

Center for Biodiversity Outcomes Annual Report | 2020





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

Letter from the founding director

Dear Friends:

This year has been unprecedented in my lifetime. The warning bells long rung by conservation scientists and epidemiologists sound loud and clear in our collective ear: humans, by encroaching into wild areas, have unleashed the pandemic now raging around the globe. We are seeing first-hand the results of unsustainable consumption, ineffective global polices and poor regulation.

“While the challenges that face us, both globally and personally, are astonishing and complex, we must resist the temptation to despair. This is a time for hard work and for hope.”

The direct drivers of biodiversity loss – land and sea use change, direct exploitation, climate change, pollution and invasive species – are rooted in our societal values. These values determine the indirect drivers of change: population and consumption, technology and economy (including trade), conflicts and social unrest, institutions and governance. Current incentives in production and consumption tend to be associated with inefficient production, excessive waste and affect nature at different levels, from genetic diversity to whole landscapes.

This global wake-up call underscores the essential need to transition to sustainable economy that steers away from the current paradigm of unlimited economic growth. This transition requires changes at all levels: consumers who are able to down-scale their consumption must explore options that are friendlier to the planet; corporations must explore how to properly value natural capital; and governments must enable and support these choices with policies and legislation.

While the challenges that face us, both globally and personally, are astonishing and complex, we must resist the temptation to despair. This is a time for hard work and for hope. Even in the grip of this pandemic, we must forestall the next one. National and local governments, corporations, NGOs and individuals must all contribute to this effort. Never has it been more important to address the stresses humans impose on species and ecosystems; never has it been more important to work together for the salvation of our planet.



Leah Gerber

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



meet the team

Faculty leadership



Leah Gerber
Founding Director



Candice Carr Kelman
Assoc. Ctr. Director of
Conservation Solutions



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

Operations and communications team



Susanne Hinrichs
Administrative Assoc.



Alice Letcher
Project Manager



Anahi Mendez
Mgr., Communications
and Business Ops.

ASU-Conservation International professors



Katie Cramer
Assistant Research
Professor



Jack Kittinger
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 2020. In particular, we would like to thank consultant Franzihó Smith, PhD and future ASU graduate student Paola Sangolqui who have been instrumental in advancing our Lenfest project in the Galapagos National Park. In the same spirit, we thank future ASU graduate student Camila Guerrero for collaborating with us in advancing the development of new conservation investment decision tools.

Postdoctoral research associates



Rachel Fovargue



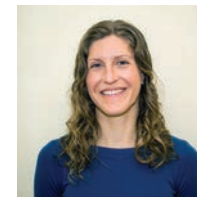
Gwen Iacona



Lars Iversen



Krista Kemppinen



**Danica
Schaffer-Smith**

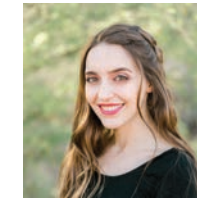
Graduate student workers



Arielle Amrein
Biology and Society
MS program



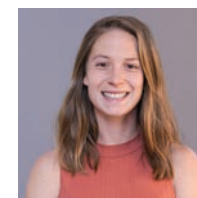
Christopher Barton
Innovation in Global
Development
PhD program



Infynity Hill
Biology and Society
MS program



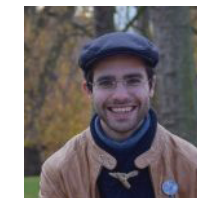
Nosizo Lukhele
Bachelor of Arts
program, Bennington
College



Erin Murphy
Biology and Society
PhD program



**Katie
Surrey-Bergman**
Biology and Society
PhD program



Alex Tunas Corzon
Environmental Life
Sciences PhD program



Learn more: biodiversity.asu.edu/people

Beyond the call of duty

We rely on strong leadership and the excellent skills and work ethic of our staff. As a small organization, we each wear many hats and pride ourselves on being flexible and adaptable to change. FY20 presented us with unusual challenges. Like many, we moved to a work-from-home model in late April to protect ourselves and our communities from COVID-19. Since starting work-from-home, our staff has actively engaged in measures and activities to maintain productivity and connectivity with each other and to promote staff wellness. We instated twice-weekly optional coffee breaks to serve as an informal way to stay connected and support each other. We also began starting our weekly operations meeting with a short mindfulness exercise followed by a brief, optional check-in. Through these measures, we intend to create a safe space to share concerns and challenges, both personal and professional.

At the same time, the operations staff began a program of self-directed career development wherein each of us learns about a topic of potential benefit to the team and shares our knowledge via PowerPoint presentations. Topics covered are diverse and include non-violent communication, design thinking, management strategies, minute-taking best practices and the Gallup method for driving employee engagement. This program is inspired by the firm belief that we all have something of importance to teach and that our knowledge is deepened when we share it with others.

One of the topics that occurred repeatedly in our coffee breaks is how COVID-19 has illuminated deep and pervasive inequalities resulting from centuries of institutional racism and discrimination in the United States. Science, including our field of conservation biology, has a long history of colonialism and exclusion. At the Center for Biodiversity Outcomes, we are actively combating that, seeking to make our organization and our field inclusive and welcoming to all. Large-scale change is slow to occur and thus the staff discussed measures we can take personally and immediately to be more inclusive. These efforts include adding the To Be Welcoming (bit.ly/39nP0ro) curriculum to our required training and pursuing training in recognizing and eradicating unconscious bias, such as those offered by The Racial Equity Institute (bit.ly/3maOall).



Actionable science

Our primary objective is to help 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.

