiversity Framework to the outcome goal of species conservation. It also allows other actors such as businesses to engage with conservation and measure their potential contribution. Mair works with Professor Philip McGowan and collaborates closely with colleagues from IUCN and the IUCN Species Survival Commission (SSC) to understand why global progress towards this target has been limited. She aims to understand the challenges in achieving Target 12 and to develop a decision-support approach that will assist countries in conserving threatened species. Learn more at [bit.ly/2NKZjgE](https://bit.ly/2NKZjgE)



### **LENFEST OCEAN PROGRAM**

Founding Director [Leah Gerber](#) continued work on a grant from the [Lenfest Ocean Program](#) of the Pew Charitable Trusts in partnership with conservation scientists working in the [Galapagos National Park](#) in Ecuador. The project is titled “Establishing the foundations for structured decision making and adaptive spatial management in the Galapagos Marine Reserve” and focuses on developing a modeling and monitoring approach to assist the Galapagos National Park Directorate in refining management goals and conservation decisions. This work provides empirically supported insight into the characteristics of actionable knowledge, relationships between scientists and decision-makers and decision-making structures. Learn more at [bit.ly/3kq2d64](https://bit.ly/3kq2d64)



### **THE NATURE CONSERVANCY**

In September Dr. Danica Shaffer-Smith joined the School of Life Sciences as Assistant Research Professor. Shaffer-Smith was featured at the School of Life Sciences New Faculty Showcase, where she presented “Water resources management under extreme events: human and natural engineering solutions.” Her talk explored risks and opportunities with remote sensing, watershed modeling and



stakeholder-based processes, focused on the question of whether infrastructure and floodplain management help to protect and sustain freshwater resources. Learn more at [bit.ly/3iV5FFG](https://bit.ly/3iV5FFG)

Shaffer-Smith presented related material at a research talk titled “Repeated Hurricanes Reveal Risks and Opportunities for Social-Ecological Resilience to Flooding and Water Quality Problems.” Her research used satellite radar to map flooding from Hurricanes Matthew (2016) and Florence (2018), examined risks to water quality, and identified opportunities to improve resilience in light of social, ecological and infrastructure vulnerabilities. Results suggest that current hazard mapping is inadequate for resilience planning: increased storm frequency and intensity necessitate modification of design standards, land-use policies, and infrastructure operation. Implementation of interventions can be guided by a greater understanding of socialecological vulnerabilities within hazard and exposure areas. The methods used in this research can support future disaster response and recovery efforts, as well as long-range planning to improve resilience in flood-prone regions. Learn more at [bit.ly/36nuOnl](https://bit.ly/36nuOnl)



### **PLASTIC POLLUTION EMISSIONS WORKING GROUP**

On September 24, Polidoro presented a talk titled “A Risk Assessment of

# highlights

Microplastics and Associated Contaminants in Coastal Environments and Seafood in American Samoa.” Solid waste disposal is a massive concern among Pacific Island nations. With severe limitations in land area, in combination with the lack of reuse or recycling options, many near-shore marine ecosystems across Oceania are severely impacted by locally derived marine debris, including plastics, microplastics and associated chemical contaminants. Polidoro discussed results from a community-based, screening-level ecological and public health risk assessment of microplastics and associated contaminants in American Samoa, highlighted best practices and suggested methods to return results to a variety of local partners for the purposes of improved regulation, educational outreach, and longer-term community conservation efforts. This presentation is part of a series by the National Oceanic and Atmospheric Administration Marine Debris Program titled “NOAA Marine Debris Research Webinar Series: Addressing the Ecological Risks of Microplastic.” Learn more at <https://bit.ly/3t8n9TU>

Gerber and Polidoro were co-authors on a widely acclaimed [Science](#) article titled “[Predicted growth in plastic waste exceeds efforts to mitigate plastic pollution](#),” published in September 2020. The research, led by Stephanie Borelle at the Department of Ecology and Evolutionary Biology, University of Toronto, Toronto, Ontario, Canada, indicates that plastic waste is accumulating around the globe far faster than it is being broken down by human or environmental means. Because plastic decomposes slowly and creates dangerous microplastics that pollute global waterways, the large amounts of plastic produced annually pose an alarming threat to species, ecosystems and humans. The authors urge the global population to reduce unnecessary plastic use and production. This work emerged from the center’s [Plastic Emissions Working Group](#) supported by the [National Socio-Environmental Synthesis Center](#), and was co-authored by researchers from other universities and NGOs, including [Conservation Innovation Lab](#) graduate students [Erin Murphy](#) and [Miranda Bernard](#). This story has also received [additional external media coverage](#). [Access the press release](#) and learn more at [bit.ly/2YSjQC0](https://bit.ly/2YSjQC0) and [bit.ly/3t3AUmH](https://bit.ly/3t3AUmH)



