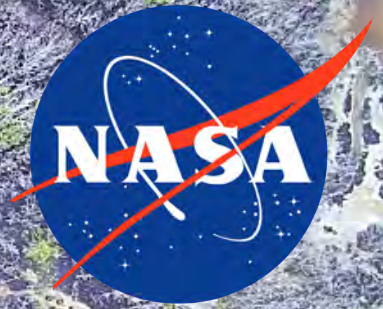


SPRING 2021

BIODIVERSITY & ECOLOGICAL FORECASTING



Funding Opportunities: NASA ROSES 2021

Research Opportunities in Space and Earth Sciences 2021

The 2021 NASA ROSES announcement was released February 12, and contains a solicitation for the Biodiversity program element:

A.7 BIODIVERSITY: MARINE, FRESHWATER, AND TERRESTRIAL BIODIVERSITY SURVEY OF THE CAPE (BIOSCAPE) AIRBORNE CAMPAIGN SCIENCE TEAM

BioSCape seeks proposals to form a science team, led by Drs. Adam Wilson and Erin Hestir, which will engage in six-week science flights aboard NASA aircraft over the Greater Cape Floristic Region (GCFR) of South Africa in late 2023. The **three research themes** for the BioSCape campaign are:

- a. the distribution and abundance of biodiversity in the GCFR,
- b. the role of biodiversity in ecosystem functions within the GCFR, and
- c. the feedbacks between global change, biodiversity change, and ecosystem services in the GCFR.

Sample research objectives are listed on page 7 of the Scoping Proposal. Proposals must combine information from at least one of the NASA airborne sensors (PRISM, AVIRIS-NG, HyTES, and LVIS) with in-situ biodiversity observations.

NOIs are due 7/16/2021. Full proposals are due 8/17/2021.

Other ROSES-21 calls that may be of interest to our community are Land Cover & Land Use Change, Health & Air Quality, and SERVIR. Please stay tuned for upcoming Ecological Forecasting and Terrestrial Ecology calls.

Save the Date: Team Meeting

The NASA BEF Team Meeting is scheduled for October 19-21, 2021, hopefully in person in the Washington, DC area. It will be followed by the MBON meeting on October 22.

Stay tuned for registration information.

Updates Reminder

Please send us manuscripts that have been accepted to journals, preferably after acceptance and well before appearance online or in print.

Additionally, let us know of any awards or recognitions received from your institution or community for your or your team's research.

These updates help us advertise our program to the public, administration, and our community.





Keith Gaddis, Ph.D.

Keith Gaddis Becomes a NASA Civil Servant

We are thrilled to congratulate Keith Gaddis on becoming a NASA civil servant. In his new role, Keith will be splitting cross-program management responsibilities with Woody Turner as both a Program Scientist for the NASA Biological Diversity Program and a Program Manager for the NASA Ecological Forecasting Program. Keith previously served as the Deputy Program Scientist for BD&EF.

Keith completed his Ph.D. at UCLA in the Department of Ecology & Evolutionary Biology. His work used remote sensing and genetics data to answer questions about the effects of environmental disturbances on natural history and future population viability.

He came to NASA as an AAAS Science and Technology Policy Fellow, in which he consulted on topics related to biology, specifically in his areas of expertise in combining ecological, genetic, and evolutionary data to answer new questions. He also managed several inter-agency collaborations between NASA and the WWF, USGS, and EPA, among others, and worked on improving the panel review process. In 2020, Keith received NASA's Early Career Public Achievement Medal.

UN Adopts New System of Natural Capital Accounting

In March 2021, the 52nd session of the United Nations Statistical Commission adopted the System of Environmental-Economic Accounting (SEEA) for ecosystem accounting (EA). SEEA EA provides a new way to organize data on ecosystem changes, and will emphasize ecosystem services, which consist of the benefits the natural world provides, such as clean air and water. These services have historically been difficult to quantify, but the framework will use statistics and biophysical data to bring them into the calculations when we balance the benefits of conservation with its costs.

In the words of UN Chief Economist Elliott Harris, "This is a singularly important new development that will have a major impact. It can and it will be a game changer for the way we make policy, and it will deeply affect how we think about and tackle climate change and biodiversity."

The system was developed by Daniel Juhn's team at Conservation International, which encompasses the use of satellite imagery with field observations to guide conservation efforts. Concurrently, the CI team is working on an ecosystem condition account using Earth Observations and field data to support the conservation province of West Papua, Indonesia.



Chief Economist Elliott Harris introduces SEEA at a UN virtual press conference.

