



# **NASA Biological Diversity and Ecological Conservation**

- 2024 Newsletter, October 22, 2024 -

We are excited to share the latest news on our initiatives, success stories, and developments from NASA's Biological Diversity and Ecological Conservation (BDEC) Programs



Dr. Jessica Burnett

**Warmest congratulations to Jessica and our wishes for great success in her new role!**

After two years as Program Coordinator for the BDEC Team, **Dr. Jessica Burnett** will be transitioning to a new role as Program Executive for Earth Science Data Systems at NASA Headquarters. We would like to thank Jessica for her dedication to the BDEC program and to the U.S. conservation community for which she set in motion long-term activities that are already being recognized by key leaders in the U.S Geological Survey, Association of Fish and Wildlife Agencies, U.S. Fish and Wildlife Service, and major professional organizations. All key partners in our vision to expand the use of Earth Observations to inform conservation science, management and policy.

Please join us in congratulating Jessica for her work and for her new path ahead where, undoubtedly, she will make a lasting impact.

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## NEW OPPORTUNITIES

### ROSES24 - A.60 Earth Action: Ecological Conservation

This program is seeking proposals for projects in any area of ecological conservation. Projects should apply Earth observations to improve or develop decision-making activities in ecological conservation and management.

Two proposal types are accepted:

1. **Feasibility Activities:** This Subelement is designed to support projects that are in the early stages of proving application concepts. Preference will be given to innovative activities leveraging one or more NASA instruments that are new or have been underutilized in applications.
2. **Decisional Activities:** This Subelement solicits proposals for activities and products that will achieve operational deployment and sustained use in decision-making by the end user(s) before the end of the award.

Notices of intent are requested by **February 14, 2025**, and proposals are due **March 14, 2025**. Virtual meetings for potential proposers will occur Friday, **November 15th** (1-3 PM Eastern Time) and Monday, **January 13th** (1-3 PM Eastern Time).

[Click Here for more information and proposal submission](#)

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**Attention PhD students and postdocs!**

Dr. Carlos Botero, Associate Professor in the Department of Integrative Biology at UT Austin, recently received an NSF Organismal Response to Climate Change award. This award will support the incorporation of what has been learned in the last two decades about the role of behavior in adaptation into a new generation of species distribution models for North American avifauna.

There is a new position opening to support his work. The project will involve some comparative and modeling work related to exploring the role of behavioral flexibility in ecological and evolutionary processes.

For further information or to express interest in the position, reach out to [carlos.botero@austin.utexas.edu](mailto:carlos.botero@austin.utexas.edu)

[Read about the NSF Award](#)

[Check out The Botero Lab](#)

## UPCOMING EVENTS



**PACE**

**REGISTRATION OPEN!**

**APPLICATIONS WORKSHOP**

**December 8, 2024**  
The Westin Washington, D.C. City Center  
1400 M St NW, Washington, DC 20005  
In person, 9am-5pm

*Held the Sunday prior to the 2024 AGU Fall Meeting in Washington DC.*

[pace.gsfc.nasa.gov](http://pace.gsfc.nasa.gov) 

The poster features a satellite in orbit over Earth, with a colorful rainbow-like arc across the globe. The text is white and yellow on a dark blue background.

# PACE Workshop

December 8<sup>th</sup>, 2024, 9am-5pm, Washington DC

## [PACE Applications Workshop: Putting PACE data to work across the Earth System.](#)

Free, in person, informative and interactive workshop held the Sunday before the 2024 Fall AGU Meeting in Washington DC. Workshop content and attendance will be cross-disciplinary, spanning atmospheric, terrestrial, and aquatic science & applications. Please visit the workshop webpage for agenda, details, and [registration information.](#)

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## Catch up with Biodiversity and Ecological Conservation at an upcoming conference/meeting!

Conference or Meeting Name	Dates	Links
<u><a href="#">Wildlife Society Meeting</a></u>	October 20, 2024	Plenary presentation: <u><a href="https://wildlife.org/">https://wildlife.org/</a></u>  Plenary information: <u><a href="https://twskonference.org/">https://twskonference.org/</a></u>
<u><a href="#">Entomology conference</a></u>	November 10-13, 2024	Conference information: <u><a href="#">Entomology 2024   Entomological Society of America (entsoc.org)</a></u>
<u><a href="#">American Geophysical Union (AGU) Fall Meeting</a></u>	December 9-13, 2024	Meeting information: <u><a href="https://www.agu.org/annual-meeting">https://www.agu.org/annual-meeting</a></u>





Emmett Culhane, PhD candidate in the Marine Predator Group at Woods Hole Oceanographic Institution helped Jessica and Nima Farchadi, Guest Investigator & Postdoc at Woods Hole Oceanographic Institution, out at the NASA booth at the 154th American Fisheries Society Annual Meeting.