## **SCISTARTER**

We connected with [SciStarter](#) to engage informal learners in conservation research. In 2021 we developed a project that launched during April 2021 as part of ASU’s celebration of Citizen Science Month. “Pollinators Across ASU Campuses” asked individuals to record and identify pollinators ASU’s campuses, using the app iNaturalist. This initiative provided us valuable data about the prevalence and variety of pollinators present and serves as a proof-of-concept for future projects that will involve formal and informal learners in research establishing species ranges and population densities.



## THOUGHT LEADERSHIP

Founding Director Leah Gerber published an op-ed in Mexican newspaper [El Universal](#) titled “[Protecting biodiversity: our best shot to prevent the next pandemic](#).” This article highlights the relationship between environmental health and human health. Habitat degradation by human activities, such as pollution, climate change, overexploitation, species removal and introduction, parallels the emergence of zoonotic (animal-to-human transmitted) viruses with pandemic causing potential. Gerber proposes composing a global body that uses science-based practice for managing disease outbreaks by supporting basic science; developing a global regulatory regime; and transforming the global market to reduce the risk for spreading zoonotic infections. Learn more at [bit.ly/2YmT8kP](https://bit.ly/2YmT8kP)

In September 2020, Gerber co-authored an article in BioScience titled “[Ecological Synthesis and Its Role in Advancing Knowledge](#),” which showed a much higher rate of citation for synthesis papers than for non-synthesis papers within eleven key topic themes (e.g., species richness, biodiversity, climate change, global change). The study concluded that synthesis papers play key roles in driving, redirecting, or resolving core questions and exhibited much greater cross-theme connectivity, and that synthesis in science has played a crucial role in accelerating and advancing ecological knowledge. <https://bit.ly/3qYA7Br>

In October Gerber published an article titled “[Producing actionable science in conservation: Best practices for organizations and individuals](#).” The publication, co-authored by ASU [School for the Future of Innovation in Society](#) Graduate Research Associate [Chris J. Barton](#), [American Museum of Natural History](#) Biodiversity Scientist [Samantha H. Cheng](#) and ASU [School of Public Affairs](#) Associate Professor [Derrick Anderson](#), identifies six best practices associated with actionable science or scientific data and models supported by conservation science. These six best practices are (1) engaging in collaboration, (2) practicing empathy, (3) building trusting relationships, (4) employing diverse communication methods, (5) incentivizing actionable science and (6) providing resources for actionable science to early-career researchers. <https://bit.ly/3r0ZVNr>



Learn about our research at [biodiversity.asu.edu/research](https://biodiversity.asu.edu/research)



Learn about our partnerships at [biodiversity.asu.edu/partnerships](https://biodiversity.asu.edu/partnerships)

**Selected publications**

Amrein, A., H. M. Guzman, K. C. Surrey, B. Polidoro and L. Gerber. (2020). Impacts of whale watching on the behavior of humpback whales (*Megaptera novaeangeliae*) in the coast of Panama. *Frontiers in Marine Science* 7:601277. DOI: 10.3389/fmars.2020.601277.

Ashe, E., Williams, R., Clark, C., Erbe, C., Gerber, L.R., Hall, A.J., Hammond, P.S., Lacy, R.C., Reeves, R., Vollmer, N.L. (2021) Minding the Data-Gap Trap: Exploring Dynamics of Abundant Dolphin Populations Under Uncertainty. *Frontiers in Marine Science*, 8(606932):1-10. doi: 10.3389/fmars.2021.606932

Borrelle, S. B., J. Ringma, K. Lavender Law, C. C. Monnahan, L. Lebreton, A. McGivern, E. Murphy, J. R. Jambeck, G. H. Leonard, M. A. Hilleary, M. Eriksen, H. P. Possingham, H. De Frond, L. R. Gerber, B. Polidoro, A. Tahir, M. Bernard, N. Mallos, M. Barnes and C. M. Rochman. (2020). Predicted growth in plastic waste exceeds efforts to mitigate plastic pollution. *Science* 369(6510):1515-1518. DOI: 10.1126/science.aba3656 .