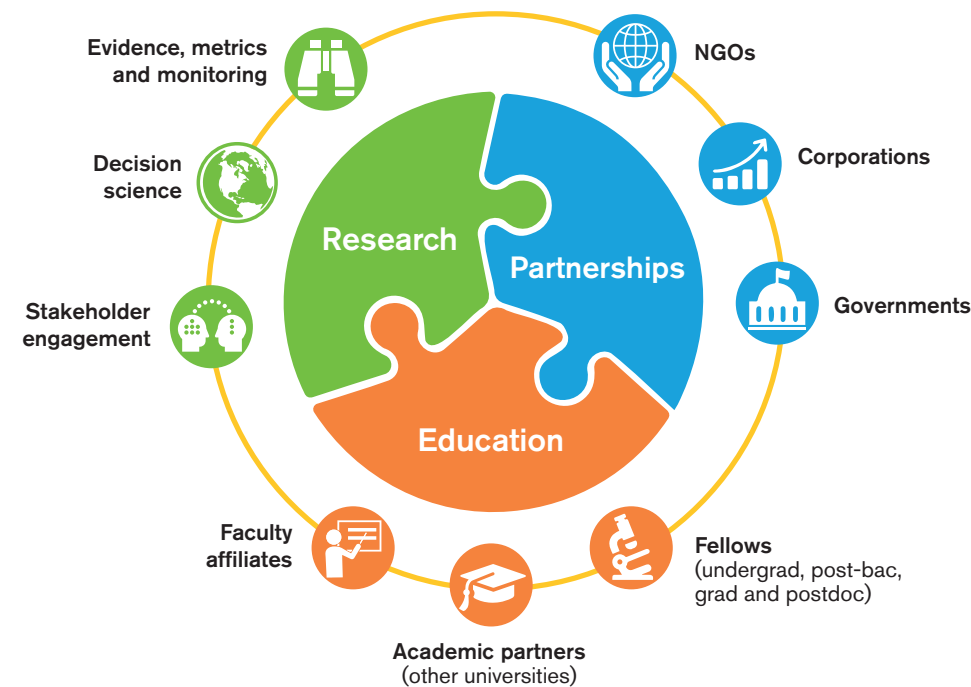


Figure 1. Actionable science model

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 have access to 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
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.	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.	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.

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 biodiversity research projects covering a variety of topics, including:

- Actionable science innovation
- Advancing corporate sustainability and biodiversity conservation investments
- Biodiversity and the United Nation's 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
- Two faces of extinction: physiological and socio-economical
- Water quality, human health and biodiversity





The year in review

It is difficult to compress a productive and exciting year into a few brief paragraphs. Below are selected highlights from research, education, activities with our partners and note-worthy events. Find more information about our activities in the media, publications and events sections of this report, as well as online at 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 FY20, 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 developed a prototype tool that allows users to explore how varying hypothetical conservation investment affects biodiversity decline in a given country and began the development of a database on conservation intervention cost-benefit information. Future work includes 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/3lXcGXp

→ **BAYER**

We are working with Bayer to apply techniques from decision science such as evidence synthesis, quantitative prioritization of actions and value of information assessment to identify sources of efficiency for conservation resource allocation. In 2020, we partnered with Purdue University to develop for Bayer an integrated, geospatial decision support framework to identify, evaluate and recommend agriculturally-based “habitats” that support biodiversity and provide benefits both on and beyond the farm. The proposed research will integrate effective agricultural practices, spatial distribution of risks and benefits (including farmer preferences and environmental, agricultural and regional factors) and effective incentive mechanisms into a geospatial decision support framework.



BIODIVERSITY AND BUSINESS

A new publication co-authored by 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

Gerber and School for the Future of Innovation in Society’s Innovation in Global Development PhD program student Chris Barton attended GreenBiz 2020 to present a micro-session on “Biodiversity and Profitability: Mapping the natural environment’s influence on your firm’s profitability.” Gerber’s and Barton’s expertise in tackling biodiversity issues in different business sectors made this event a perfect opportunity for them to connect and engage with corporations. This session discussed biodiversity inclusion in corporate sectors and was a valuable opportunity to connect and engage with corporations. Learn more: bit.ly/3nxxnL2s

In December 2019, Gerber shared her insights on identifying key priorities in biodiversity efforts through a high-level conversation on Politico. The event, titled “Nature in Crisis,” included Rep. Raúl Grijalva from The House Committee of Natural Resources, Linda Krueger from The Nature Conservancy and Nick Juliano from Politico as moderator. The conversation addressed the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services global assessment’s dire conclusions that 1 million species of the estimated 8 million species of plants and animals on Earth are threatened with extinction. Gerber stressed that “It is unequivocal that biodiversity is the foundation of our economy. We could also argue that biodiversity is like art; it’s priceless.” The panel discussed possible ways to combat the biodiversity crisis, including the protection of natural areas, working with the agriculture and construction sectors to implement sustainable practices and mainstreaming biodiversity in the economic sector. Learn more: bit.ly/36MKmlu

In June 2020, in response to the COVID-19 pandemic, Gerber gave a presentation titled “A Global Strategy for Preventing the Next Pandemic.” Her talk was based on her recently published article of the same title and detailed three strategies for preventing the next pandemic: supporting basic science, creating a global governing body with regulatory influence and transforming the global economy and markets. Learn more: bit.ly/33EWH9G



CHEMONICS INTERNATIONAL

Chemonics International is a private international development company that works for donors and the private sector to manage projects in developing countries. Their mission is to promote meaningful change around the world to help people live healthier, more productive and more independent lives. We have partnered with Chemonics to create the Conservation Solutions Lab, a collaboration dedicated to the effective and equitable engagement of communities in conservation.

