

National Aeronautics and Space Administration



IONA ECOLOGICAL CONSERVATION

Utilizing Earth Observations to Understand Landscape Patterns and Assist in Wildlife Management in Iona National Park, Angola

Emmanuel N. AklieLukka WolffFaith MacdonaldWei Lun Tay



OUR TEAM





African Parks — Iona National Park Management



Daniel van de Vyver Conservation Manager

Pedro Monterroso Park Manager Priya Tekriwal Funding and Reporting Manager

Image Credits: Priya Tekriwal

STUDY AREA

Iona National Park, Namibe Preserve, & Associated Areas



Increased Human & Livestock Population



Drought between 2017 - 2024



Image Credits: African Parks

Species Reintroduction



Image Credits: Priya Tekriwal

Drought between 2017 - 2024





Increased Human & Livestock Population





Image Credits: Priya Tekriwal



OBJECTIVES

Objective 1: Map Land Use/Land Cover (LULC) with vegetation details for 2023

<u>Objective 2:</u> Generate a **time-series of LULC** maps between 1990-2024 that analyzes change overtime

<u>Objective 3:</u> Produce a **short video** highlighting the importance of the project, methods, and results

Image Credits: Margot Michaud, Jan A. Venter, Herbert H. T. Prins, David A. Balfour & Rob Slotow

EARTH OBSERVATIONS

Landsat 5 TM

Landsat 7 ETM+

Landsat 8 OLI

Sentinel-1 SAR

9111

Image Credits: NASA, Rama, USGS

Methodology

Methodology

Broad Class	Narrow Class
Drainage Lines	Mixed vegetation
	Mopane dominated
	Vachellia dominated
Dunes	Bare
	Oases
	Vegetated
Mountains	Bare
	Vegetated
Plains	Grasslands
	Gravel
	Mopane dominated
Shrublands	Mopane-Commiphora
	Vachellia-Commiphora
Marsh/River	

Image Credits: Priya Tekriwal, Maria Costa

1990 & 2023 Raw Imagery

Results: LULC Time Series 1990-2023

- > Overall Accuracy: 93.5%
 (2090)
- Four broad regions emerge on a west to east gradient: Dunes, Plains, Vachellia Shrubland, & Mopane Shrubland

 General loss of Vegetated Dunes over time, as well as Marsh/River

Results - Landscape Metrics

Results – Shannon Diversity Index

Results - Change Detection Analysis

Results - Change Detection Analysis

Results - Change Detection Analysis

Lack of available cloud free imagery prior to 1990 prevented additional analyses

Spectral inconsistencies in satellite data quality

Limited time and spatial resolution to assess the impacts of human activities (herding) within the park

Image Credits: Maria Costa

2

3.

Errors and Uncertainty

Extremely **arid regions** make vegetation detection difficult

The waterway feature collection is dated to 2000 but used for all dates in our time series

Training data is only applicable to 2023, and may have biased the earlier maps

Image Credits: Priya Tekriwal

2.

3.

Feasibility & Partner Implementation

Image Credit: Bernard Dupont

Conclusion

Model **successfully classified** fine scale landcover types with high accuracy

Diversity **decreased** across the study period

Limited time series made change analysis data difficult to interpret

Image Credit: Andy Wilson, Lisa Nicvert

Acknowledgments

Thank you to **Megan Rich** (Georgia–Athens Lead), **Dr. Marguerite Madden** and **Dr. Sergio Bernardes** (UGA) for all their support and advice throughout this project.

Also, thank you to our amazing partners and collaborators at African Parks: **Pedro Monterroso**, **Daniel van de Vyver**, **Priya Tekriwal**, and **Evan Trotzuk**.

"This material contains modified Copernicus Sentinel data 2016, 2022, 2023, processed by ESA."

This material is based upon work supported by NASA through contract 80LARC23FA024. Any mention of a commercial product, service, or activity in this material does not constitute NASA endorsement. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Aeronautics and Space Administration and partner organizations.