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Halpern, B.S., Berlow, E., Williams, R., Borer, E.T., Davis, F.W., Dobson, A., Enquist, B.J., Froehlich, H.E., Gerber, L.R., Lortie, C.J., O'Connor, M.I., Regan, H., Vazquez, D.P., Willard, G. (2020). Ecological Synthesis and Its Role in Advancing Knowledge. *BioScience*, 70(9):1-10. doi: 10.1093/biosci/biaa105

Kelman, C.C. (2020). Wilderness Conservation Around the World, in *Environmental Issues Today: Choices and Challenges*. ABC-CLIO.

Kittinger, J., Bernard, M., Finkbeiner, E., Murphy, E., Obregon, P., Klinger, D., Schoon, M., Dooley, K., and Gerber, L.R. (2021). Applying a jurisdictional approach to support sustainable seafood. *Conservation Science and Practice*, 3(5):e386. doi: 10.1111/csp2.386

Mair L et al (Gerber, L.R., Polidoro, B. + 83 additional authors). (2021). A metric for spatially explicit contributions to science-based species targets. *Nature Ecology and Evolution*, 5(6):836-844. doi: 10.1038/s41559-021-01432-0

McKenzie, P. F., G. D. Iacona, E. R. Larson and P. R. Armsworth. (2021). Partitioning tree diversity patterns to prioritize conservation investments. *Environmental Conservation* 1-9. DOI: 10.1017/S0376892921000060.

Visseren-Hamakers, I.J., Razzaque, J., McElwee, P., Turnhout, E., Kelemen, E., Rusch, G.M., Fernandez-Llamazares, A., Chan, I., Lim, M., Islar, M., Gautam, A.P., Williams, M., Mungatana, E., Karim, S., Muradian, R., Gerber, L.R., Lui, G., Liu, J., Spangenberg, J.H., Zaleski, D. (2021). Transformative governance of biodiversity: insights for sustainable development. *Current Opinion in Environmental Sustainability*, 53:20-28. doi: 10.1016/j.cosust.2021.06.002

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Wysong, M. L., G. D. Iacona, L. E. Valentine, K. Morris and E. G. Ritchie. (2020). On the right track: Placement of camera traps on roads improves detection of predators and shows non-target impacts of feral cat baiting. *Wildlife Research* 47(7-8):557-569. DOI: 10.1071/WR19175.

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## COMMUNITY ENGAGEMENT:

The Center engages students, faculty and stakeholders through public and invited talks by Center leadership.

Founding Director Leah Gerber represented the center at the [United Nations Global Compact's](#) Uniting Business LIVE (September 21-23), which marked the opening of the 75th session of the United Nations General Assembly. Gerber facilitated an audience Q & A session following a panel discussion titled "[Ocean Hope Spots: A panel discussion on marine protected areas with leading experts.](#)" Speakers included Sylvia Earle from [Mission Blue](#); 'Aulani Wilhelm from [Conservation International](#); and Lance Morgan from the [Marine Conservation Institute](#). Gerber also hosted a panel discussion titled "[Industry Partnerships for Biodiversity Outcomes: Measuring private sector contributions toward mitigating biodiversity loss.](#)" Due to technical difficulties during the conference and popular demand for the content, the discussion was presented again on October 6, 2020. The panel included CBO partners from industry and NGO sectors, including [Laura McConnell](#), University and Scientific Society Engagement, Regulatory and Scientific Affairs, BayerCrop Science; Christian Newman, Technical Executive, Endangered and Protected Species, Sustain Sustainability and Ecosystem Stewardship Research Group, Electric Power Research Institute; [Frank Hawkins](#), Director, International Union for Conservation of Nature – United States; and [Christopher Barton](#), fellow, ASU Office of the President. Learn more at [bit.ly/3t6n9U3](https://bit.ly/3t6n9U3) and [bit.ly/2NJxWUe](https://bit.ly/2NJxWUe)

On October 21, Gerber presented a talk titled "Knowledge to Outcomes in Global Biodiversity Conservation" for New Mexico State University's Climate Change Education Seminar Series. The talk summarized the findings of the recent [Intergovernmental Panel on Biodiversity and Ecosystem Services \(IPBES\) report](#), which estimates the global status of biodiversity and ecosystem change, the implications for people, policy options and likely future pathways over the next three decades if current trends continue. She also discussed trade-offs and synergies in progress toward achieving [UN Sustainable Development Goals \(SDGs\)](#), the [Aichi Biodiversity Targets](#) and the [Paris Agreement goals](#), and the research needs for ensuring a sustainable pathway toward achieving these goals. Learn more at [bit.ly/2MAKNHv](https://bit.ly/2MAKNHv)