Chemonics and the Kenya Wildlife Conservancies Association organized a summit about moving from “community engagement” to community-led conservation solutions in Africa. Held 11-14 February 2020 at the Mt. Kenya Safari Lodge, Nanyuki, Kenya, the summit was designed to provide a forum for dialogue on the central role of communities to conservation success, their current challenges and impact and to generate new ideas for the future of communities in driving sustainable conservation outcomes in East Africa and beyond. The summit report was distributed to participants and will be available through the Conservation Solutions Lab websites on Chemonics and ASU sites (or by demand) as developed. Learn more: bit.ly/2Hy17qE



CONSERVATION SOLUTIONS LAB

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.

Associate Center Director Candice Carr Kelman and CSL colleagues published a commentary in the online journal Mongabay titled “Communities, conservation and development in the age of COVID: Time for rethinking approaches,” in which they explore the opportunity the conservation community has to evolve away from business-as-usual and reactionary approaches and focus on addressing the underlying causes of conservation challenges. They discuss the connections between systemic racism, colonialism and oppression and raise the importance of engaging frontline communities in meaningful dialog and as equal stakeholders in conservation actions. Learn more: bit.ly/3manpx2

CSL submitted a Science for Nature and People Partnership proposal that will fund research on the typology of successful projects. Project design does not always rely on evidence-based approaches and theories of change (ToC) when articulated, are often based more upon previous experience than upon research or guidelines. Building on previous CSL work, this research will systematically

synthesize the evidence from a wide cross-section of scientific literature and reports assessing projects around the world to identify which ToC are used (whether explicit or implicit), their frequency and their rates of success at meeting goals. This will determine a typology of successful projects based upon ToC, context and process of implementation, including community engagement.



CONSERVATION INTERNATIONAL

The ASU-Conservation International partnership supported two postdoctoral researchers from 2017–2019 who were jointly advised by a CI scientist and an ASU faculty member to advance cutting-edge conservation research. Elena Finkbeiner focused on social responsibility in seafood production and Krista Kemppinen worked on quantifying the potential contribution that reforestation interventions make to biodiversity conservation. Learn more at bit.ly/33LLqUW and bit.ly/34E21Jy

ASU-Conservation International professor of practice and senior director of the blue production program for CI's Center for Oceans, Jack Kittinger, shared insights on the challenges and opportunities of the seafood industry in an article by Conservation International titled "Meet a scientist: The sustainable-food guru." Kittinger discussed the environmental threats to our oceans and seafood supply and human rights violations experienced daily by workers in the seafood industry remain a major concern. Learn more: bit.ly/3iEJ26A

In partnership with CI and the Global Trophic Cascades Program at Oregon State University, we published a new study in Conservation Biology revealing the potentially significant contribution reforestation could have on biodiversity conservation. The publication, titled "Global reforestation and biodiversity conservation," was led by Postdoctoral Research Associate Krista Kemppinen and co-authored by Pamela Collins and David Hole from Conservation International, Christopher Wolf and William Ripple from the Global Trophic Cascades Program at Oregon State University and Leah Gerber. This study overlaid maps of areas occupied by threatened species with maps of degraded forests that have restoration potential. Where these maps overlap are opportunities for species conservation. The study identified more than 1.424 million square miles of degraded land that could be restored and predicted that reforestation of 43% of that area would afford significant benefits to threatened vertebrates. Learn more: bit.ly/2TkDbt1



ASU-Conservation International Assistant Research Professor Katie Cramer recently co-authored a paper in Science Advances titled the "Widespread loss of Caribbean acroporid corals was underway before coral bleaching and disease outbreaks." The research examined a 125,000 year record and revealed that the abundance of staghorn and elkhorn corals began declining significantly in the mid-1900s, potentially due to fishing and land-clearing and ocean warming. As oceans continue to warm, the extinction of corals will lead to trophic cascades decimating reef ecosystems. Learn more: bit.ly/3kpDKOf

In February, Cramer also gave a presentation on the research, titled The Past, Present and Future of Coral Reefs, in which she discussed the causes and degree of Caribbean reef decline recorded in a continuous 3000-year record. Learn more: bit.ly/3iKjxAM

→ DEFENDERS OF WILDLIFE

Leah Gerber is one of ten prestigious scientists to join Defenders of Wildlife as science advisors to help expand the organization's scientific capacity, guiding science-based conservation policy that protects wildlife. Defenders of Wildlife is a non-profit conservation organization with a mission to protect all wild animals and plants in their natural environments. Through policy and innovative solutions, they envision a future where wildlife thrives. Learn more: bit.ly/2SHxPI8

In October 2019, Gerber delivered a congressional briefing on funding needs to implement the Endangered Species Act 2019. The congressional testimony title was "Solving the Biodiversity Crisis and Saving Endangered Species: The critical need for federal funding." Additional briefings were given by US Representative for Arizona's third congressional district Raúl M. Grijalva, US Representative for California second congressional district Jared Huffman, US Representative for Minnesota's fourth congressional district Betty McCollum, Chair of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Sir Robert Watson and Director of the Center for Conservation Innovation of Defenders of Wildlife, Jacob Malcom. As one of the lead authors of the Global Assessment Report on Biodiversity and Ecosystem Services of the IPBES, Gerber addressed some of the top recommendations to reverse the

extinction trajectory anticipated for one million endangered species of plants and animals. A critical aspect of the recovery process is funding. Related to the congressional briefing, Defenders of Wildlife submitted recommendations for edits for Renewing America's Wildlife Act. They also published a letter titled "Solve the biodiversity crisis with funding" in Science inviting scientists to voice their support. Over 1,600 scientists have signed up.