## **Spotlight: 154th Annual Meeting of the American Fisheries Society, September 15-19, 2024**

NASA, NOAA, FWS, and USGS hosted one oral session and one "innovate" session, wherein participants discussed innovations in applying remote sensing data and technology to support fisheries and fish habitat. Dr. Jodi Brandt, NASA BDEC PI, presented their work on beavers: using NASA data to support monitoring and evaluation after beaver rewilding.

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# Upcoming ARSET trainings

## ARSET Training

## Dates

ARSET - Earth Observations of Blue Carbon Ecosystems

October 28-30, 2024

ARSET - An Introduction to Synthetic Aperture Radar (SAR) and Its Applications

November 6-20, 2024

ARSET - Methane Observations for Large Emission Event Detection and Monitoring

November 19-21, 2024

ARSET - Earth Observations of Blue Carbon Ecosystems

December 03, 2024 -  
December 05, 2024

[Take me to all ARSET Trainings](#)

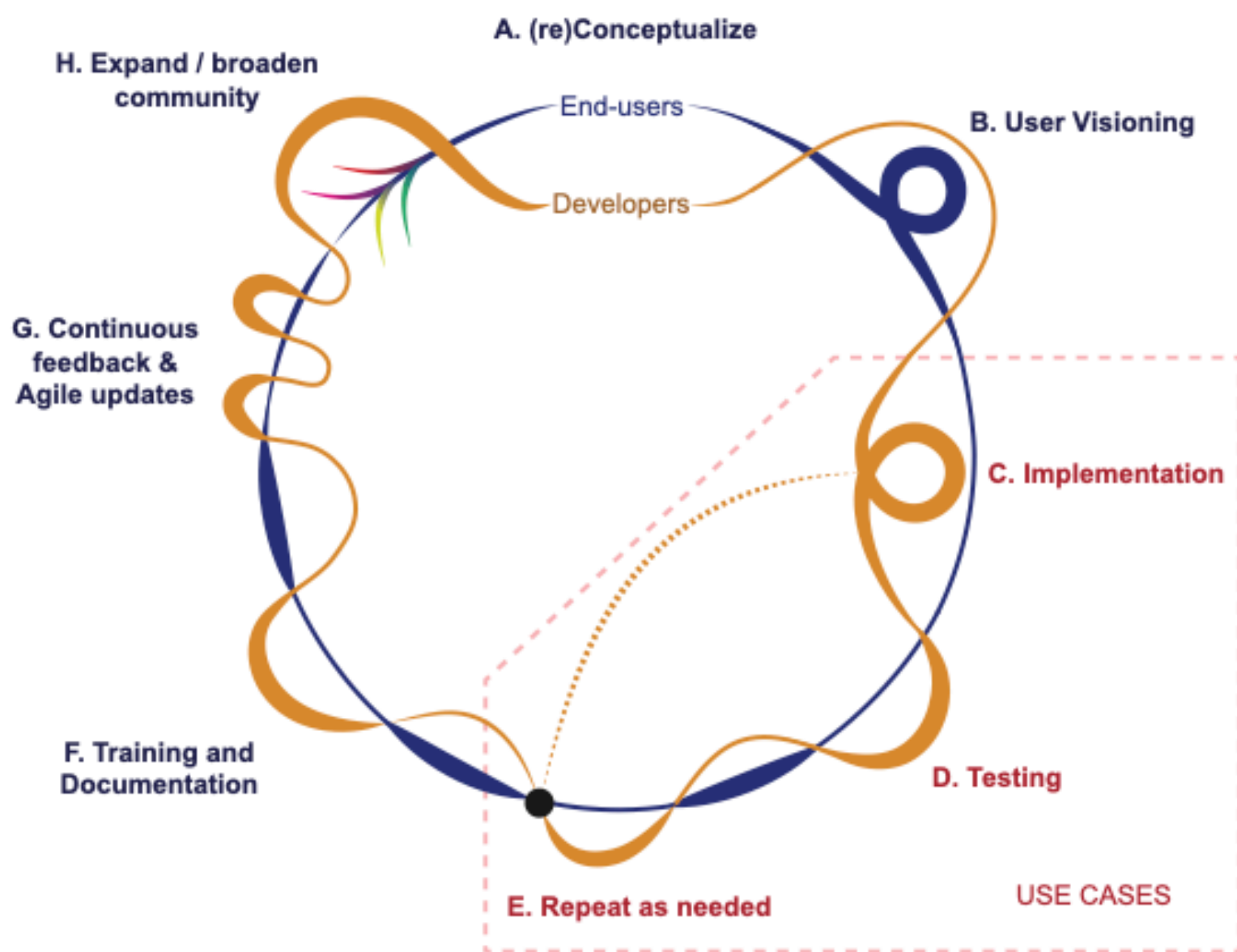
## PUBLICATION HIGHLIGHTS

**Just released! Software codesign between end users and developers to enhance utility for biodiversity conservation**



End User Consultation and Testing Workshop, Bogotá, Colombia, 2019





Steps in our flexible implementation of the core steps of agile software development to achieve codesign of extensions of Wallace EcoMod and BioModelos for biodiversity conservation users. Software developers (the orange line) and end users (the blue line) iteratively interact (see the line intersections) and engage more intensely (see the loops) or exchange leadership of engagements (the thicker lines) during the process, showing more flexibility in how and when end users are engaged than in typical agile frameworks.

What changes when end-users are involved from day 1 in software development? In this paper, led by Dr. Mary Blair, the authors highlight how NASA-funded projects were able to support intensive collaboration between end-users, scientists, and developers in a way that led to innovative tools to drive critical decision-making for biodiversity. They detail an example collaboration with the Biodiversity Observation Network of Colombia, for which they leveraged and modified common paradigms of software production, including codesign and agile development, to facilitate collaboration through all stages (including conceptualization, development, testing, and feedback) to ensure the accessibility and applicability of new tools that leverage Earth Observations to inform decision-making for biodiversity conservation. Dr. Mary Blair is Director of Biodiversity Informatics Research at the Center for Biodiversity and Conservation at the American Museum of Natural History