Learn more: [biodiversity.asu.edu/education](https://biodiversity.asu.edu/education)



## → FACULTY ENGAGEMENT

Innovative solutions require diverse perspectives. We partner with a range of faculty across ASU to conduct research that sheds light on biodiversity conservation issues. We currently have 131 affiliates from over 25 different units across the university. The majority of our faculty affiliates come from the School of Life Sciences, the School of Sustainability, the School of Human Evolution and Social Change and the School of Earth and Space Exploration. In FY21, we introduced the Program Leads model through which to scale the reach and impact of center research and activities, engaging [six faculty members as program leads](#). The center acts as a convener for research projects and initiatives that align with our strategic plan. Selected members of our affiliated faculty were invited to lead these research Incubators, with the center providing logistic and project management support.

## → TRAINING OPPORTUNITIES:

We support an internship program established by Associate Center Director Beth Polidoro in which undergraduates are placed with our partner organizations. Through our partners, who include the IUCN, the Phoenix Zoo, the Desert Botanical Garden and other associated organizations, students are afforded available opportunities to engage in local and global conservation work, gaining crucial skills and professional connections. To date, more than 30 students have participated in this program.



**STUDENT ENGAGEMENT**

The Center is fortunate to work with dedicated, passionate undergraduate and graduate students. In September, five graduate students affiliated with the center published a [memo](#) addressing how to reinvigorate recycling in Arizona through state-level policy reform. [Erin Murphy](#), [Miranda Bernard](#), [Levi Helm](#), [Infynity Hill](#) and [Alex Tunas-Corzon](#) interviewed recycling coordinators from across the state and found that most municipalities have been forced to alter their programs due to changing international markets and a lack of state-level support. Despite these challenges, interviewees view an investment in the recycling sector as an opportunity to improve the economic, environmental and social wellbeing of their community. The authors created wrote a [petition](#) asking the state to fund the recycling program. Learn more at [bit.ly/3pwVx8A](http://bit.ly/3pwVx8A)

Since we founded the center in 2014, we have completed 46 student hires from six different schools across the university. Our students engage in a variety of projects including scientific research, communications and marketing, project management and event planning.

We assign students to projects that align with their career interests and provide them with hands-on experiences and mentoring to help them hone their transferable skills and learn to network with professionals in their field, gaining a competitive advantage in the workforce.

In 2021, we continued to support Nature at ASU, an undergraduate student-led initiative aimed at helping nature conservation career students connect with resources and opportunities inside and outside ASU. We contributed \$2,000 to support their daily operations and provided designated student workspace in our administrative suite (LSA 351). Learn more at [bit.ly/2GFmJAH](http://bit.ly/2GFmJAH)

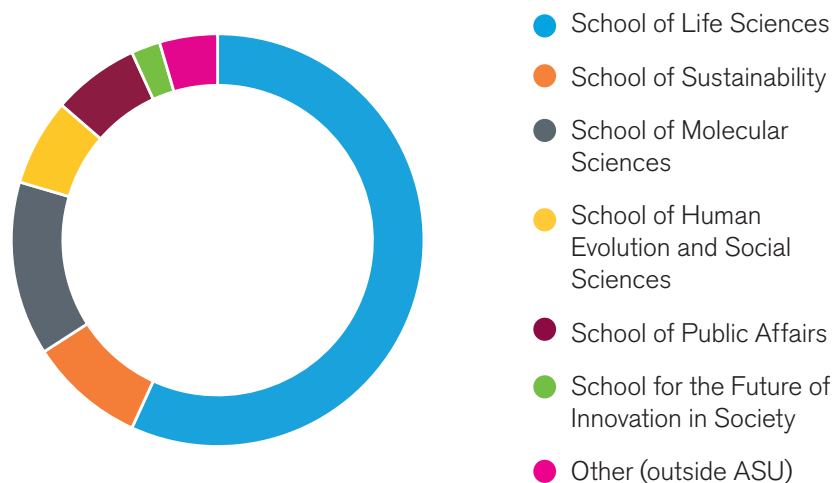


Figure 2. Student workers engagement by school, FY15-FY21

## Goals and accomplishments

CBO reports proposal activity in three levels: proposals written by Center personnel, proposals written by Program Leads or co-led by Center personnel and proposals on which CBO played a catalyzing or enabling role for which the PI granted us REC. Activity details for each are given in the tables below to show how the Center scales our impact through involving and supporting our broad network of ASU faculty affiliates.