Learn more: bit.ly/2GRTgmN

→ ELECTRIC POWER RESEARCH INSTITUTE

We continued to work with the Electric Power Research Institute 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. Project research assistant Katie Surrey-Bergman led the push to forward each of these goals during the year. To do so, we explored several possible sources for relevant pilot data and settled on compiling a dataset for analysis from published Habitat Conservation Plans (HCPs). The costing framework was then used to inform a protocol for data processing to enable valid and transparent analysis of compliance costs across different types of projects and compliance actions. Preliminary results suggest that compliance cost data available from HCPs is incomplete and best suited for exploring costs associated with compliance project implementation. Within implementation costs, there are large differences in average cost across industry and action types, but potentially mitigation and monitoring costs dominate.

→ ENVIRONMENTAL COMMUNICATION AND LEADERSHIP

Students continued to apply to this graduate certificate, which we launched in fall 2017 (see promotional flier and list of approved coursework on pages 24-25). We designed this certificate to train graduate students in science-based fields to communicate effectively their findings to public audiences and decision-makers. We are currently offering this certificate across all campuses.

Learn more: bit.ly/2OMmmG4

During fall 2019, 10 students enrolled in the main course. Their capstone projects included designing a detailed outreach and communication plan and route for a research sailing vessel that will launch in 2020 and an outreach and public education plan for the City of Phoenix's Zero Waste initiative. On December 5, students presented their plans to the public and representatives of the SEEOOP Argo Research Sailing Vessel and the City of Phoenix's Zero Waste initiative. Learn more at bit.ly/3jJNltn and bit.ly/34AWKCI



Open to all graduate students across ASU

Graduate Certificate in Environmental Communication and Leadership

This certificate trains graduate students in environmental sciences to communicate their findings to decision-makers and the broader public. Graduate students will obtain valuable training in leadership and will learn to communicate with public, media, policymakers and other relevant stakeholders.

Students will learn to:

Effectively communicate with the public, including media and decision-makers, to translate complex technical and scientific concepts into easy to understand language.

Demonstrate leadership skills such as strategic thinking and planning, team management, conflict resolution, collaboration, mentorship and self-reflection.

Inform policy and decision-making for an organization, governmental body or other institution by describing their goals and incentives.

Requirements:

BIO 578 Environmental Leadership and Communication (3 credits) is the core course for this 15 credit hour certificate. This course is designed to build skills specific to environmental policy and management (offered every spring).

Students will complete 12 additional credits of coursework from our approved course list in the areas of policy and management, communication and leadership.

To apply, you need:

1. Official transcripts
2. CV

biodiversity.asu.edu/education

Elective coursework for the ECL graduate certificate

Students enrolled in the Graduate Certificate in Environmental Communication and Leadership can complete their 12 additional credits of coursework from the following approved list of courses:

Policy and management

Course number	Credits	Course title
BIO 517, SOS 518	3	Uncertainty and Decision-Making
BIO 412, BIO, SOS, GPW 598	3	Conservation in Practice
ERM 528	3	International Environmental Management
ERM 540	3	International Environmental Law and Policy
HSD 501	3	Science and Technology Policy
HSD 502	3	Advanced Science and Technology Policy
PAF 505	3	Public Policy Analysis
PAF 540	3	Advanced Policy Analysis
SOS 545	3	Topic: Organizations, Sustainability and Public Policy
PAF 545	3	Organizations, Sustainability and Public Policy

Communication

Course number	Credits	Course title
SOS 598	3	Communicating about Sustainability
SOS 577	3	Interdisciplinary Writing Seminar
SOS 545	3	Organizations, Sustainability and Public Policy
PRM 470	3	Environmental Communication
COM 414	3	Topic: Crisis Communication
CMN 598	3	Topic: Environmental Risk and Communication Advocacy

Leadership

Course number	Credits	Course title
SST 591	3	Topic: Transformational Leadership and Embodied Activism
MGT 513	3	Mindful Leadership
MGT 545	3	Becoming Leaders Who Matter
NLM 560	3	Leadership and Ethics in the Nonprofit Sector
PAF 508	3	Organization Behavior
PAF 529	3	Organization Change and Development
PAF 574	3	Diversity, Ethics and Leading Public Change

→ INTERNATIONAL UNION FOR CONSERVATION OF NATURE

In September 2016, we became an official partner of the IUCN Red List of Threatened Species. We have established a training center at ASU, led by Associate Center Director Beth Polidoro. In February 2020 (announced in March), we became an official voting member of IUCN, joining forces with other 1,400 member organizations around the world to inform sustainable development. Learn more: bit.ly/3jnV98l

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 Center Director Beth Polidoro.

Polidoro helped draft and submit two international motions for consideration for global adoption at the upcoming IUCN World Conservation Congress in June 2020. These include Motion 29, improved conservation and assessment of the world's marine ecosystems)and Motion 30, improved coordination for the remediation or removal of sunken vessels.

Polidoro, Helen Rowe and Linda Howard attended the IUCN Species Survival Commission Leadership meeting in Abu Dhabi, in October 2019. Funded by the UAE Environmental Agency, this meeting takes place every 4 years to create strategic plans for different IUCN species specialist groups, as well as to work on meeting and creating new targets for the CBD and other international biodiversity conservation initiatives.

For the IUCN Red List of Ecosystems, we are currently reviewing the new partnership agreement with ASU's New College of Interdisciplinary Arts and Sciences. With funding from the PLS Alliance, we have finalized the IUCN Ecosystem Typologies for which the methods and additional analyses are currently under review in the journal Nature.