[Read Publication Here](#)

**Divergent seed dispersal outcomes: Interactions between seed, disperser, and forest traits**



In this publication, graduate student at the University of Queensland, Bastien Dehaut, focuses on the seed dispersal pathways provided by different species of duikers in the Dja Faunal Reserve. Bastien and other authors found that duikers can both defecate and regurgitate seeds and that this is determined by seed traits. Depending on the pathway, they found that seeds can be dispersed in different proportions between different forest types. This project used both indigenous Baka knowledge and drone lidar technology. The publication highlights that, when used in conjunction with science and technology, indigenous locals can provide complementary on-the-ground data and foster partnership.

[Read Full Paper Here](#)

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**Toward the quantification of the climate co-benefits of invasive mammal eradication on islands: a scalable framework for restoration monitoring**





The non-for-profit organization, Island Conservation, has developed a consistent and scalable framework for long-term monitoring of tree cover, forest extent, forest carbon, and vegetation productivity across 1,078 islands in 17 ecoregions. Analysis of 36 years of satellite-derived NASA Earth observation data revealed significant and sustained positive trends in all indices on islands where eradication efforts were implemented. David Will, Director of Impact and Innovation for Island Conservation is leading research to use NASA Earth Observations to understand and maximize holistic ecosystem benefits from invasive mammal eradications on islands.

***“This is the first time that the collective climate benefits of locally-led island restoration efforts have been documented, showing the powerful potential for these actions to act as a natural climate solution,” said David Will, Director of Impact and Innovation for Island Conservation and lead researcher. “It highlights the significant, and yet overlooked, role that invasive mammal removal plays in protecting and restoring carbon stocks of native woody vegetation that exist nowhere else in the world.”***

[Read Full Paper Here](#)