Our FY21 fundraising goal was to achieve \$2 million in research expenditures by applying for \$13 million and achieving a 15% success rate. Center directors and Program Leads submitted proposals totaling \$12,816,639, of which \$1,772,184 was awarded, yielding a success rate of 14%. \$5,264,675 of the total proposals submitted are still pending a final decision.

Proposal title	Sponsor	Awarded	Pending
Amazon Development Entrepreneurial and Learning Alliance (PI: Leah Gerber)	USAID	\$425,000	
Repeated Hurricanes Reveal Risks and Opportunities for Social-Ecological Resilience to Flooding and Water Quality Problems (PI: Danica Schaffer-Smith)	The Nature Conservancy	\$88,076	
Estimating costs associated with compliance with the Endangered Species Act (PI: Leah Gerber)	Electric Power Research Unit	\$56,664	
Models and Algorithms for Strategic Conservation Planning (PI: Jorge Sefair)	NSF CAREER	\$500,000	
Focused Hub: Hawai'i Coastal Research Hub for Sustainable Management of Marine and Consumer Plastic (PI: Kevin Dooley)	NSF CoPe	-	\$4,739,913

Table 1. FY21 grants and donations awarded

Proposal title	Sponsor	Awarded	Pending
Supply- vs demand-driven science: the role of knowledge partnerships in improving the public value of conservation science (PI: Leah Gerber)	NSF SoS-DCI	\$616,784	
A New Wave: Implementing Alternatives to Plastic Food Packaging in American Samoa (PI: Beth Polidoro)	NOAA	\$85,660	
Designing fire risk management strategies to improve risk reduction and ecological conservation (PI: Gwen Iacona)	USDA NIFA	-	\$325,001
Realizing the benefits of near-real-time, machine-learning-based electronic monitoring in fishery management (PI: Kailin Kroetz)	NSF	-	\$199,761
<b>TOTAL</b>		<b>\$1,772,184</b>	<b>\$5,264,675</b>

**Looking ahead**

In our eighth year, we will continue to advance our research and education agenda around achieving biodiversity outcomes. It is vitally important to create an understanding of and support for a richly biodiverse planet among individuals, governments, corporations and nations. The challenges to creating this understanding and support include the lack of awareness of and capacity to implement win-win solutions that benefit biodiversity and the corporate bottom line, or biodiversity and satisfying lifestyle. With seven years of experience behind us, having interfaced on a global map, influencing policy and creating actionable outcomes through the research we conduct, we are excited to meet these challenges.

In the next year, we will convene and foster interdisciplinary research efforts around biodiversity challenges, led by our program leads and faculty affiliates. We will engage in education research and activities, including citizen science and informal education, as well as formal K-12, college, and graduate activities. We will continue to support partnerships with government, corporate and corporate-facing institutions through actionable science to increase the valuation of biodiversity in the public and private sector, supported by our research.

