**Project Proposal: Integrating NASA Satellite Data for Systemic Monitoring of Biodiversity, and NBS Intervention Impacts**

Effective and cost-efficient biodiversity monitoring at the landscape scale remains a significant challenge for conservation efforts worldwide. The Nature-Based Solutions Origination Platform (NBS-OP) seeks to address this challenge by evaluating the impact of interventions on key biodiversity metrics. This project leverages NASA’s Earth observation products alongside advanced ground-based methodologies, including eDNA analysis and community-based monitoring of selected groups, to establish a comprehensive and systematic biodiversity monitoring framework for the Yucatán Peninsula and Madre de Dios (MDD) landscapes.

The proposed framework integrates remote and in-situ monitoring of Essential Biodiversity Variables (EBVs) to derive ecosystem health indicators to deliver actionable insights. By combining NASA’s cutting-edge satellite data with detailed ecosystem structure characterization and transformation analyses, the project enhances our ability to detect and assess changes in biodiversity across these critical regions. Community involvement and locally adapted monitoring approaches ensure that the framework is both grounded in local realities and scalable for broader applications.

The project aims to develop and implement cost-effective methods to evaluate the impacts of Nature-Based Solutions (NBS) interventions on biodiversity within the targeted landscapes. Leveraging the unique capabilities of NASA’s Earth observation products and WWF’s technical expertise in biodiversity monitoring and conservation and local partner participation, the project will advance the production accurate, relevant, and timely biodiversity metrics that will not only inform local decision-making but also contribute to advance ecological monitoring capabilities adapted to the specific context of different landscapes.

By launching this system in MDD and the Yucatán Peninsula—two ecosystems of immense conservation potential—the project addresses areas where the stakes are high, and transformative impacts are achievable. This integrated monitoring system will enhance the credibility of biodiversity impact claims, ensuring transparency and reliability. It will help assess the extent to which investments in biodiversity conservation and restoration result in measurable, impactful outcomes.

Ultimately, the combination of robust, transparent data and community engagement will position these biodiversity-rich landscapes as destinations for high-quality private sector investments. This initiative builds trust and momentum toward sustainable financing for nature-based solutions, creating a pathway for long-term conservation success.

**Status of interventions impacting biodiversity in two landscapes**

|  |  |  |
| --- | --- | --- |
| **Landscape** | **Intervention** | **State of play** |
|  |  |  |
|  |  |  |
|  |  |  |

**Methodology:**

1. **Community-Based Monitoring:**
   * Engage local communities in biodiversity monitoring activities by providing training on data collection methods and leveraging their knowledge to enhance relevance.
   * Incorporate insights from local expertise to better understand specific needs and challenges, ensuring that the monitoring system aligns with user expectations
   * Establish protocols for community involvement in monitoring efforts, ensuring data quality and consistency.
2. **eDNA Analysis:**
   * Implement eDNA sampling across various aquatic and terrestrial habitats within the Yucatán Peninsula and MDD landscapes. WWF has already conducted pilot sampling in both landscapes, demonstrating the feasibility of this methodology.
   * Use high-throughput sequencing to identify and quantify species presence and richness, providing a comprehensive assessment of biodiversity.

Note: eDNA sampling is already underway for selected areas within the Yucatán Peninsula and MDD landscapes. This proposal will enable the expansion of sampling efforts and establish a second point of measurement over time. By increasing the scope of the survey and incorporating longitudinal data, it will be possible to identify trends in species richness and composition.

1. **Fauna Monitoring:**
   * Conduct systematic surveys of key macrovertebrate groups (e.g., large mammals, birds, amphibians) using camera traps, acoustic sensors, and direct observations.
   * Analyze population trends and distribution patterns in relation to habitat changes detected by satellite data.

Note: Camera trap sampling is already underway for selected areas within the Yucatan Peninsula and MDD landscapes.

1. **Data Integration and Processing:**
   * Utilize NASA's Earth observation satellite data, including high-resolution imagery and multi spectral data, to monitor land cover changes, habitat fragmentation, and ecosystem dynamics.
   * Integrate local expertise to improve mapping accuracy and validate outputs.
   * Integrate these data sets with ground-based biodiversity monitoring techniques such as eDNA analysis for species richness and traditional surveys for fauna abundance.
   * Perform spatial analysis to correlate biodiversity data with environmental variables and habitat metrics derived from satellite imagery.
   * Conduct temporal analysis to monitor changes over time, assessing the impact of NBS interventions on biodiversity metrics and functional connectivity.
2. **Habitat restoration impacts**

* Biodiversity Monitoring Integration: Restoration sites are monitored using eDNA, fauna surveys, and camera traps to track species richness and the return of indicator species. This integrated data supports consistent biodiversity assessment across methods.
* In synergy with point 6, functional Connectivity: Using satellite data, restoration areas are evaluated for their role in landscape connectivity, assessing corridors that aid species movement.