We are currently embarking on reassessing the world's tunas and billfishes, as well as the reef-building corals. Additionally, we are continuing to support the IUCN SSC Sonoran Desert Plant Specialist Group, through PhD student Linda

Howard, the new Red List Authority for this group and by providing assessment training and advice for the new co-Chair, Dr. Helen Rowe, who is now managing 11 undergraduate students at NAU.

Additionally, we planned a study abroad program for undergraduate students to attend the World Conservation Congress in Marseille, France, in June 2020. Due to COVID-19 restrictions, this program did not occur.

→ LENFEST OCEAN PROGRAM

Leah Gerber secured a new 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 will focus on developing a modeling and monitoring approach to assist the Galapagos National Park Directorate in refining management goals and conservation decisions. This work will provide empirically supported insight into the characteristics of actionable knowledge, relationships between scientists and decision-makers and decision-making structures. Learn more: bit.ly/3kq2d64

On October 24, 2019, one of the project collaborators, Professor Susana Cárdenas Díaz from the Universidad San Francisco de Quito, spoke at the Hugh Hanson Seminar. We co-hosted this event with the School of Life Sciences. In her talk, titled "Valuation of Marine Wildlife in the Galapagos Island," Cárdenas Díaz discussed preference data from a survey of tourists in the Galapagos National Park and its Marine Reserve. Their research investigated tourists' willingness to pay for the recovery of two marine endangered species (hammerhead shark and green sea turtle) through visitor fees and donations. Learn more at bit.ly/33FnBOG and watch the presentation at bit.ly/35DvxRz

→ THE NATURE CONSERVANCY

Danica Schaffer-Smith, NatureNet Science Fellow and ASU postdoctoral research associate, conducted research with The Nature Conservancy's North Carolina Water Program on resilience to flooding and water quality problems under extreme events. A study published in June 2020 outlined a reproducible method for hurricane flood mapping using satellite-based radar imagery, examined water quality implications of repeated hurricane flooding and identified opportunities to improve resilience in light of social, ecological and infrastructure vulnerabilities. Floodplain vegetation is considered high-value natural infrastructure for storing floodwater, processing contaminants and providing more in-stream flow during droughts, yet regulations protecting these

resources vary widely and land use change in floodplains is ongoing. Danica has quantified changes in floodplain vegetation across Eastern North Carolina from 2001 – 2015 using multiple data sources. She is assessing the effectiveness of state-level riparian protections, which may become more important given recent changes to the federal Clean Water Act. Danica has also continued to develop a more focused study of solutions to water quality and flooding in the Cape Fear River Watershed – the most densely populated river basin in the state. She is working with the U.S. Geological Survey developing a model to highlight nutrient pollution hotspots and evaluate the performance of specific interventions (e.g., wetland restoration, agricultural best management practices) under conditions ranging from droughts to hurricanes. Over the past year, results have been presented at the Annual Meeting of the American Geophysical Union, as well as in webinars attended by >50 TNC scientists and practitioners and >70 stakeholders, many of whom are engaged in ongoing disaster relief, recovery and resilience assessment efforts in North Carolina and other states. Learn more: bit.ly/3kpkgch

→ PLASTIC POLLUTION EMISSIONS WORKING GROUP

With the Plastic Pollution Emissions Working Group, we contributed to new research indicating that even if governments around the world meet their most ambitious global commitments to curb plastic pollution, worldwide annual emissions to rivers, lakes and oceans could be as much as 53 million metric tons by the year 2030. To achieve the global reduction target of less than 8 Mt by 2030 requires a staggering level of effort is enormous: 25 to 40% reduction in plastic waste across all economies, increasing the level of waste management from 6% to 60% in low-income economies and cleanup of 40% of annual plastic emissions. A presentation entitled Plastic Pollution: Emissions and Mitigation Strategies was planned for March 17 but was canceled due to COVID-19. Learn more: bit.ly/3jFaNx7

→ SCISTARTER

We connected with SciStarter to engage informal learners in conservation research. In 2020 we began developing a project that will launch during April 2021 as part of ASU's celebration of Citizen Science Month. "Pollinators Across ASU Campuses" will ask individuals to record and identify pollinators they see on ASU's campuses, using the app iNaturalist. This initiative will provide us valuable data about the prevalence and variety of pollinators present. It will also serve as a proof-of-concept for future projects that will involve formal and informal learners in research establishing species ranges and population densities.

→ SMITHSONIAN TROPICAL RESEARCH INSTITUTE

We have paused Smithsonian Tropical Research Institute (STRI)-ASU research activities due to COVID-19. Before the pandemic, the STRI-ASU Cooperative Research and Education Program provided partial support for graduate students Katie Surrey and Arielle Amrein, who researched the impacts of whale watching on whale behavior in Las Perlas Archipelago, Panama. This research was a collaboration with Hector Guzman from STRI, who served on both graduate students' advising committees and resulted in two peer-reviewed publications, currently in preparation.



Learn about our research at biodiversity.asu.edu/research



Learn about our partnerships at biodiversity.asu.edu/partnerships



For the sixth consecutive year, ASU has been named the most innovative school in the nation, recognizing the university's culture and groundbreaking research and partnerships, as well as its commitment to helping students thrive in college and beyond.

Learn more: asu.edu/rankings

#1 in the U.S. for innovation

ASU ahead of MIT and Stanford

– U.S. News & World Report, 6 years, 2016–2021

Publications and reports

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➔ **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, which 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.

