



IONA ECOLOGICAL CONSERVATION

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

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Georgia – Athens | Summer 2024



OUR TEAM



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Emmanuel N. Aklie



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PARTNERS

African Parks — Iona National Park Management



Daniel van de Vyver
Conservation Manager



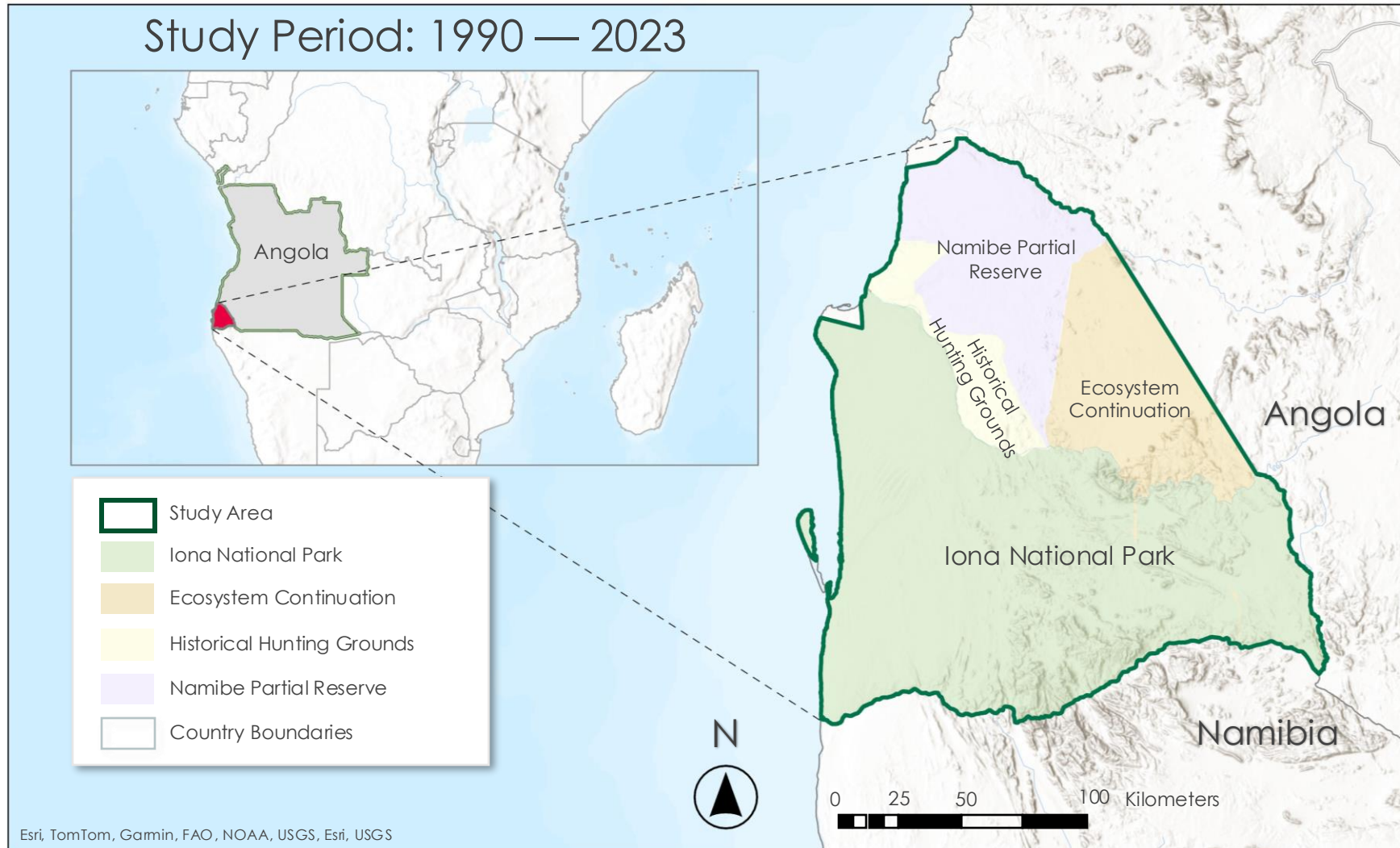
Pedro Monterroso
Park Manager



Priya Tekriwal
Funding and Reporting
Manager

STUDY AREA

Iona National Park, Namibe Preserve, & Associated Areas



COMMUNITY CONCERNS

Increased Human & Livestock Population



COMMUNITY CONCERNS

Drought between 2017 - 2024



COMMUNITY CONCERNS

Species Reintroduction

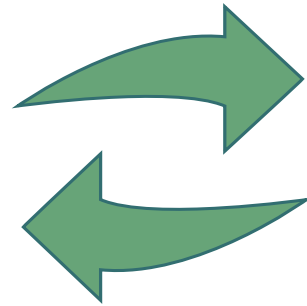


COMMUNITY CONCERNS

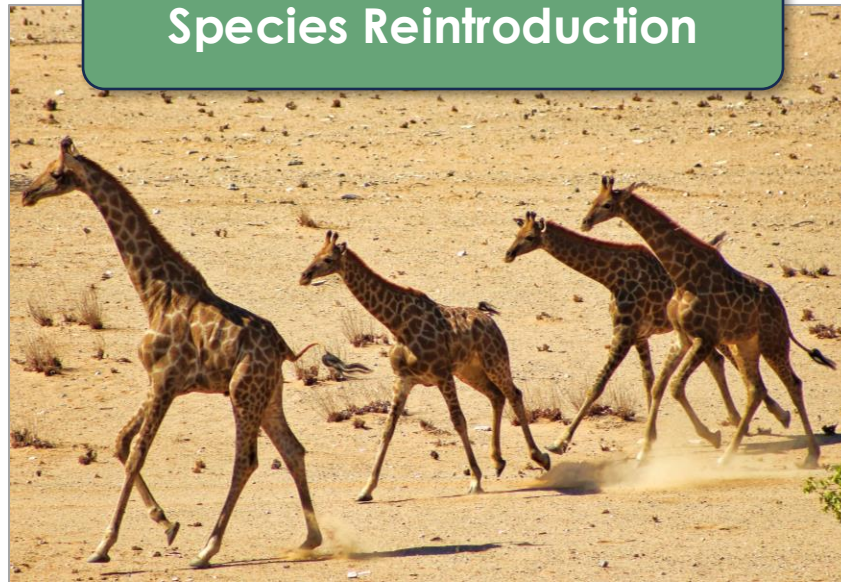
Drought between 2017 - 2024



Increased Human & Livestock Population



Species Reintroduction



OBJECTIVES



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



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

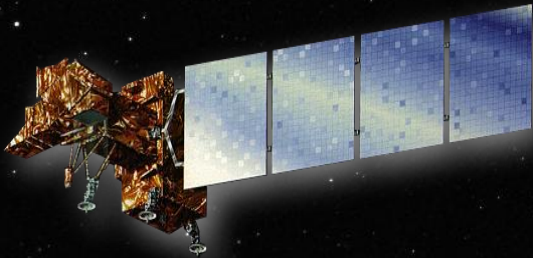


Objective 3: Produce a **short video** highlighting the importance of the project, methods, and results