## Using imaging spectroscopy to assess the impacts of invasive plants on aboveground and belowground characteristics

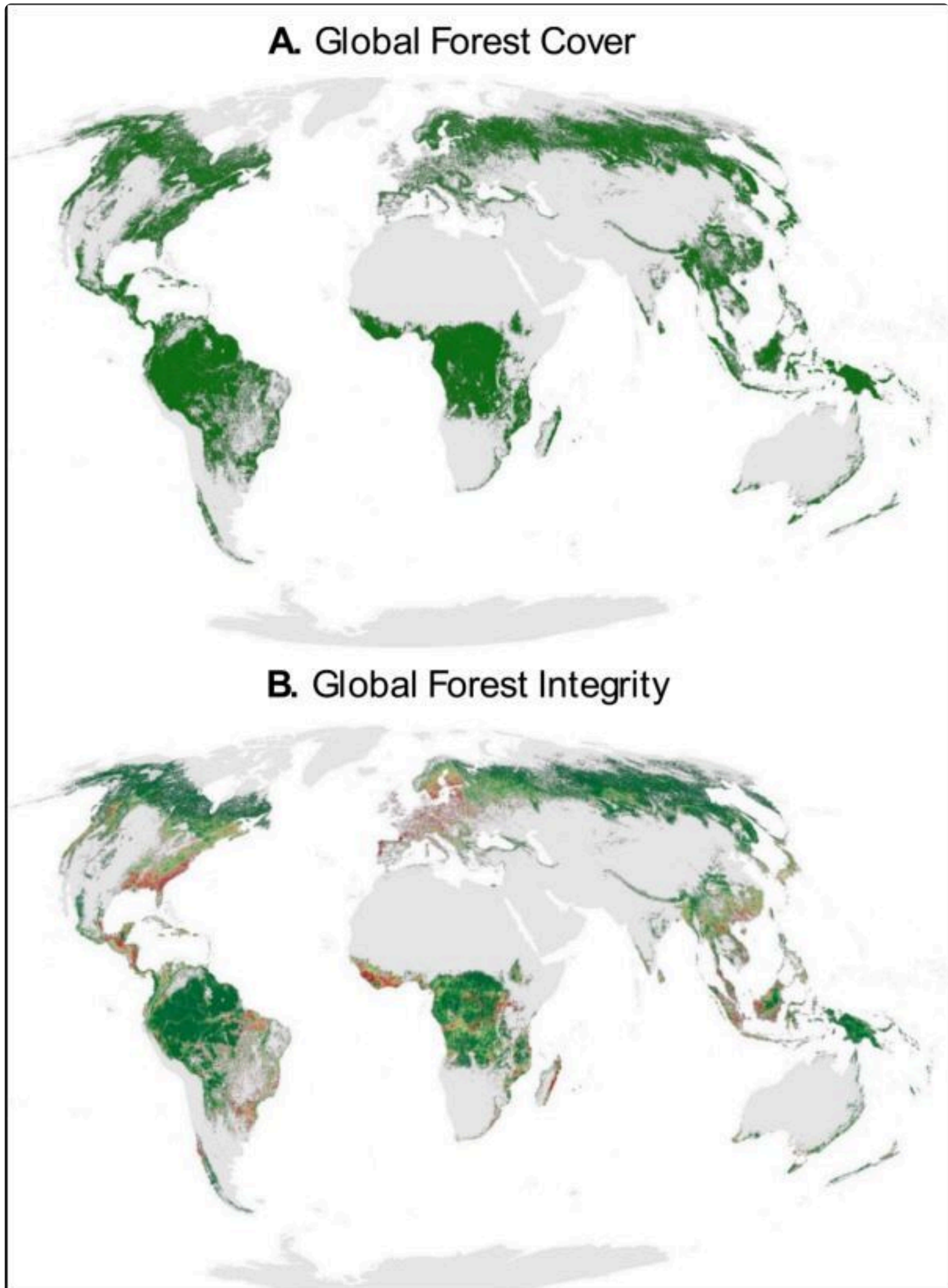


Quantifying the impacts of biological invasions on ecosystems is usually challenging, primarily due to inconsistencies in sampling methods and the context-dependency of the impacts of biological invasions on various ecosystems. This publication led by NASA FINESST grant recipient, Ny Aina Rakotoarivony, showed that we can use remote sensing, specifically imaging spectroscopy, to assess the impacts of invasive plants on aboveground characteristics, including plant nitrogen, phosphorus, potassium, and biomass, and belowground characteristics, including soil carbon and nitrogen. The paper serves as a showcase of how combining remote sensing data, in situ observations, and statistical analyses can advance the study of biological invasions and their ecological impacts across large spatial domains. Moreover, the study has important implications for the management of invasive species through providing a cost-effective remote sensing approach to study invasive plants at large scales, especially when assessing the impacts of invasive plants using traditional fieldwork can be time-consuming and expensive. Ny Aina Rakotoarivony is a Ph.D. candidate working with Dr. Hamed Gholizadeh in the Department of Geography at Oklahoma State University.