Upcoming Conferences

Ecological Society of America Annual Meeting,
August 2-6, 2021 | Virtual

International Union for the Conservation of
Nature World Conservation Congress,
September 3-11 2021 | Marseille, France

World Health Organization Global Conference
on Health & Climate Change,
November 6-7, 2021 | Glasgow, UK

International Congress for Conservation
Biology, December 12-16, 2021 | Kigali, Rwanda

American Geophysical Union Fall Meeting,
December 13-17, 2021 | New Orleans, Louisiana
& Online

Available Trainings

ARSET Trainings:

Introduction to Population Grids and
their Integration with Remote Sensing
Data for Sustainable Development and
Disaster Management
March 30 & April 6, 2021

Satellite Observations and Tools for Fire
Risk, Detection, and Analysis
May 11, 2021

DEVELOP Fall 2021

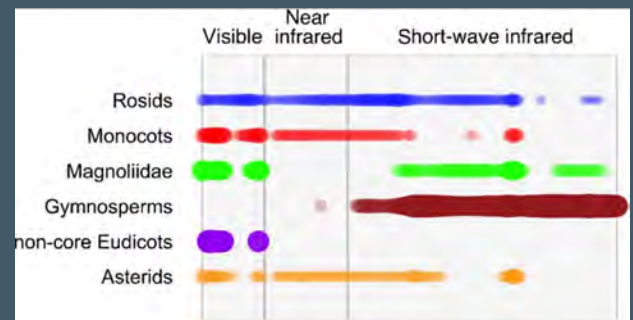
NASA DEVELOP uses Earth Observing
data in interdisciplinary research
projects aimed at addressing
environmental and public policy issues.
Currently enrolled students, recent
graduates, and early or transitioning
career professionals are eligible to
apply.

Research Briefs

LEAF REFLECTANCE SPECTRA CAPTURE THE EVOLUTIONARY HISTORY OF SEED PLANTS

José Eduardo Meireles et al. investigated the correlation between plant species' evolutionary relationships and the spectra of visible light they reflect. The differences in species' spectra are caused by variances in particular genetic traits, which cause the plants to produce chemical compounds that reflect different patterns of light. The authors tested whether 544 species of American and European seed plants could be classified into their known evolutionary relationships on the basis of their spectra, and found that this was possible for broad groups, orders, and families.

This allows future studies to **use remotely sensed spectral data to classify plant lineages and relationships**, supporting assessments of biodiversity.



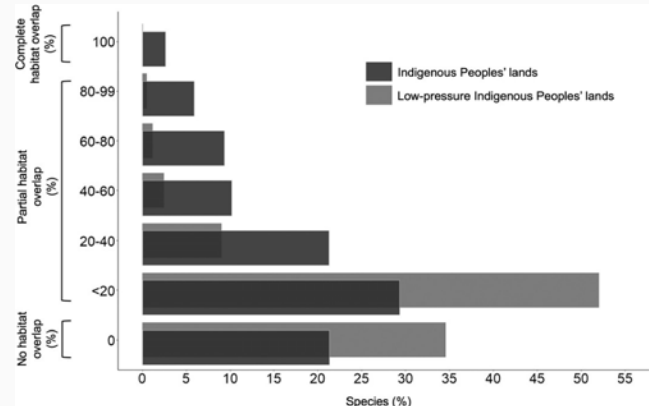
Correlation of phylogeny and reflectance spectra for major seed plant lineages, with larger diameter circles meaning higher correlation.

Research Briefs

THE IMPORTANCE OF INDIGENOUS PEOPLES' LANDS FOR THE CONSERVATION OF TERRESTRIAL MAMMALS

Christopher J. O'Bryan et al. assessed the overlap between mapped Indigenous Peoples' lands, which make up a quarter of Earth's surface, and the mapped habitats of IUCN's comprehensively assessed list of terrestrial mammals (4460 species). Using the most recent global human footprint map to evaluate human impacts, a large proportion of Indigenous lands were found to have low levels of human pressure, and offer refuges to wildlife across the world.

60.4% of all assessed species had at least 10% of their habitat on Indigenous lands, with 22.6% having over 50%, marking these lands as critical to conservation efforts. These results underline the necessity of partnerships with Indigenous Peoples to increase knowledge and maintain biodiversity.

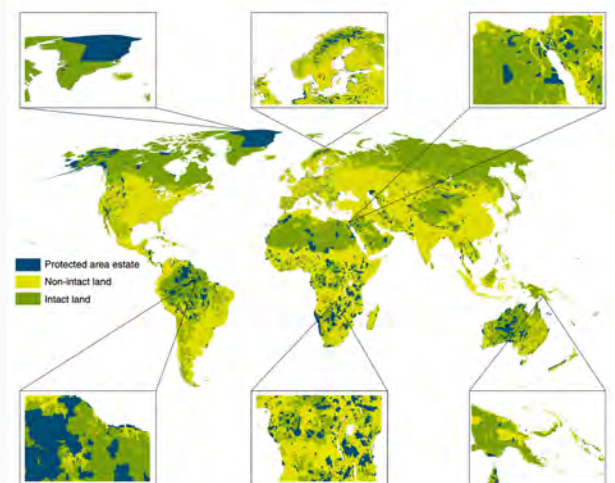


Percentage of species with low, partial, and complete habitat overlap with Indigenous (black) and low-pressure Indigenous (gray) lands.