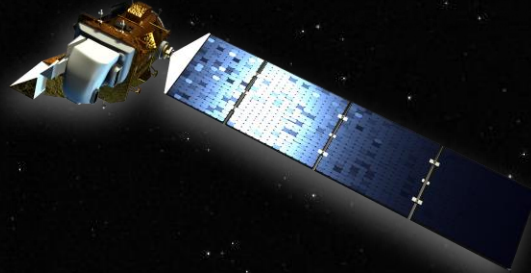
EARTH OBSERVATIONS



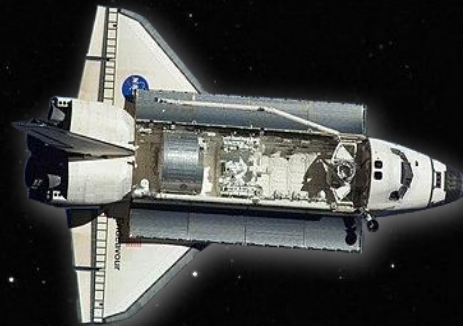
Landsat 5 TM



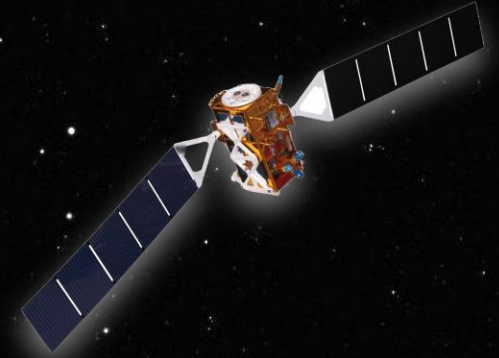