[Read Full Paper Here](#)

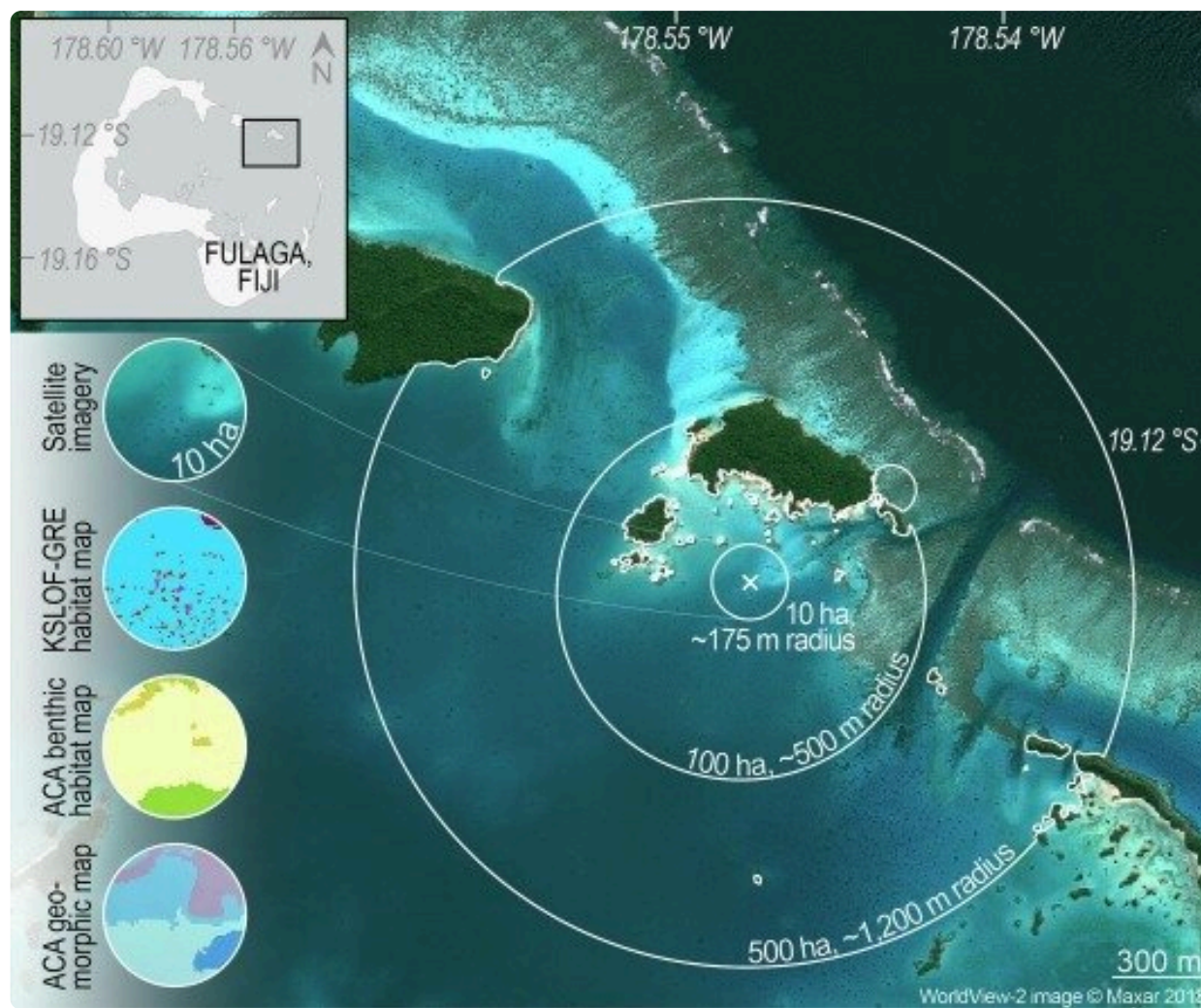


**The Kunming-Montreal Global Biodiversity Framework needs headline indicators that can actually monitor forest integrity**



This recent perspective in Environmental Research Ecology makes the point that the Global Biodiversity Framework (GBF) needs to consider advancing use of forest structure and integrity, rather than just forest cover, in its Framework headline indicators. Analyses were facilitated by Gridded GEDI Vegetation Structure Metrics at Multiple Resolutions (Burns, Hakkenberg, Goez).