1. **Functional Connectivity Monitoring:**
   * Assess functional connectivity by analyzing movement patterns of selected species, habitat corridors, and landscape permeability using satellite data and ground-based tracking methods.
   * Develop connectivity models to identify critical corridors and assess the impact of NBS interventions on ecosystem connectivity.
2. **Protocol Development for Landscape-Level Monitoring:**
   * Develop standardized protocols for biodiversity and functional connectivity monitoring that can be applied to other landscapes beyond the Yucatan Peninsula and MDD.
   * Ensure protocols are adaptable to different ecological and socio-cultural contexts, facilitating broader implementation.
3. **Cost Estimation:**
   * Estimate costs for implementing the monitoring framework, including satellite data acquisition, eDNA analysis, macrovertebrate surveys, community-based monitoring activities, and functional connectivity assessments.
   * Provide a detailed budget breakdown to support funding applications and project planning.
4. **Impact Assessment:**
   * Develop models to predict biodiversity and connectivity outcomes based on different NBS intervention scenarios, using integrated satellite and ground-based data.
   * Evaluate the effectiveness of interventions in enhancing biodiversity conservation, ecosystem resilience, and functional connectivity.
5. **Incorporation of Inputs into NBS Design and Monitoring Framework:**

* Integrate the findings and data from the monitoring activities to update and refine the design of Nature-Based Solutions (NBS) for both the Yucatan Peninsula and MDD landscapes.
* Revise the respective monitoring frameworks to incorporate new insights and ensure they remain effective in tracking the impact of NBS interventions.
* Enhance data management systems to systematically collect, store, and analyze information related to interventions and their respective impacts, facilitating continuous improvement and adaptive management of NBS strategies.

**Expected Outcomes:**

* A robust and scalable framework for biodiversity and functional connectivity monitoring that combines satellite and ground-based data with community involvement.
* Enhanced understanding of the spatial and temporal impacts of NBS interventions on biodiversity and ecosystem connectivity.
* Improved decision-making tools for conservation planning and management. DSS-Decision support system set up and running, with data and algorithms accessible to mid tier and end users.
* Protocols for landscape-level biodiversity and connectivity monitoring that can be applied to other regions.
* Cost estimates to guide project implementation and funding strategies.

This project will leverage cutting-edge satellite technology, innovative biodiversity monitoring techniques, community engagement, and functional connectivity assessments to provide a comprehensive evaluation of NBS intervention impacts. By integrating NASA's satellite data with eDNA analysis, camera traps detection and surveys, community-based monitoring, and connectivity assessments, the NBS OP aims to establish a cost-effective and scalable approach to biodiversity and connectivity monitoring at the landscape scale. This initiative will not only enhance our understanding of ecosystem dynamics but also support the conservation and sustainable management of critical landscapes in the Yucatan Peninsula, MDD, and beyond.

**End users**

**Country offices agreemts**

Cost Center creation - no sub - Grant

**Estimated Timelines and Team Allocation**

**Tranche 1 (100k yr)**

Two experts parcial time?

**Tranche 2 ? (hard to access, we do not have a prototype)**

To ensure the successful implementation of the biodiversity monitoring framework, the following team members will dedicate specific portions of their time over the project duration:

* **Surendra**
  + **Role:** Incorporate monitoring inputs into NBS design and monitoring framework.
  + **Allocation:** 10% time
  + **Duration:** 24 months
* **Jeronimo**
  + **Role:** Incorporate monitoring inputs into NBS design and monitoring framework.
  + **Allocation:** 10% time
  + **Duration:** 24 months
  + **CO Time?**
  + **Science team Leadership**
* **Matheus** 
  + **Role:** Support Community-Based Monitoring in line with social monitoring guidelines.
  + **Allocation:** 10% time
  + **Duration:** 12 months
* **Carolin**
  + **Role:** Estimate and provide detailed costs for the monitoring framework.
  + **Allocation:** 10% time
  + **Duration:** 12 months
* **Martin** 
  + **Role:** Integrate monitoring data into NBS design and support strategic decision-making.
  + **Allocation:** 5% time
  + **Duration:** Entire project