Landsat 7 ETM+



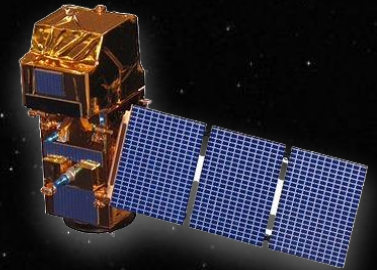
Landsat 8 OLI



Endeavour SRTM

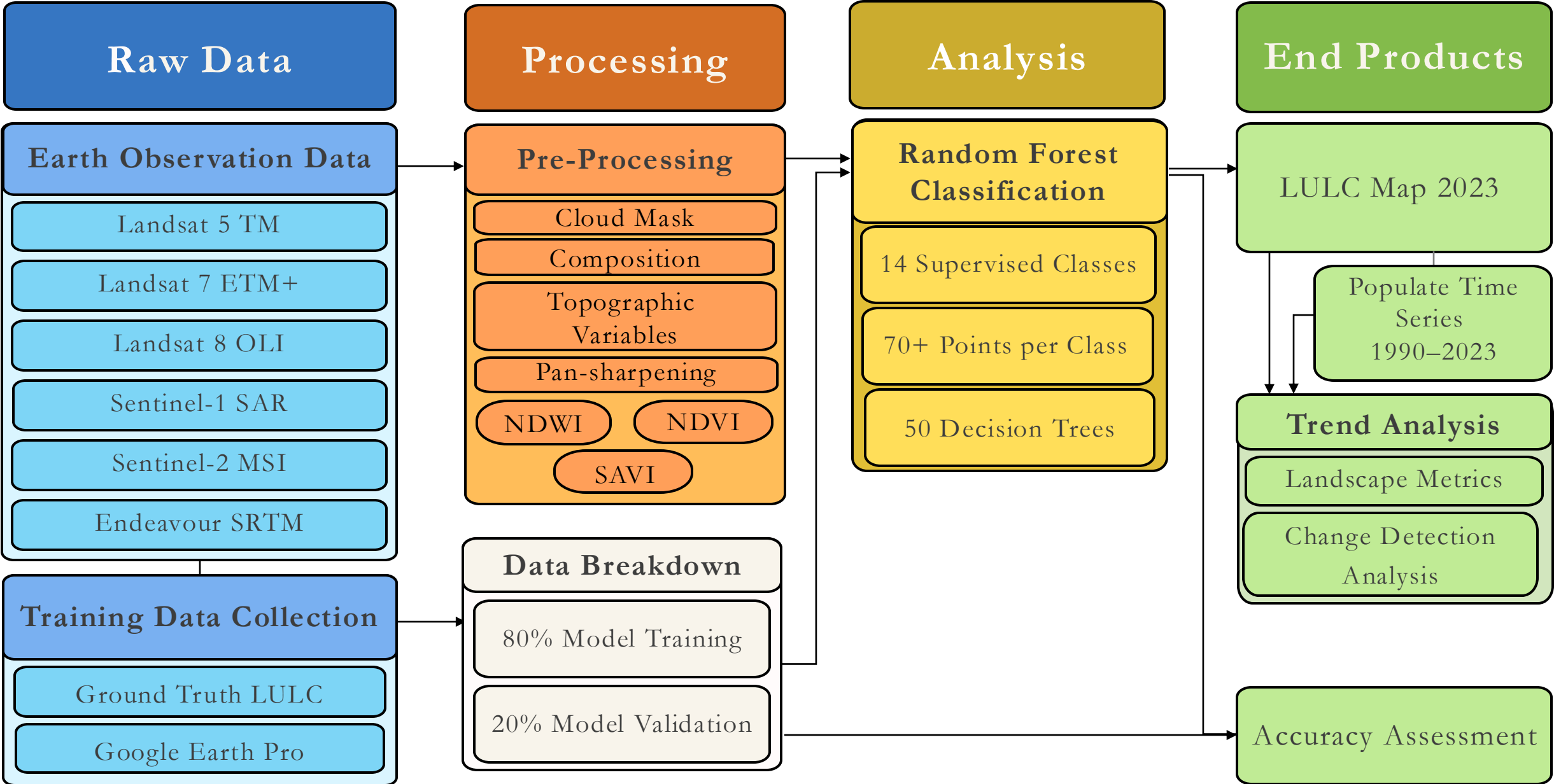


Sentinel-1 SAR