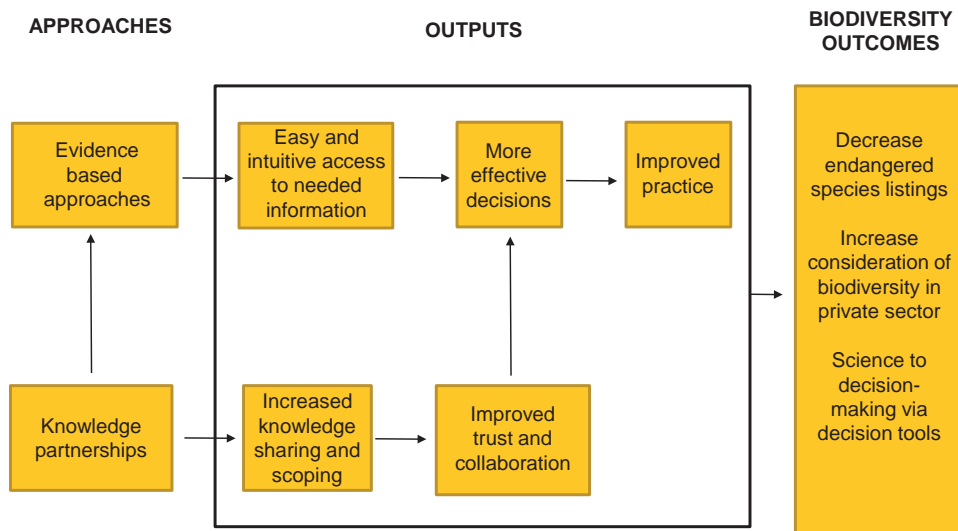


Figure 4. Our theory of change for achieving biodiversity outcomes



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# 2022 goals

Big goal	Metrics
<p><b>Education and diversity</b></p> <p>Train the next generation of conservation leaders and increase diversity and inclusion in biodiversity conservation science.</p>	<p><b>Expand the reach of the <a href="#">Graduate Certificate in Environmental Communication and Leadership</a></b> by (1) conducting targeted outreach to engage larger cohorts of students and (2) continuing promotion via our media channels.</p> <p><b>Scope a graduate certificate in Biodiversity Decision Science</b> by (1) developing concept proposals and (2) conducting market research to launch the certificate in FY22.</p> <p><b>Engage undergraduate students</b> by (1) providing internal support for Nature at ASU to reach conservation biology undergraduates at ASU (we will offer desk space, small stipends if funds are available and at least one joint annual meeting or event); (2) supporting the internship program established by Beth Polidoro with existing partners (Phoenix Zoo, McDowell Sonoran Conservancy, Desert Botanical Garden and IUCN) if positions are available; and (3) providing IUCN Red List training through webinars with students and external partners.</p> <p><b>Support research and career development for underrepresented minorities</b> by (1) analyzing the relationship between diversity and propensity to engage in co-production and (2) developing recommendations for incentivizing co-production in academia (Beyond the Academy).</p> <p>Also, we would develop recommendations for culturally sensitive teaching of biodiversity by (1) hosting a workshop with the Center for Gender Equity in Science and Technology to explore culturally sensitive teaching; (2) engaging the Mary Lou Fulton Teachers College faculty to benefit both future teachers and students; and (3) mentoring a student who writes a proposal concept for the MARGIRLS initiative.</p>

Big goal	Metrics
<p><b>Research</b></p> <p>Bring biodiversity to the center of the world's decision-making.</p>	<p><b>Develop decision science and decision-making tools</b> by (1) submitting at least three papers related to implementing our Recovery Prioritization Explorer; (2) expanding and applying our plastic pollution emissions decision tool; (3) Developing a structured decision framework for estimating pesticide exposure risk for endangered species (with Bayer, USFWS, EPA); (4) developing a structured decision framework for managing and monitoring the Galapagos Marine Reserve; (5) developing a trait-based vulnerability framework for assessing the impacts of threats to species and ecosystems, implementing the framework in at least two different regions and publishing at least two papers on results; and (6) publishing a paper on the value of the IUCN and ESA coordination for conservation.</p> <p>Also, we would advance this goal by promoting the costs and benefits of conservation inventions by (1) piloting our Conservation Investment Tool in at least two countries (Colombia and potentially Peru); (2) working with IUCN and funders to refine a tool to inform international conservation investment; (3) establishing a central repository and reporting system of biodiversity conservation intervention costs and benefits to provide cost evidence to enhance the conservation evidence movement; and (4) developing a costing framework for estimating energy sector compliance risk with endangered species (with EPRI).</p> <p><b>Increase consideration of biodiversity in the private sector</b> by (1) publishing at least one paper on biodiversity and business; (2) engaging at least three companies to consider biodiversity valuation; (3) developing narratives and communication documents to share with corporations; (4) submitting at least one proposal related to sustainability in fisheries and supply chains; (5) submit at least one proposal related to sustainable agriculture; and (6) submit at least one proposal related to circular economy and plastic waste.</p>