We, along with the Center for Gender Equity in Science and Technology, hosted Nosizo Lukhele, an undergraduate student from Bennington College in Vermont, for a six-week fieldwork experience. Nosizo's assignment during the fieldwork term was to design activities or a program to help female BIPOC students learn about biodiversity conservation through computer science and STEM engagement. Her objective was to identify intersections in thought between centers and their respective fields of study that could inspire a curriculum enabling female BIPOC students to apply STEM thinking to challenges faced by their communities. Nosizo proposed a project using augmented or virtual reality to explore biodiversity in culturally relevant ways that foster leadership, group learning, communication and collaboration. Read her reflection on the experience here: bit.ly/3kt2tAY

➔ **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 2020, we started an incubator program through which to scale the reach and impact of center research and activities. We acted 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. In 2020 we launched Incubators for Plastics and Sustainable Agriculture, both of which have subsequently submitted major funding proposals. We anticipate launching two-three incubators each year, dramatically growing the reach of our center's influence and impact.

➔ **STUDENT ENGAGEMENT**

Since the center was founded in 2014, we have completed 44 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.

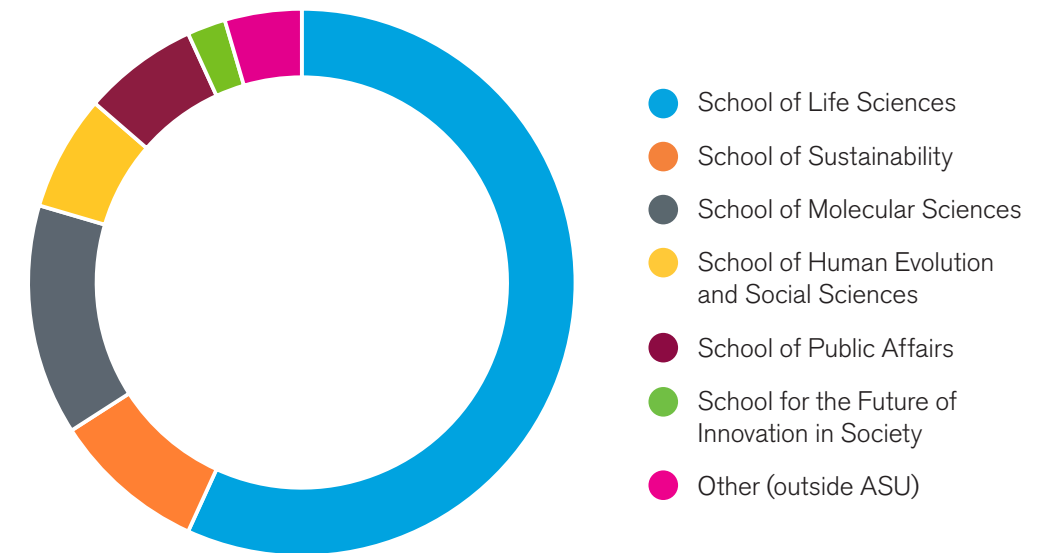


Figure 2. Student workers engagement by school, FY15-FY20

In 2020, 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: bit.ly/2GFmJAH



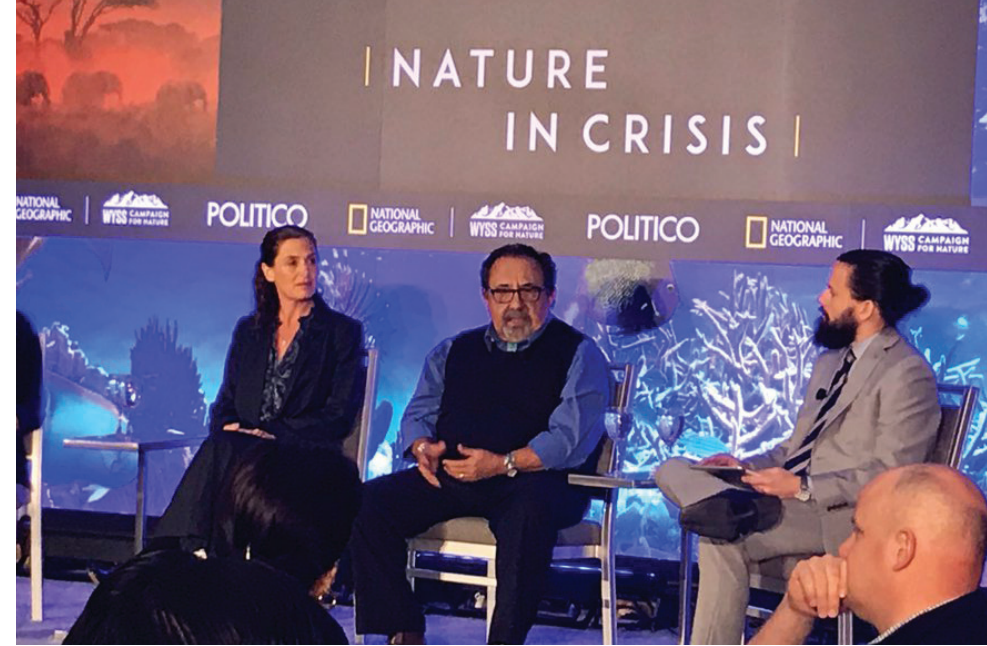
Learn more: biodiversity.asu.edu/education

➔ **COMMUNITY OUTREACH**

We attended the Third Annual OdySea Aquarium Conservation Expo and facilitated hands-on activities designed to teach visitors of all ages how our seafood consumption options affect marine life ecosystems. The interactive activities included a tropical rainforest puzzle, a species-to-habitat matching game and a poster with conservation facts about marine biodiversity and plastic pollution. Our staff engaged hundreds of children and adults in learning about the world's biodiversity crisis and exploring how individual options impact wildlife and natural resources. Learn more: bit.ly/3dfewPQ