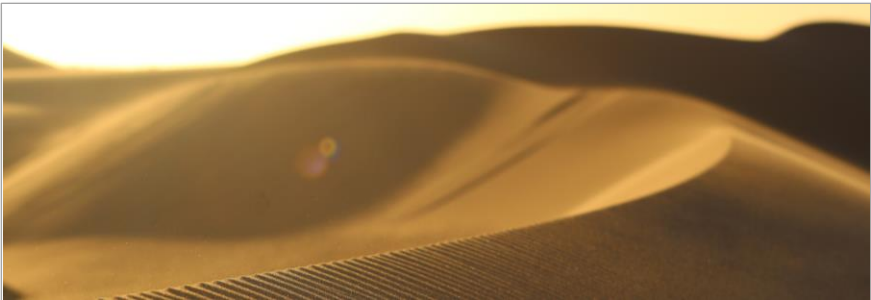
Sentinel-2 MSI

Methodology

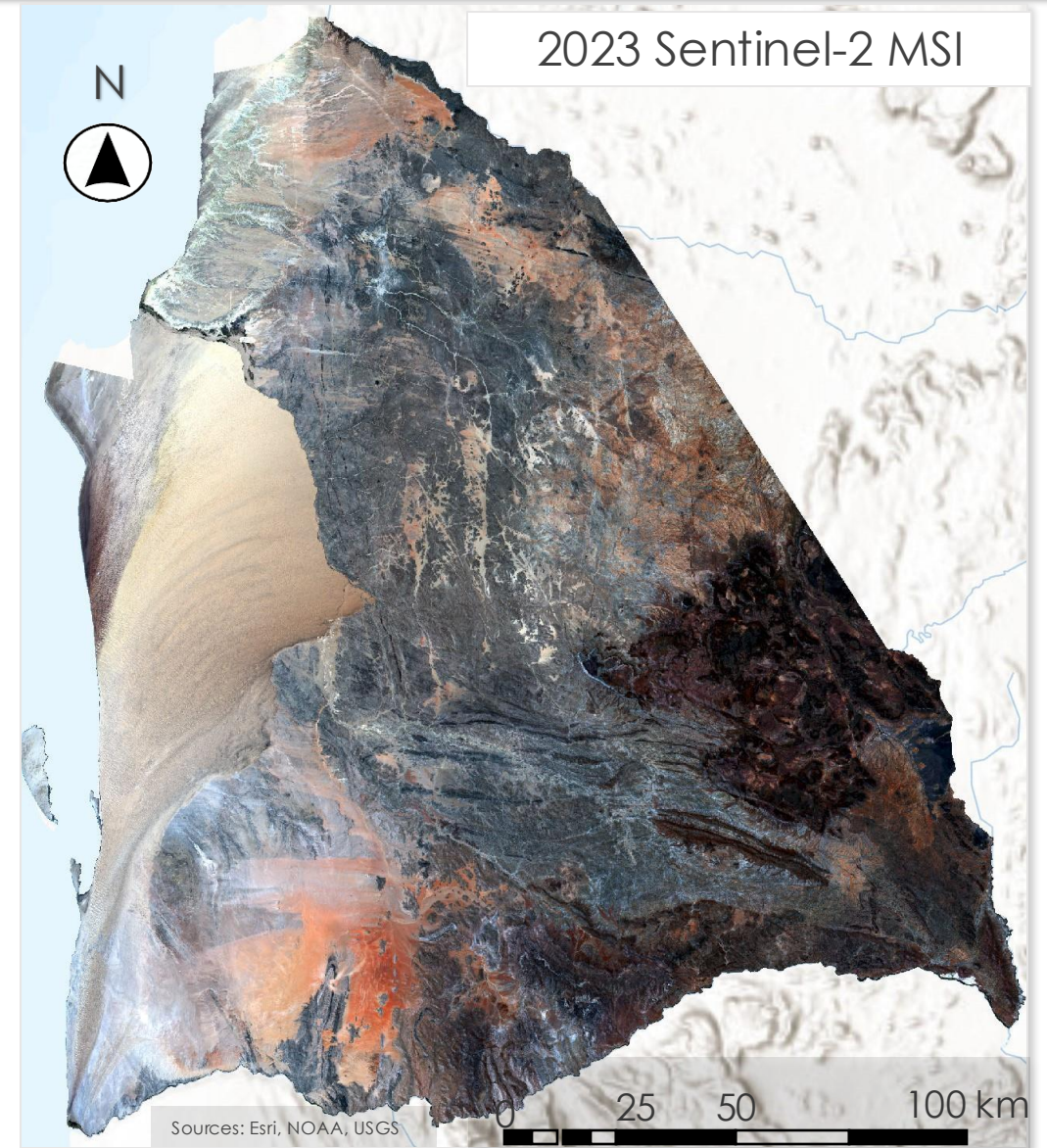
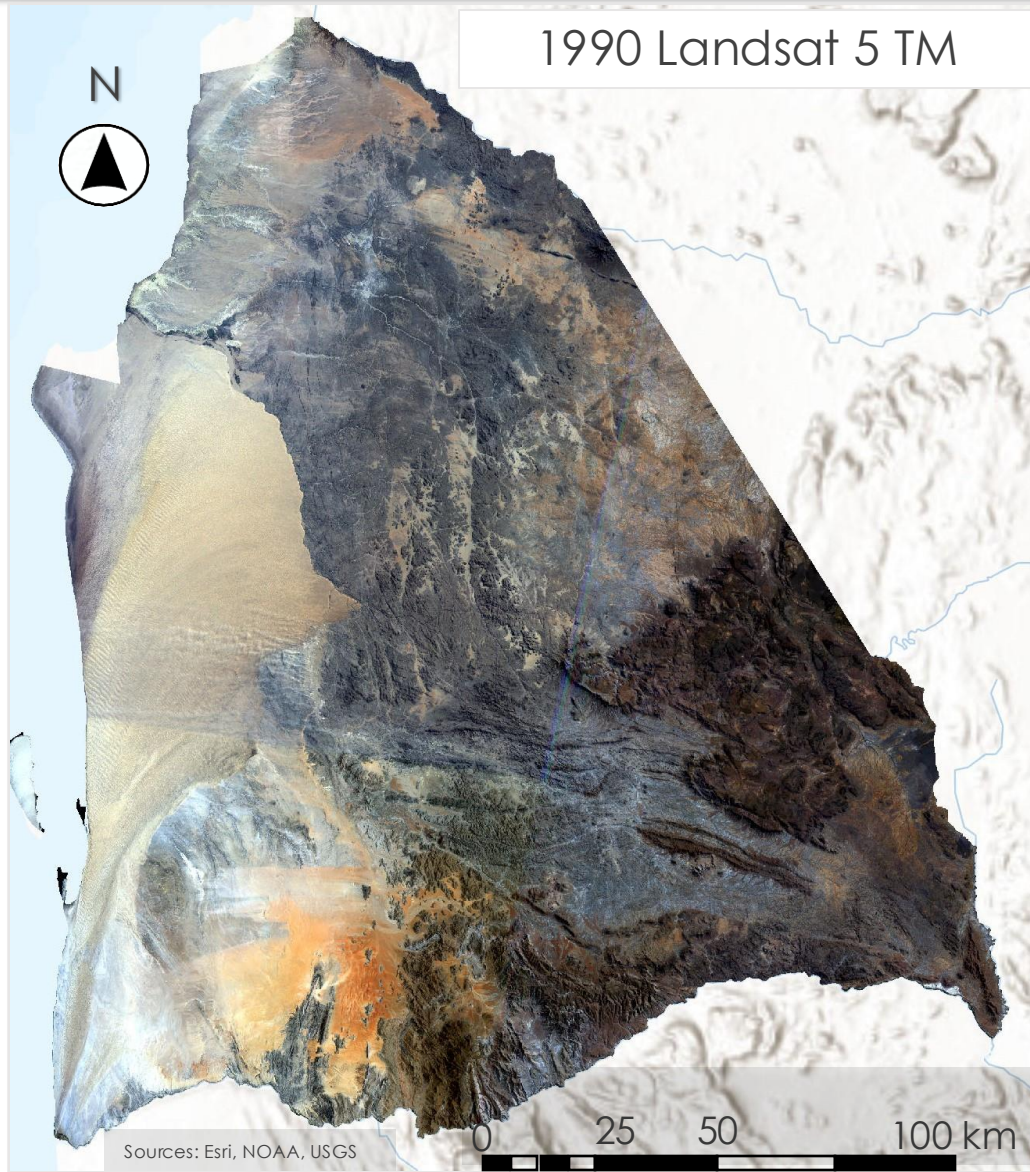