JUST TEN PERCENT OF THE GLOBAL TERRESTRIAL PROTECTED AREA NETWORK IS STRUCTURALLY CONNECTED VIA INTACT LAND

Michelle Ward et al. used the 2009 global human footprint map to quantify connectivity between protected areas of land around the globe. Pathways visible at a 1 km² scale free of human pressure that connect protected areas of at least 10 km² were counted for this effort.

The study found that **only 9.7% of protected land worldwide is structurally connected, with a median connectivity of 0%.** Only nine countries have over 17% of their land protected and maintain over 50% connectivity; this may be due to more human-modified countries establishing many small protected areas surrounded by human-impacted land, rather than large contiguous areas. These results underscore the lack of connectivity as a focus for protected area management.



Map of protected areas (blue), non-intact land (yellow), and intact land (green), illustrating higher connectivity in intact areas.



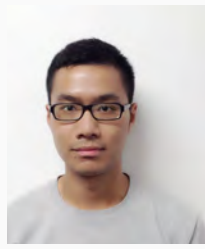
Researcher Profiles



Dr. Stephanie Dutkiewicz

SENIOR RESEARCH SCIENTIST,
MASSACHUSETTS INSTITUTE
OF TECHNOLOGY

Stephanie Dutkiewicz is a Senior Research Scientist at MIT in Earth, Atmospheric, and Planetary Sciences. She is affiliated with the MIT Center for Global Change Science, which takes an interdisciplinary approach to climate science, and the Darwin Project, which brings together ocean science fields to model marine microbes and their communities. Dr. Dutkiewicz develops and uses models guided by laboratory, field, and satellite data to study how ocean chemistry and physics determines phytoplankton biogeography, focusing on how this system will be impacted by climate change. In her NASA-funded project, she collaborated with a group of scientists in using high-resolution imaging to observe nanoplankton dynamics in the North Pacific Ocean, finding a strong relationship between net community productivity-- how much carbon the phytoplankton sequester-- and biomass in these intermediate-sized phytoplankton. Dr. Dutkiewicz's modeling showed that this size class is a particularly important component of the global marine ecosystem. These results suggest that including phytoplankton size classes may be key in modeling and understanding ocean biological production.



Dr. Jie Dai

POSTDOCTORAL SCHOLAR,
ARIZONA STATE UNIVERSITY

Jie Dai uses remote sensing data to study forest biodiversity dynamics of both flora and fauna, incorporating both imaging and anthropogenic data for a holistic view of ecosystem change over time. For his recently completed doctoral dissertation, funded by the NASA Earth and Space Science Fellowship, Dai used Landsat imagery to map the spatial extent of an invasive vine in the understory of Chitwan, Nepal, a biodiversity hotspot and a frontier of human-environment interactions. Dai investigated the historical green vegetation dynamics of the forest ecosystem, and then combined the results with the mapping data to project the future of the invasion and provide guidance to combat it, taking into account other environmental and anthropogenic inputs. In his current postdoctoral work at the Arizona State University Global Discovery and Conservation Science Center, Dr. Dai works on airborne & spaceborne imaging spectroscopy for biosphere applications, with a particular focus on terrestrial and coastal ecosystems. Additionally, he reviews, designs, and develops scientific products for future satellite-based imaging spectroscopy missions.

Biodiversity & Ecological Forecasting Team

Woody Turner | Program Scientist & Manager

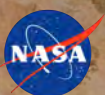
Keith Gaddis | Program Scientist

Maury Estes | Program Associate, Marshall Space Flight Center

Laura Rogers | Program Associate, Langley Research Center

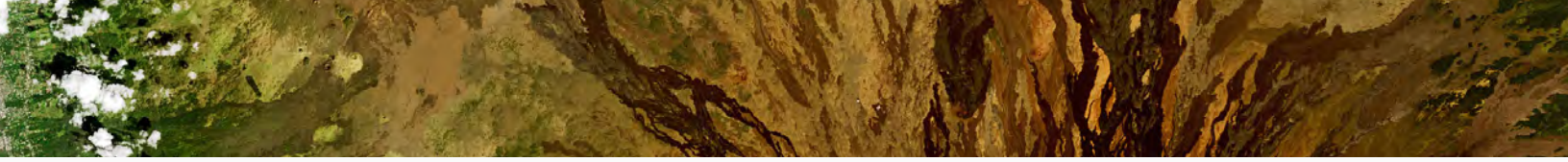
Cindy Schmidt | Program Associate, Ames Research Center

Maya V. Mishra | Intern



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