We also hosted a table at the annual ASU Open Door community gathering with hands-on activities including a “which fish is which” poster designed to help identify mislabeled seafood, an ocean conservation facts poster board, a jungle-themed large print puzzle for children and a new activity of marine biodiversity Jenga. Monterey Bay Aquarium pocket-size seafood watch guides were handed out to participants, along with other fun participation incentives. Learn more: bit.ly/3iGIY7p

In November 2019, we joined other ASU units to celebrate Homecoming. Conservation students at our booth interacted with families and engaged them in biodiversity conservation-related activities to educate them on its importance. Our volunteers facilitated an activity designed to educate the public on species' habitats by placing animal figurines in their correct environments. Learn more: bit.ly/2GvYN2Y



Learn more: biodiversity.asu.edu/events

Goals and accomplishments

Our FY20 fundraising goal was \$20 million, with a 15% success rate (\$3 million). Of the \$3 million, \$350K would go towards operations. We requested a total of \$5,391,748 of which we secured \$1,383,748. We did not secure funds for operations. At the close of the fiscal year, we had submitted proposals totally \$1,451,124 that were pending decisions by the funding sponsor.

Proposal title	Sponsor	Amount
Incorporating prioritization into endangered species risk assessments and decision-making (PI: Leah Gerber)	Bayer	\$295,323
Integrating social responsibility into global seafood production: Overfishing, human rights abuse and the pathway to ending illegality in global fisheries (PI: Jack Kittinger)	University of Washington	\$118,735
Establishing the foundations for structured decision-making and adaptive spatial management in the Galápagos Marine Reserve (PI: Leah Gerber)	Lenfest Ocean Program (The Pew Charitable Trusts)	\$349,570
Developing decision tools to inform effective biodiversity conservation (PI: Leah Gerber)	Arthur L. and Elaine V. Johnson Foundation	\$193,920
The Amazon Development Entrepreneurial and Learning Alliance (PI: Leah Gerber)	U.S. Agency for International Development	\$425,000
Discretionary donations via the ASU Foundation	Various	\$1,200
	TOTAL	\$1,383,748

Table 1. FY20 grants and donations awarded



Media highlights

EXTERNAL MEDIA

Plastic in seafood. October 29, 2019. Arizona PBS. bit.ly/3iJEdsK

Amazon rainforest fires. August 29, 2019. Arizona PBS. bit.ly/2SxHiSa

The Trump Administration's Changes to the Endangered Species Act Risks Pushing More Species to Extinction. August 14, 2019. Time. bit.ly/3nsChsb

ASU NOW

Preventing the next pandemic. June 17, 2020. bit.ly/3lm3niS

ASU professor secures UN patent for anti-poaching gunshot detection device. April 30, 2020. bit.ly/2SAQ1Tx

To prevent another pandemic, police the wildlife trade, says ASU expert. April 24, 2020. bit.ly/3nt57ZG

ASU ranked top in the US, 5th in world pursuit on UN sustainability goals. April 22, 2020. bit.ly/30JXkwz

Caribbean coral reef decline began in 1950s and '60s from human activities. April 22, 2020. bit.ly/34uZ9yC

Today I learned: How to save the environment. April 21, 2020. bit.ly/33H61tH

Time for a rethink: Why communities need to co-drive conservation. September 25, 2019. bit.ly/3d6cJfR

Tiny little pieces of plastic are getting into everything. September 18, 2019. bit.ly/2GBnWcf

With urban fishing, there's a catch. August 14, 2019. bit.ly/3nvsP7l



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Digital presence

TWITTER

In 2020, we published an average of 24.67 Tweets monthly. We gained 93 new followers and generated 99,752 impressions (the number of times people saw our Tweets), propelling the reach and impact of our conversations. People mentioned us 102 times and we received 1,285 profile visits.

Based on the "2020 Social Media Industry Benchmark Report: Industry benchmarks across the most important social media metrics" by Rival IQ, Twitter engagement has remained consistent for the third consecutive year, with higher education leading the way due to high-frequency posting. The median engagement (liking, commenting and sharing of social media posts) rate across all industries was 0.045%. The engagement rate for higher education was 0.091% and 0.063% for non-profits. Our engagement rate in 2020 was 1.025%. Learn more: bit.ly/3jMwEmr



WEBSITE

Figure 3 provides a snapshot of our website's (biodiversity.asu.edu) activity throughout the years, per Google Analytics. Of the 15,252 people who visited our website in 2020, 88.5% were new users. The number of sessions (site visits) also increased by 31.57% compared to last year, our highest thus far. The average length of sessions was 1:59 minutes.

- FY16
- FY17
- FY18
- FY19
- FY20

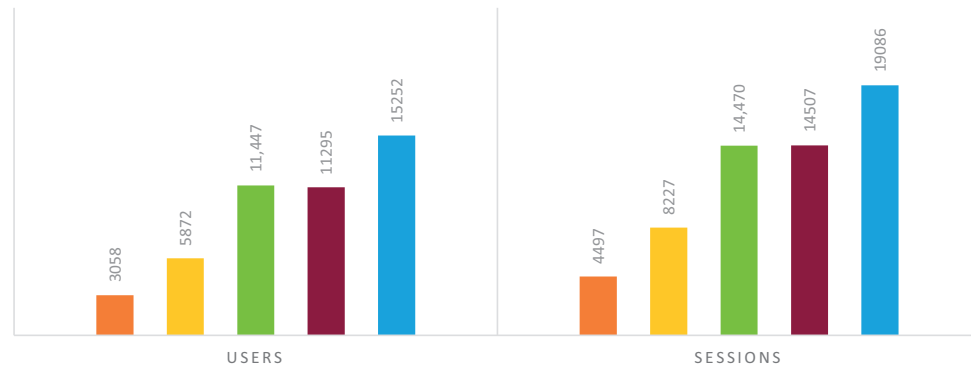


Figure 3. Annual comparison of website traffic (users and sessions), FY16-FY20

The acquisition channels (ways in which visitors arrived at the site) changed slightly in 2020. Organic searches went up 15.2%. This means more people arrived at our site via search engine results that were not ad campaigns, which denotes improved search engine optimization or SEO.