## Remotely sensed habitat diversity predicts species diversity on coral reefs



Measuring the biodiversity of coral reefs using divers is expensive and inefficient. A remote sensing solution to making this measurement would speed the pathway to understanding (and therefore conserving) the most biodiverse marine ecosystem on Earth. This publication leverages the "habitat heterogeneity hypothesis," which contends that the biodiversity of organisms is directly linked to the diversity of habitats which they occupy. Using a global database of coral reef maps which the authors have created, it demonstrates how the HHH can be used to audit the diversity of reef fish and corals. The results suggest that satellite maps can be used as a surrogate for species biodiversity. Anna Bakker, lead author, won the "Millero Prize" for best student publication at the Rosenstiel School - University of Miami. Anna Bakker is a Ph.D. student in Dr. Sam Purkis' Remote Sensing Lab at the University of Miami's Rosenstiel School of Marine, Atmospheric, and Earth Science.

[Read Full Paper Here](#)

## Using multiscale lidar to determine variation in canopy structure from African Forest Elephant Trails

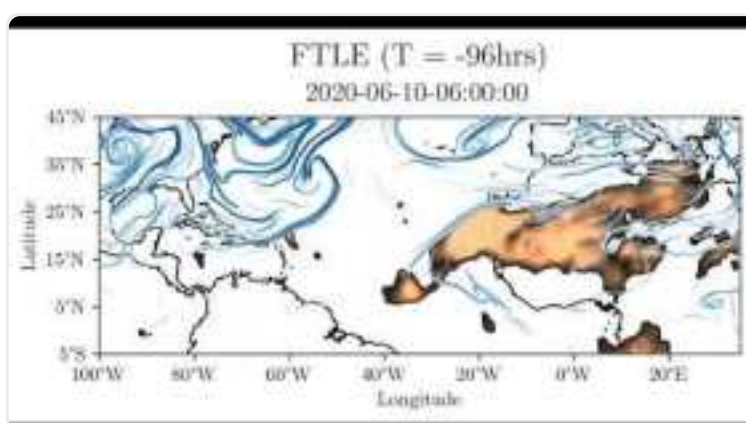




NASA FINESST grant recipient, Jenna Keany is lead author in a first of its kind paper to use different scales of lidar to study African forest elephant trails, and the structural impact of those trails on the surrounding forest. Using two NASA airborne lidar datasets from Lope National Park, Gabon, Jenna and team were able to determine that forest elephants are ecosystem engineers, impacting not only understory vegetation but canopy height and vertical structure as a whole. Jenna Keany is a PhD Graduate at Northern Arizona University.

[Take me to the African Forest Elephant Trails](#)

## Atmospheric transport structures shaping the “Godzilla” dust plume



### Backward FTLE (T = 96 hours) and OMPS aerosol index data during 'Godzilla' dust event

Backward FTLE (T = 96 hours) and OMPS aerosol index data during 'Godzilla' dust event

 YouTube Video

Using a new set of tools for uncovering atmospheric dynamics, this study identifies important "Lagrangian coherent structures" which influence and bound this historic continent-sized trans-Atlantic dust cloud, revealing novel insights into general plume evolution. This paper was led by Albert Jarvis, PhD student in Engineering Mechanics at Virginia Tech and is part of the work led by Dr. Hosein Foroutan and Dr. Shane Ross on Multiscale Investigation of Microbial Biodiversity in Trans-Atlantic Dust Plumes funded by NASA's Biological Diversity Program.

[Access Full Publication Here](#)

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## Other Recent Publications

- Sundquist, S., Lutz, D., Foster, A., Fulé, P., Goetz, S. (2024). **Integrating remotely sensed imagery in a forest gap model to study North American boreal forests in a changing world.** *Environmental Research: Ecology*, 3(4). <https://doi.org/10.1088/2752-664X/ad7d94>
- Tonelli, B. A., Youngflesh, C., Cox, T., Neate-Clegg, M. H. C., Cohen, E. B., Tingley, M. W. (2024). **Spatial Nonstationarity in Phenological Responses of Nearctic Birds to Climate Variability.** *Ecological Letters*, 27(10). <https://doi.org/10.1111/ele.14526>
- Russo, N., Nshom, D., Ferraz, A., Barbier, N., Wikelski, M., Noonan, M., Ordway, E., Saatchi, S., Smith, T. (2024). **Three-dimensional vegetation structure drives patterns of seed dispersal by African hornbills.** Authorea. [10.22541/au.172115227.74173101/v1](https://doi.org/10.22541/au.172115227.74173101/v1)
- Rossi, C., McMillan, N. A., Schweizer, J.M., Gholizadeh, H., Groen, M., Ioannidis, N., Hauser, L. T. (2024). **Parcel level temporal variance of remotely sensed spectral reflectance predicts plant diversity.** *Environmental Research Letters*, 19(7). <https://doi.org/10.1088/1748-9326/ad545a>
- John, C., Avgar, T., Rittger, K., Smith, J. A., Stephenson, L. W., Stephenson, T. R., & Post, E. (2024). **Pursuit and escape drive fine-scale movement variation during migration in a temperate alpine ungulate.** *Scientific Reports*, 14(1). <https://doi.org/10.1038/s41598-024-65948-8>
- Quinn, C. A., Burns, P., Jantz, P., Salas, L., Goetz, S. J., & Clark, M. L. (2024). **Soundscape mapping: Understanding Regional Spatial and temporal patterns of soundscapes incorporating remotely-sensed predictors and wildfire disturbance.** *Environmental Research: Ecology*, 3(2), 025002. <https://doi.org/10.1088/2752-664x/ad4bec>