Methodology

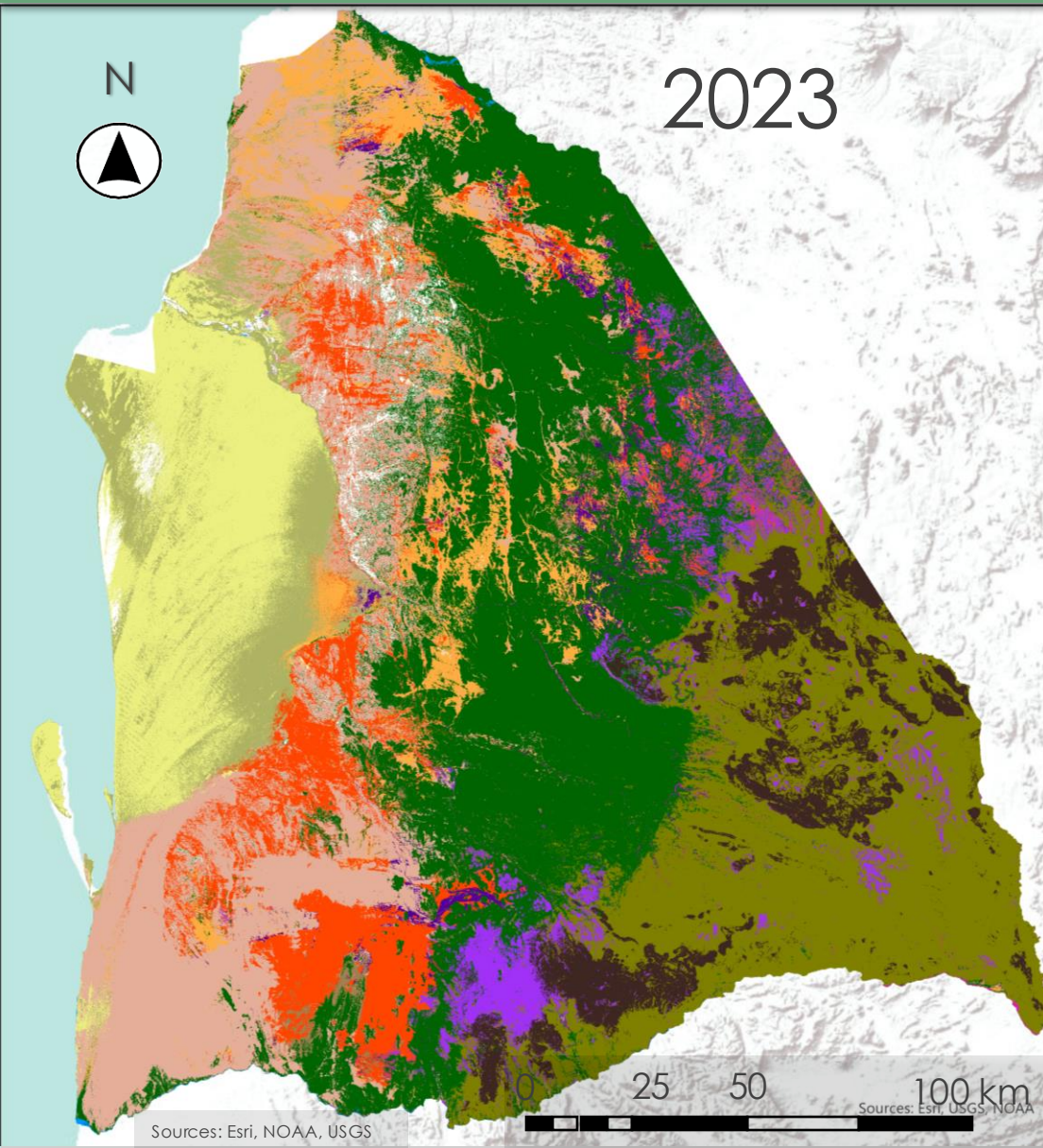
Broad Class	Narrow Class
Drainage Lines	Mixed vegetation
	Mopane dominated
	<i>Vachellia</i> dominated
Dunes	Bare
	Oases
	Vegetated
Mountains	Bare
	Vegetated
Plains	Grasslands
	Gravel
	Mopane dominated
Shrublands	Mopane- <i>Commiphora</i>
	<i>Vachellia</i> - <i>Commiphora</i>
Marsh/River	