# 2022 goals

Big goal	Metrics
<p><b>Partnerships and relationships</b></p> <p>Transform biodiversity conservation investments and decision-making.</p>	<p><b>Engage over 10 external partners in research co-production</b> (to reach over 50 partners by FY24).</p> <p>Specific partnerships we are supporting and key goals:</p> <p><b>International Union for Conservation of Nature</b></p> <ul style="list-style-type: none"> <li>▪ Develop IUCN page on the website (e.g. IUCN at ASU) to showcase the partnership and projects.</li> <li>▪ Include IUCN-related activities on social media.</li> <li>▪ Provide quarterly updates on CBO-IUCN projects at Programmatic meetings.</li> </ul> <p><b>Conservation Solutions Lab</b></p> <ul style="list-style-type: none"> <li>▪ Establish a relationship with the new Chemonics CSL leads and new norms and plans for CSL.</li> <li>▪ Cultivate existing relationships with the CSL network.</li> <li>▪ Submit at least two grant/workshop proposals.</li> <li>▪ Submit at least one thought leadership piece.</li> <li>▪ Meet monthly with our operations team to discuss CSL support needs.</li> <li>▪ Provide quarterly updates on CBO-IUCN projects at Programmatic meetings.</li> </ul>





Big goal	Metrics
<p><b>Fundraising</b></p> <p>Develop a robust external fundraising strategy to advance our research projects.</p>	<p><b>Develop and enact a fundraising strategy that will provide ongoing support for our research activities</b> by raising \$2 million in research expenditures in FY21 by applying for \$13 million and achieving a 15% success rate.</p> <p><b>Build lasting financial support for our research initiatives by engaging faculty in research incubators</b> through:</p> <ul style="list-style-type: none"> <li>▪ Developing a strategic plan for starting and cultivating incubators, including (1) incentive for faculty involvement; (2) our operations staff involvement; (3) our founding director involvement; and (4) expectations for REC/RID.</li> <li>▪ Continuing to support mitigation of plastics pollution and sustainable agriculture.</li> <li>▪ Advancing sustainable fisheries related work.</li> <li>▪ Identifying three incubators to start in FY22.</li> </ul> <p><b>Establish an external advisory council to guide our fundraising strategy</b> by:</p> <ul style="list-style-type: none"> <li>▪ Determining terms of service (18 months max), functions and responsibilities.</li> <li>▪ Identifying potential council members who already have involvement/investment with us.</li> <li>▪ Developing the “Ask.”</li> <li>▪ Cultivating relationships with the council.</li> <li>▪ Delivering the “Ask.”</li> </ul> <p><b>Work with the ASU Foundation to develop a philanthropic fundraising strategy.</b></p> <ul style="list-style-type: none"> <li>▪ Develop a one-pager regarding the impact of our global and possible partnerships.</li> <li>▪ Meet with the ASUF to discuss our fundraising strategy.</li> <li>▪ Launch an ASUF page.</li> </ul>

# 2022 goals

Big goal	Metrics
<p><b>Operations</b></p> <p>Streamline daily functions to support our growth.</p>	<p><b>Review our governance structure to define and codify roles and responsibilities, titles and terms of service.</b></p> <p><b>Complete a recruitment plan and recruit new associate center directors.</b></p> <p><b>Establish schedules for meetings, including quarterly team meetings, monthly programmatic meetings and associate center director meetings.</b></p> <p><b>Complete all annual mandatory training.</b></p> <p><b>Complete annual &gt;16 hours of professional development training.</b></p> <p><b>Help align individuals' career goals with the center's strategic goals</b> by (1) following Gallup method recommendations for engaging employees in development opportunities; (2) encourage completion of the CliftonStrengths Assessment; and (3) identify ways to discuss our individual and group strengths to enhance our team.</p> <p><b>Encourage employee work-life balance and wellness.</b></p> <p><b>Onboard and train new members; assist exiting ones.</b></p> <p><b>Streamline internal communications and task tracking</b> by (1) adopting one-on-one agendas to facilitate discussions and track action items and (2) continuing to work with the team to optimize use of Monday.com.</p> <p><b>Continue performing daily administrative, HR, travel and financial tasks as assigned.</b></p> <p><b>Assess and update the essential duties of the operations team due to staff reductions.</b></p>

Big goal	Metrics
<p><b>Marketing and communications</b></p> <p>Enhance our communications and media presence to achieve our strategic goals.</p>	<p><b>Refine our social media strategy to support our fundraising efforts</b> by (1) developing a plan to connect on social media with existing and potential sponsors, program managers and potential collaborators; (2) developing a follow-up/conversation plan for social media; and (3) reviewing our monthly social media plan during the operations meeting.</p> <p><b>Launch the Biodiversity Bulletin (e-newsletter)</b>, including (1) completing the Salesforce Marketing Cloud training; (2) finalizing the template with the KE/GIOSI graphic designer; and (3) meeting monthly/quarterly to select and compose content from the CBO Media Calendar.</p> <p><b>Edit the website quarterly, including annual updates to the partners' list.</b></p> <p><b>Develop thought leadership pieces</b> via our directors (each to publish at least one thought leadership piece annually in a recognized publication) and by exploring the creating of visual content (e.g. infographics, videos).</p>

