

FY23 Strategic Initiatives Research and Technology Development (SRTD)

Biodiversity change: A pilot study to advance JPL's strategy for biodiversity monitoring from space

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Strategic Focus Area: Earth System Science and Application Architecture Development | **Strategic Initiative Leader:** Jessica L Neu

Background: The world's biodiversity is suffering from severe losses. Novel remote sensing capabilities have the potential to fill many biodiversity data and knowledge gaps needed for transformative action to safeguard life on Earth and nature's contributions to people.

Biodiversity Change SRTD Objectives:

1. Demonstrate the value of existing JPL/NASA biodiversity data and information for both biodiversity science and conservation (knowledge & action) in a use case,
2. Engage users and develop a biodiversity change observing system architecture for the ESAS2027 Decadal Survey process,
3. Develop a prototype system to prepare JPL/NASA to monitor terrestrial biodiversity change from space.

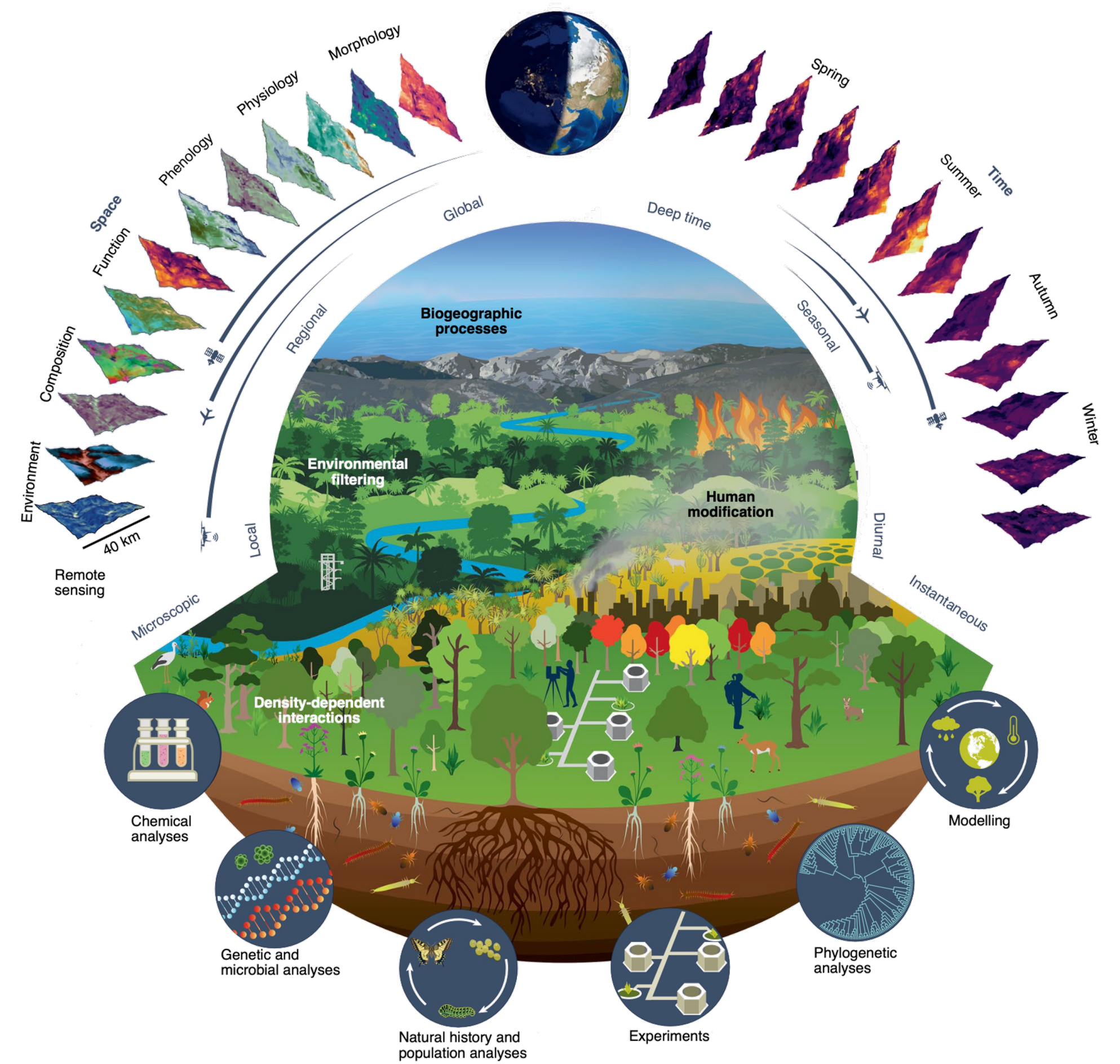


Figure. The integration of remote sensing and in situ observations, experiments and models as tools to understand biodiversity in the Earth system. Cavender-Bares, J., Schneider, F.D., et al. (2022) *Nature Ecology & Evolution*.

Approach and Results for Pilot Study:

In a series of workshops held at JPL, we defined a new concept for the biodiversity change strategic initiative task, including refining the definition and high-level goals and targets with respect to the new Global Biodiversity Framework finalized in December 2022 by the UN Convention on Biological Diversity, creating a draft DIKW (data, information, knowledge, wisdom) table to inform JPL's Decadal Survey priorities, and formulating a new proposal (and objectives listed above) for the FY24 SRTD initiative.