1990 & 2023 Raw Imagery



Results: LULC Time Series 1990-2023

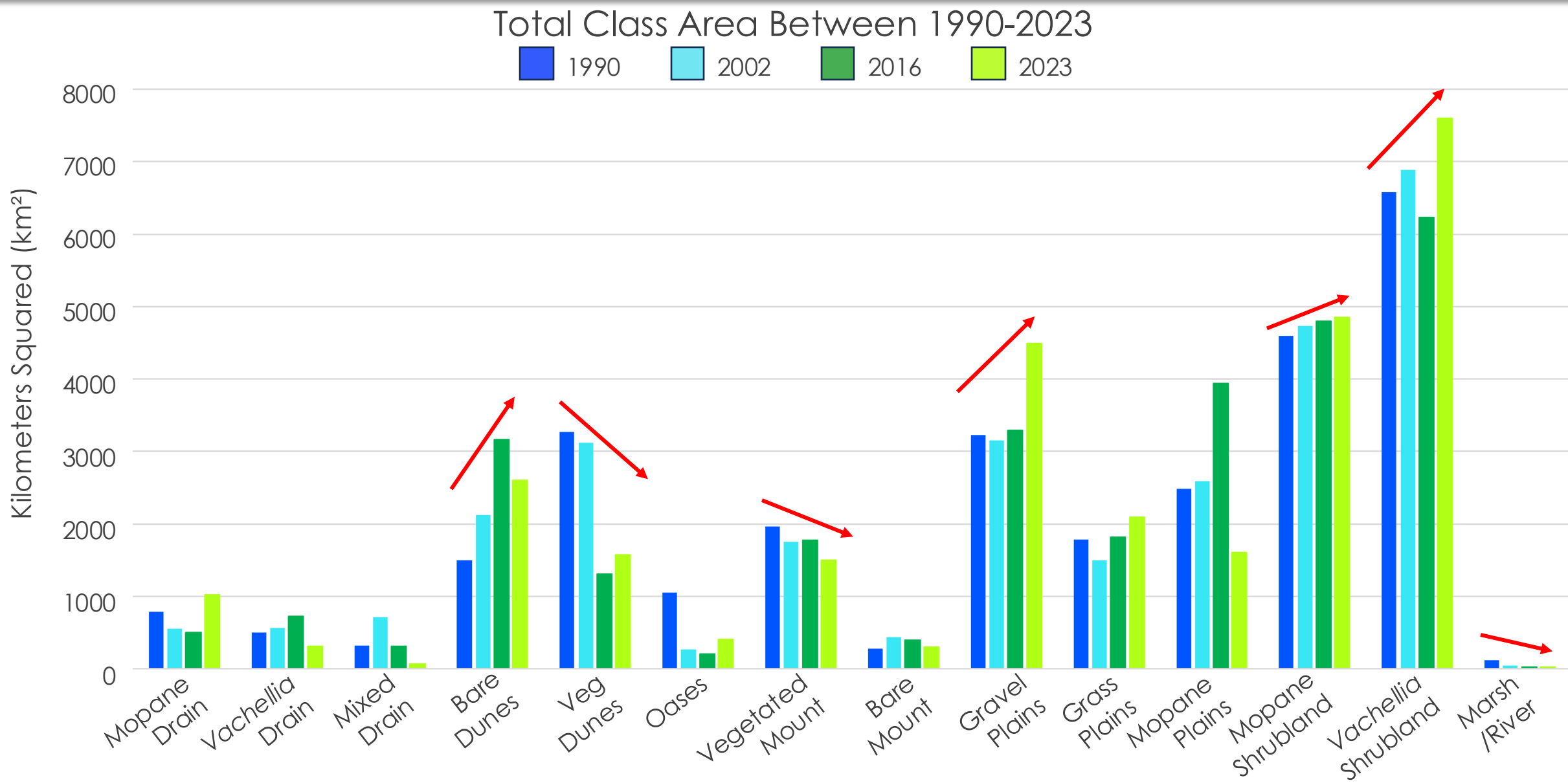


Landcover Classes:

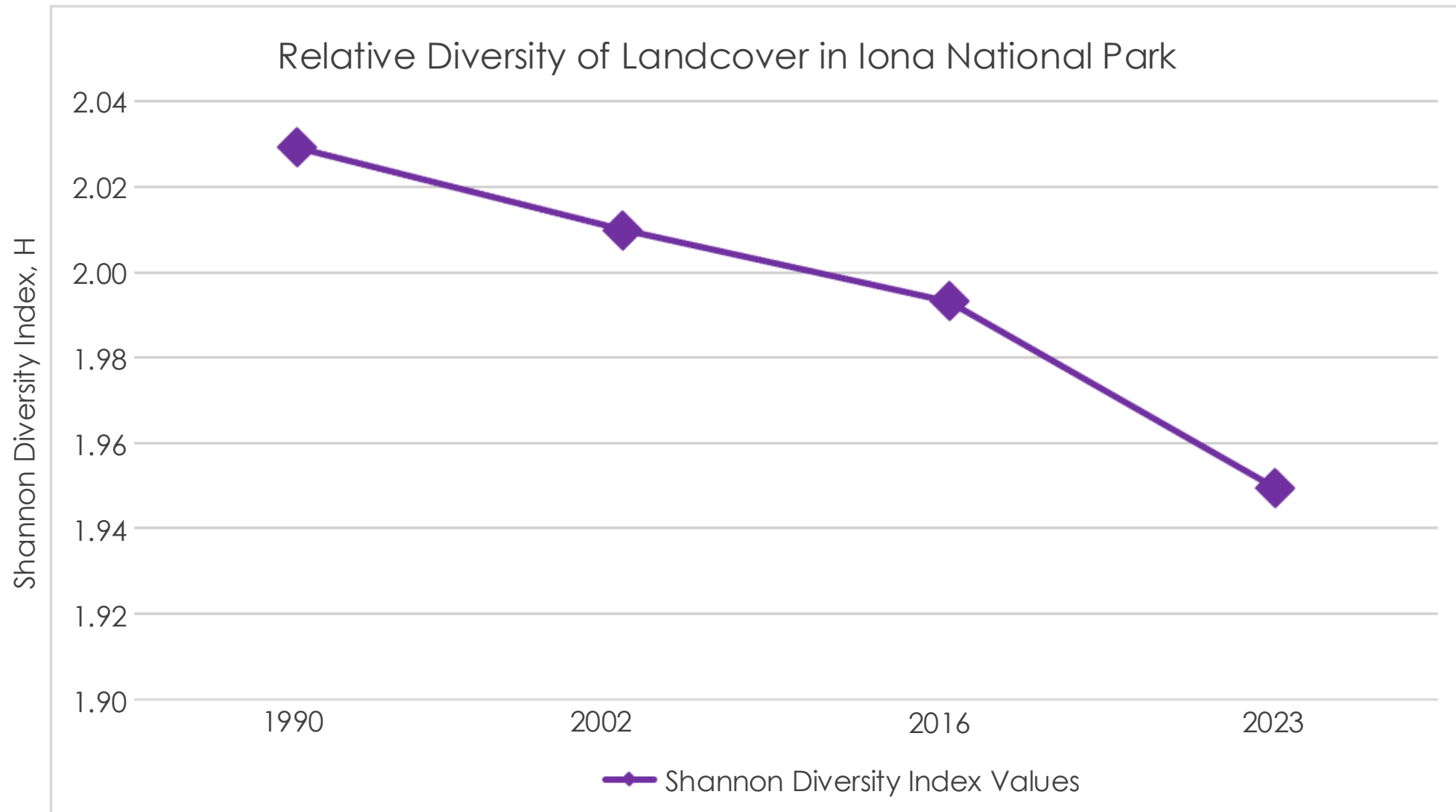
- Mixed Drainage
- Mopane Drainage
- Vachellia Drainage
- Bare Dunes
- Vegetated Dunes
- Oases
- Bare Mountains
- Vegetated Mountains
- Grasslands
- Gravel Plains
- Mopane Plains
- Mopane Shrublands
- Vachellia Shrublands
- Marsh/River

- Overall Accuracy: ~~92.5%~~ **94.5%** (2020)
- 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