As in previous years, the Introduction to Biodiversity (bit.ly/36LmNJW) segment of our website was the most popular, receiving 18,025 visits. We continue to build upon this section to direct traffic to the rest of our site.

#BackyardBiodiversity

In 2020, we launched the #BackyardBiodiversity social media campaign, inviting our followers and affiliates to submit photographs or videos taken by them depicting the variety of living species around their vicinity. We thank those who participated for sharing such wonderful imagery! Also thanks to our administrative and communications aides (Arielle Amrein and Infynity Hill) for linking interesting facts about each species. Learn more: bit.ly/2HBTX4v



Looking ahead

In our seventh 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, corporations and nations. The challenges to promoting 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 six years of experience behind us, we are excited to meet these challenges. We will focus our activities around three major outcomes for biodiversity: (1) to decrease the number of threats to species, (2) to increase consideration of biodiversity in the private sector and (3) to develop science-based tools to facilitate decision-making that protects Earth's diverse life forms. Figure 4 illustrates how our organizational approaches lead to these outcomes.

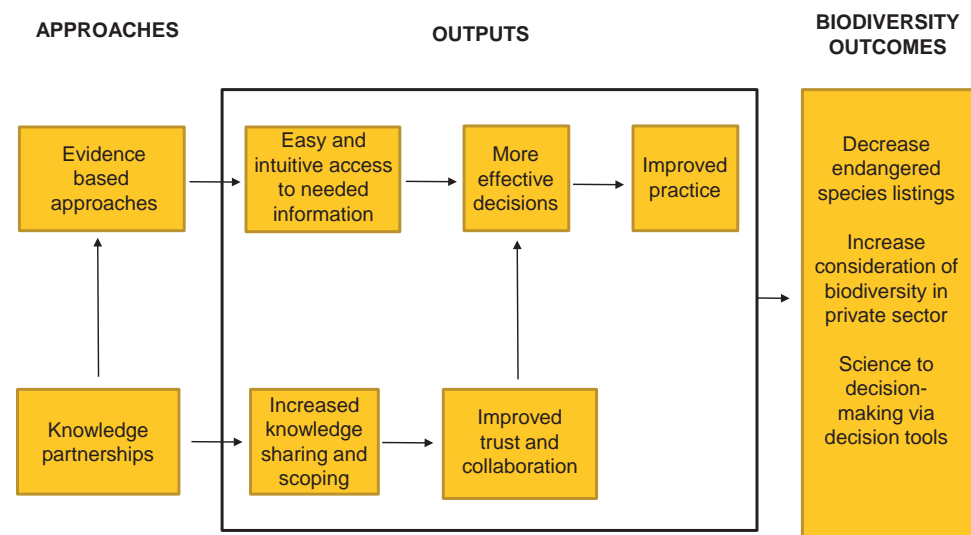


Figure 4. Our theory of change for achieving biodiversity outcomes

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



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2021 goals

Big goal	Metrics
<p>Education and diversity</p> <p>Train the next generation of conservation leaders and increase diversity and inclusion in biodiversity conservation science.</p>	<p>Expand the reach of the Graduate Certificate in Environmental Communication and Leadership by (1) conducting targeted outreach to engage larger cohorts of students and (2) continuing promotion via our media channels.</p> <p>Scope a graduate certificate in Biodiversity Decision Science by (1) developing concept proposals and (2) conducting market research to launch the certificate in FY22.</p> <p>Engage undergraduate students 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>Support research and career development for underrepresented minorities 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>Research</p> <p>Bring biodiversity to the center of the world's decision-making.</p>	<p>Develop decision science and decision-making tools 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 interventions 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>Increase consideration of biodiversity in the private sector 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>

2021 goals

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

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

2021 goals

Big goal	Metrics
<p>Operations</p> <p>Streamline daily functions to support our growth.</p>	<p>Review our governance structure to define and codify roles and responsibilities, titles and terms of service.</p> <p>Complete a recruitment plan and recruit new associate center directors.</p> <p>Establish schedules for meetings, including quarterly team meetings, monthly programmatic meetings and associate center director meetings.</p> <p>Complete all annual mandatory training.</p> <p>Complete annual >16 hours of professional development training.</p> <p>Help align individuals' career goals with the center's strategic goals 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>Encourage employee work-life balance and wellness.</p> <p>Onboard and train new members; assist exiting ones.</p> <p>Streamline internal communications and task tracking 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>Continue performing daily administrative, HR, travel and financial tasks as assigned.</p> <p>Assess and update the essential duties of the operations team due to staff reductions.</p>

Big goal	Metrics
<p>Marketing and communications</p> <p>Enhance our communications and media presence to achieve our strategic goals.</p>	<p>Refine our social media strategy to support our fundraising efforts 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>Launch the Biodiversity Bulletin (e-newsletter), 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>Edit the website quarterly, including annual updates to the partners' list.</p> <p>Develop thought leadership pieces 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 (FY21) goals and metrics

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for joining our efforts to
protect Earth's biodiversity



**The Center for Biodiversity Outcomes is a partnership between the
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