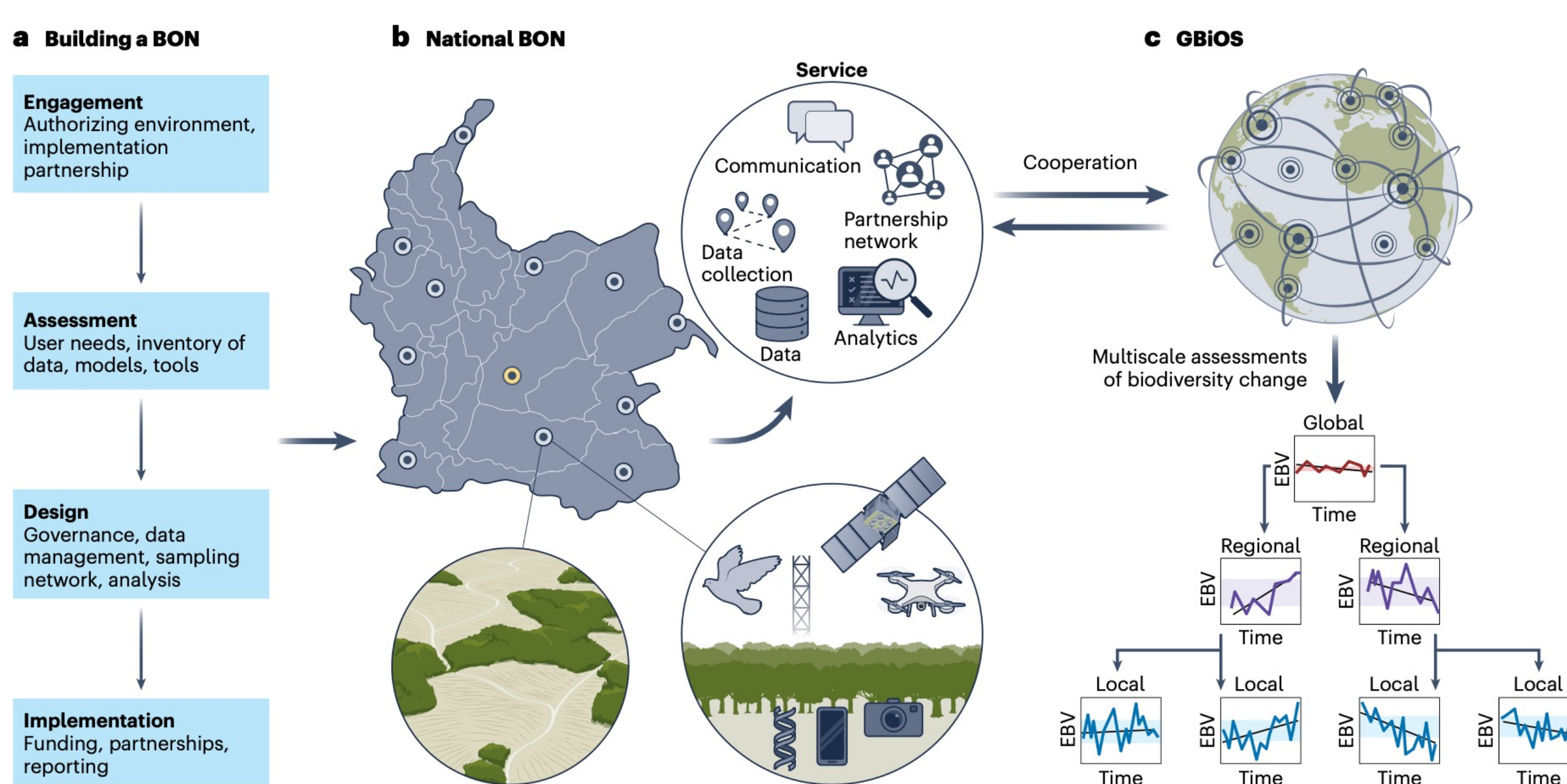


Figure. Remote sensing data needs to be integrated with in situ data and ground networks to unlock its full potential. A *Global Biodiversity Observing System (GBIOS)* could act as a global network of interconnected national and regional BONs to assess biodiversity trends worldwide. Gonzalez, A., et al. (2023) *Nature Ecology & Evolution*.

References. Cavender-Bares, J., Schneider, F. D., Santos, M. J., Armstrong, A., Carnaval, A., Dahlin, K. M., Fatoyinbo, L., Hurr, G. C., Schimel, D., Townsend, P. A., Ustin, S. L., Wang, Z., & Wilson, A. M. (2022). Integrating remote sensing with ecology and evolution to advance biodiversity conservation. *Nature Ecology & Evolution*, 6(5), 506–519. <https://doi.org/10.1038/s41559-022-01702-5>
Gonzalez, A., Vihervaara, P., Balvanera, P., Bates, A. E., Bayraktarov, E., Bellingham, P. J., Bruder, A., Campbell, J., Catchen, M. D., Cavender-Bares, J., Chase, J., Coops, N., Costello, M. J., Dornelas, M., Dubois, G., Duffy, E. J., Eggermont, H., Fernandez, N., Ferrier, S., ... Wright, E. (2023). A global biodiversity observing system to unite monitoring and guide action. *Nature Ecology & Evolution*. <https://doi.org/10.1038/s41559-023-02171-0>

Significance/Benefits to JPL and NASA:

- Address high importance Decadal Survey question (E-1) What are the structure, function, and biodiversity of Earth's ecosystems, and how and why are they changing in time and space?
- Leverage NASA's Earth System Observatory, including JPL-led missions EMIT, NISAR and SBG, for biodiversity science, policy and conservation, and inform priorities for the 2027 decadal survey.
- Strengthen NASA's role and partnerships with national and international biodiversity initiatives, including the development of a Global Biodiversity Observing System (GBIOS).