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**BDEC TEAM MEMBER HIGHLIGHTS**



## NASA BDEC, UNESCO, the University of Wisconsin support Simcelile Chenge to study in Madison as part of NASA's BioSCape Campaign



Simcelile Chenge, a PhD candidate at the University of Cape Town, studies three major plant lineages in the BioSCape Domain (Restionaceae, Ericaceae and Proteaceae). He is exploring seasonal variation in leaf reflectance spectra in representative species of the three families, and how this may affect our ability to map these lineages with imaging spectroscopy. In the Restionaceae he is also exploring the relationships between culm (akin to leaf) and canopy reflectance spectra, and the hydrological niche preferences of these plants. Chenge's work aims to address a key gap in that BioSCape was a once-off set of flights in the Austral spring, and thus cannot address questions around seasonality. He is spent the summer in the lab of BioSCape scientist, Prof Phil Townsend, at the University of Wisconsin, Madison, USA. This visit is made possible through funding from NASA BDEC, UNESCO, and the University of Wisconsin and is a testament to the potential impact of Chenge's work. The primary objective of this visit is to equip Chenge with new methodologies for measuring and analyzing plant traits using field and imaging spectroscopy. These techniques provide detailed insights into plant characteristics, enhancing our understanding of plant lineages in the BioSCape domain and their environmental interactions.

## From Poop to Protection - Project Team Awarded the Golden Goose Award



### 2024 Golden Goose Award Documentary Short Film

2024 Golden Goose Award Documentary Short Film

 YouTube Video



Christian Che-Castaldo, Heather Joan Lynch, and Mathew Schwaller were awarded the 2024 Golden Goose Award for their work on tracking penguin populations using the bright pink poop appearing on satellite imagery. Their innovative ideas and work have led to the discovery of 1.5 million previously undocumented Adélie penguins with their eyes set on more prospective discoveries.

*“We’re far from a point where satellites are going to make field work irrelevant. Instead, it has made fieldwork more efficient. We can plan expeditions to target colonies of high interest, and satellites have made expeditions much safer because we know so much more about what to expect. There is a nice synergy between satellite-based surveys and field surveys that I expect will be the status quo for a long time.” - Heather Joan Lynch*

[Read About the Team's Journey of Discovery](#)

## PI-LED TRAININGS/CONFERENCES SPOTLIGHT



**Introduction to GIS and Animal Population Monitoring Workshop**



From 16-20 September 2024, the Smithsonian National Zoo & Conservation Biology Institute led a 5-day workshop focused on building analytical capacity amongst Kenya partners. The course, supported by NASA's Ecological Conservation Program, was attended by 25 participants from organizations based in the Masai Mara Ecosystem.

Demand was high with 86 applicants to the course that offered an introduction to R, data management/wrangling, basic GIS and remote sensing, and regression analyses. For many of the 25 group of students that joined the course R was completely new to them, and it was common to see the students working through the lectures until 10-11 pm at night. Initial results from a post-course survey showed a marked increase in the level of comfort with using R and interest in continued use as part of future job activities.

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***"This course has given me an appreciation for all things possible with R. It has really opened my mind to different ways to analyze and display data. My favorite part was learning about how interactive maps can be utilized to satisfy all partners on data collected in their project area of interest. I am excited to see how the capacity built in this ecosystem will transpire to shared high-quality data analysis in the future." –Post-course Survey Response - anonymous***

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Dr. Jared Stabach, Research Ecologist at the Smithsonian Conservation Biology Institute's Conservation Ecology Center is leading a project to develop a toolbox using Earth observation data to help conservancy managers accurately assess large-herbivore abundance and understand spatial and temporal dynamics across the landscape in Kenya. With this new tool conservancy managers, who currently lack the scientific expertise to integrate field-based biodiversity monitoring efforts with remotely sensed data, as well as communication and data sharing across conservancy boundaries, would be able to evaluate the effect that different management scenarios (e.g., livestock density) or environmental conditions (i.e., vegetation and water variability) will have on trends in wild herbivore abundance.

