

FY24 Strategic Initiatives Research and Technology Development (SRTD)

Biodiversity change: Advancing JPL's strategy for biodiversity monitoring from space

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Strategic Focus Area: Biodiversity Change: A Global Remote Sensing Baseline | **Strategic Initiative Leader:** Jessica L Neu

Objectives:

1. Engage users towards developing a Biodiversity Change Observing System for the 2027 Decadal Survey process
2. Prototype a system and algorithms to prepare JPL/NASA to monitor changes in Biodiversity Indicators using multi-sensor spaceborne time-series

Background:

Biodiversity is suffering severe losses, threatening essential ecosystem services for human well-being. Our understanding of biodiversity patterns and their changes under climate and human pressures remains limited. Utilizing satellite remote sensing is key to providing actionable data for conservation, though much of its potential remains unexplored. **New Sensors, new products and multi-sensor fusion have the potential to directly reveal new dimensions of the diversity of biological function.** Our project will make these emergent capabilities useful for biodiversity science, management and policy.

Approach and Results:

Progress towards Obj.1: We organized a community workshop and out reach meetings to conceptualize workflows to bridge the science-policy gaps

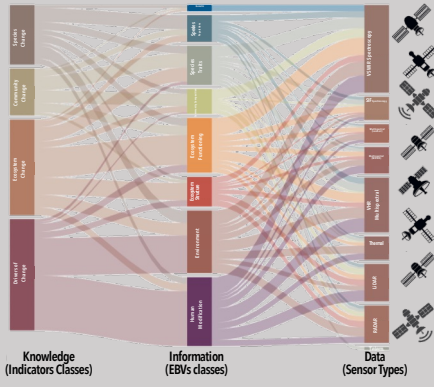
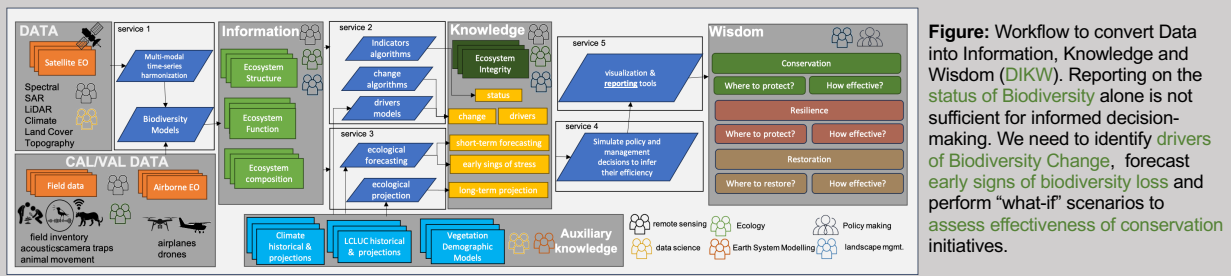
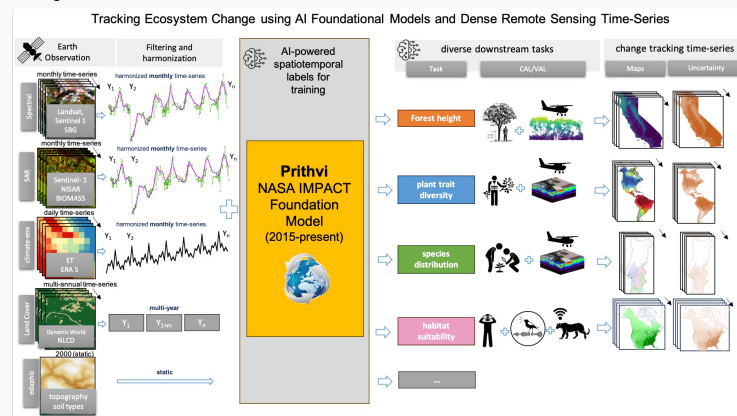


Figure: Novel **multi-sensor fusion** are essential to monitor Essential Biodiversity Variables (EBVs) that inform Biodiversity Indicators capturing **diverse dimensions of biodiversity: structure, composition, and function.**

Progress towards Obj.2: We are prototyping an AI model based on NASA's Foundation Model Prithvi [1] to track changes in forest height. This model is designed to support the development of additional tasks for monitoring multiple dimensions of biodiversity as shown in the figure below.



Significance/Benefits to JPL and NASA:

- Fusion of multi-sensor satellite time-series using innovative AI methods prepares JPL to ingest SBG and NISAR in monitoring Biodiversity Change
- The DIKW workflow leverages JPL expertise in System Engineering, Biodiversity Modeling, Ecological Forecasting and Digital Twins
- Strengthen NASA's role and partnerships with national and international biodiversity initiatives within the UN Convention on Biological Diversity

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References:

[1] EarthData, "NASA and IBM Openly Release Geospatial AI Foundation Model for NASA Earth Observation Data", 2023, accessed on September 2024

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