Table 2. 2021 (FY22) goals and metrics



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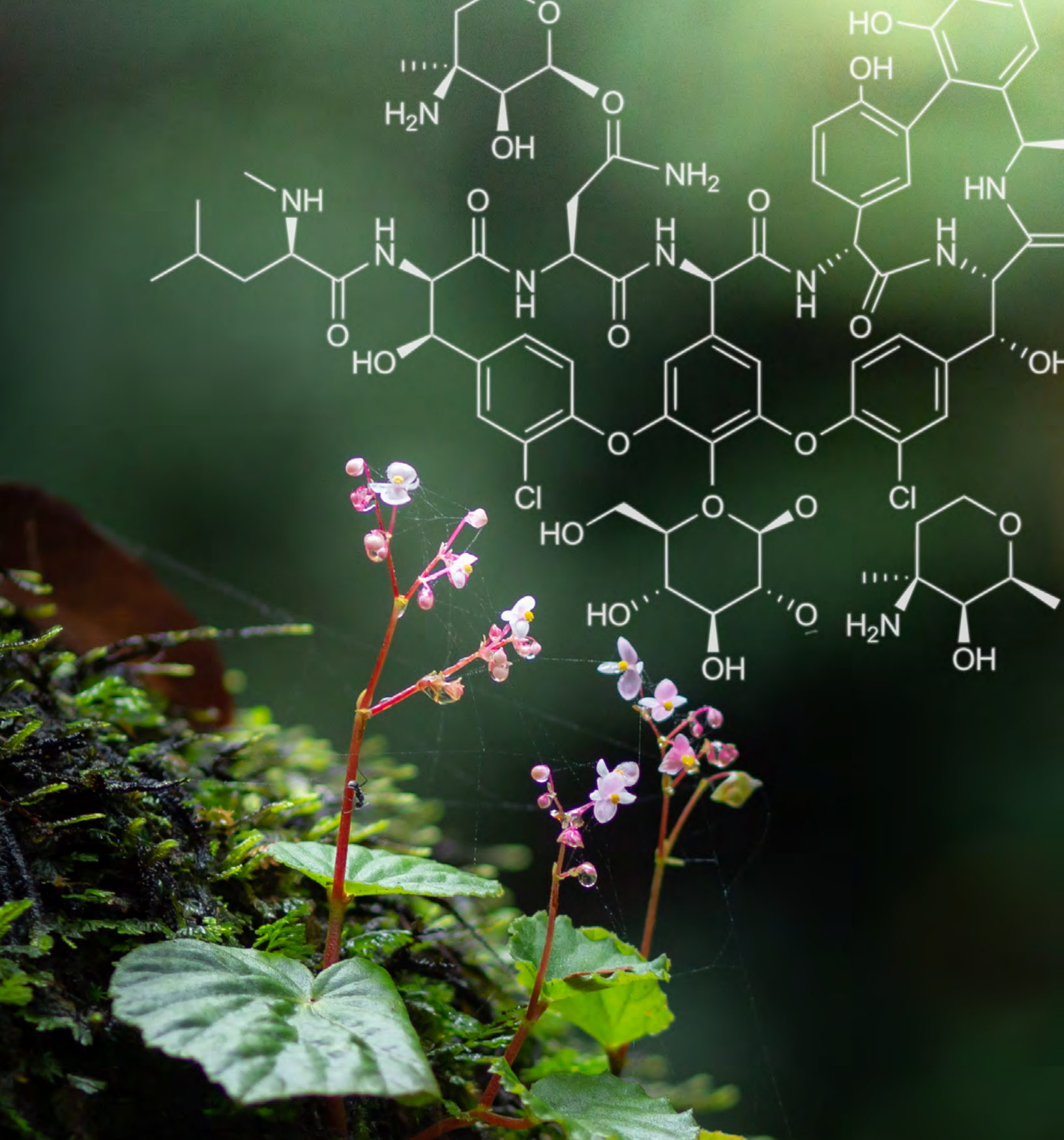


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**thank you**



The Center for Biodiversity Outcomes is a partnership between the Global Institute of Sustainability and Innovation and the School of Life Sciences.