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Decision support tool feedback workshop at the Scientific Committee on Antarctic Research Open Science Conference in August 2024

## Scientific Committee on Antarctic Research Open Science Conference

Dr. Alice DuVivier, project scientist at NCAR's Climate & Global Dynamics Lab, is leading research to provide information about the conservation value of polynyas in different Antarctic regions over policy relevant timescales. As part of the project, Alice and her team are developing a web-based tool to socialize the science with educational storytelling about polynyas to three audiences: the general public, policymakers and scientists. Recently, the team led a decision support tool feedback workshop at the Scientific Committee on Antarctic Research Open Science Conference in August 2024. Attendees included science-policy interface experts and scientists from South America, Europe, and North America. The attendees were highly engaged and provided targeted feedback about how usable the tool was and what needed to be expanded. The team is now in its final year of the project and can use this feedback to make the DST more usable.

### *Quote from workshop:*

***"It's a great tool and will be better with small changes" - Camilia Neder, Argentinian Scientist***

Alice also highlights a quote from Symposium on co-producing knowledge at the Antarctic science-policy interface in a complex world (although not from the team's workshop, it's relevant):

***"Emotion is important. If we as policy makers - and as a society as a whole - do not understand, do not sense, do not feel what you are***



*“talking about, what the impact is and what the dangers are if we don’t make decisions for conservation, then we don’t take that into the negotiations.” - Stephanie Langrock, CCAMLR Commissioner for Belgium*

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MBON All-Hands Workshop in New Orleans, Louisiana, March 18-22, 2024

### **MBON All-Hands Workshop & Leadership of Marine Life 2030**

Earlier this year, the Marine Biodiversity Observation Network (MBON; <https://marinebon.org/>) hosted the annual MBON All-Hands Workshop in New Orleans, Louisiana, March 18-22, 2024.

The MBON is an open community of practice in which all can participate, contribute, and from which all can benefit. The goal of the meeting was to strengthen collaborations among the MBON projects and stakeholders in local and national government agencies. We discussed how the MBON can identify gaps in information and human capacity, support applications using biodiversity and ecosystem observations, and how to develop better products for resource management. An important focus was advancing data management strategies to support user needs. We were honored to have participants from the US and international offices of OBIS, GBIF, and FishBase in the meeting, among others.

MBON continues to make significant progress through a series of Working Groups and its leadership of the Marine Life 2030 Programme (<https://marinelife2030.org/>) of the UN Decade of Ocean Science for Sustainable

Development, and the close collaboration with the MBON Secretariat led from the AIR Centre in the Azores (Portugal) and strong collaborations with the GEO BON, the Global Ocean Observing System (GOOS), OBIS, GBIF, and other partners around the world.

MBON participated in the 2024 UN Ocean Decade Conference held in Barcelona, Spain from April 10–12, 2024. MBON helped lead the development on a white paper on biodiversity and ecosystem conservation, restoration and protection. The paper was discussed in an open forum at the Conference and a final draft was delivered May 12 to the UN for publication as a Technical Report of the UNESCO Intergovernmental Oceanographic Commission.

[Read Whitepaper Here](#)

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## NASA Earth Science Research Results Portal

The NASA Earth Science Research Results Portal is an internal database designed to make it easier for NASA Headquarters Leadership to find, communicate, and promote YOUR accomplishments. NASA funded investigators are encouraged to submit publications, impact stories, photos of field work, scientific visualizations and or other products that demonstrate how important NASA's unique perspective is for understanding Earth systems. Please direct questions to Megan McGroddy, [megan.e.mcgroddy@nasa.gov](mailto:megan.e.mcgroddy@nasa.gov).

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## Contribute Content for an Upcoming Newsletter!

Thank you for sharing your highlights, news and publications with us! If you're part of a NASA-funded project (including students), we welcome your news, project updates, or announcements regarding published or forthcoming papers, reports, media, software, or events.



NASA's Biological Diversity & Ecological Conservation Program Managers:  
**Keith Gaddis and Woody Turner**

Learn more about NASA's Biological Diversity & Ecological Conservation Program



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