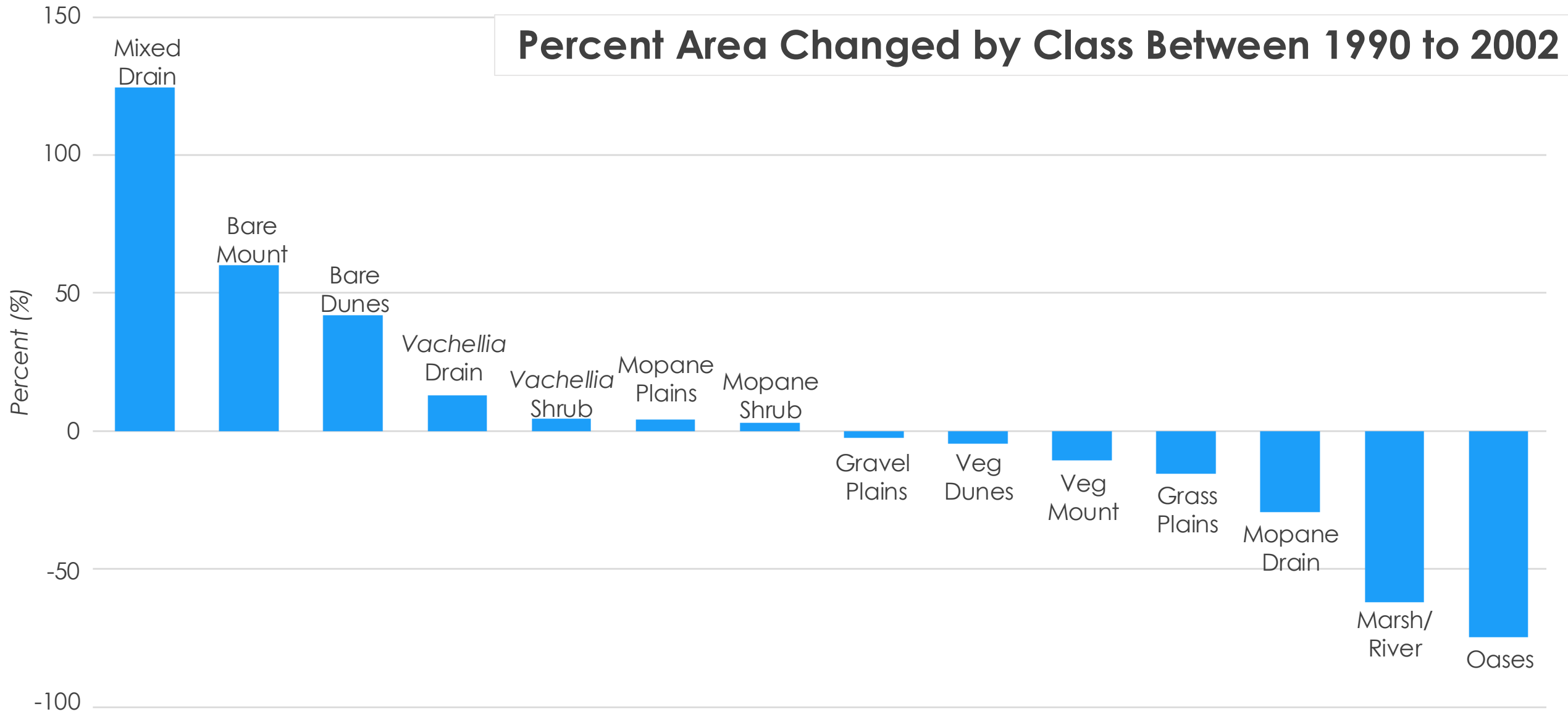
Results - Landscape Metrics



Results – Shannon Diversity Index

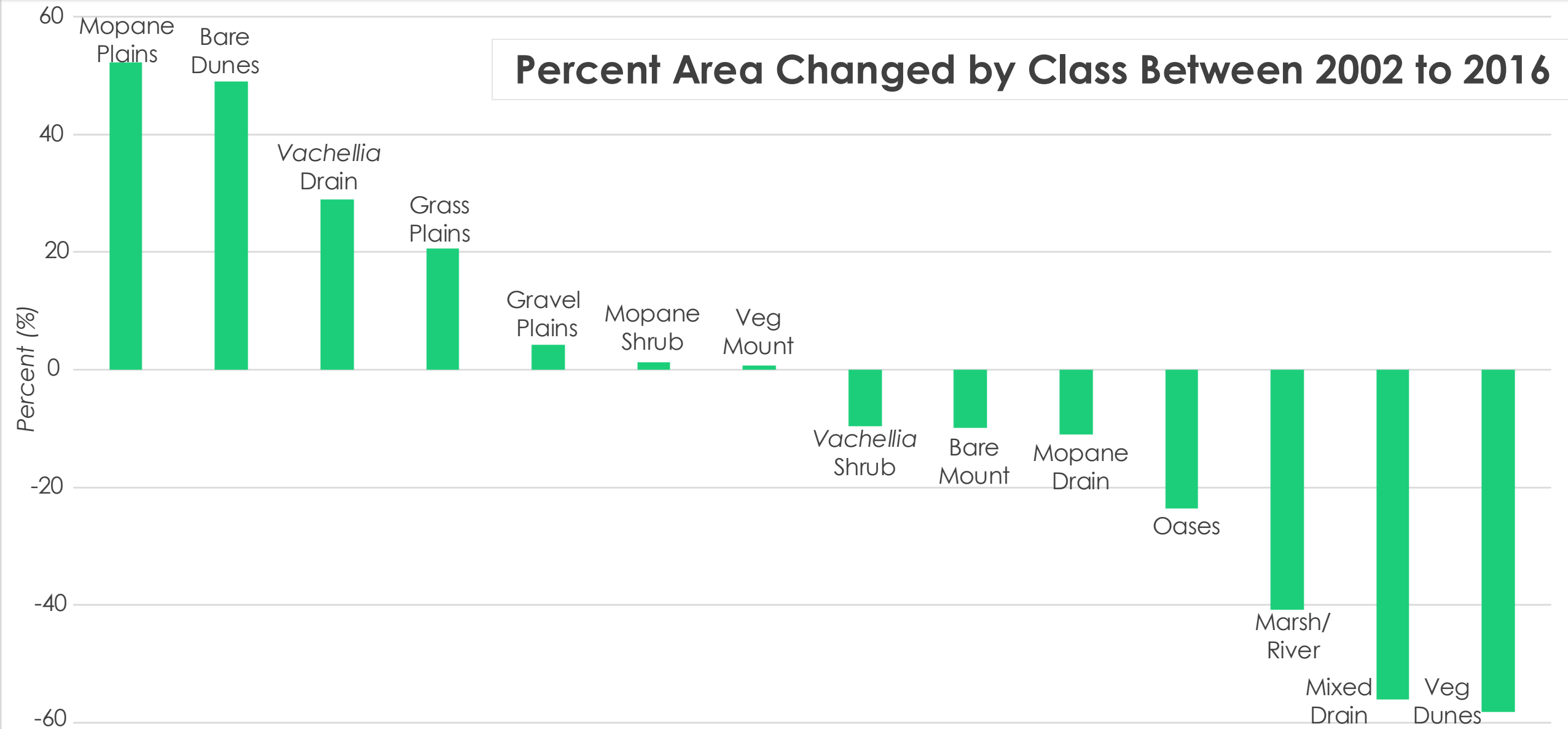


Results - Change Detection Analysis

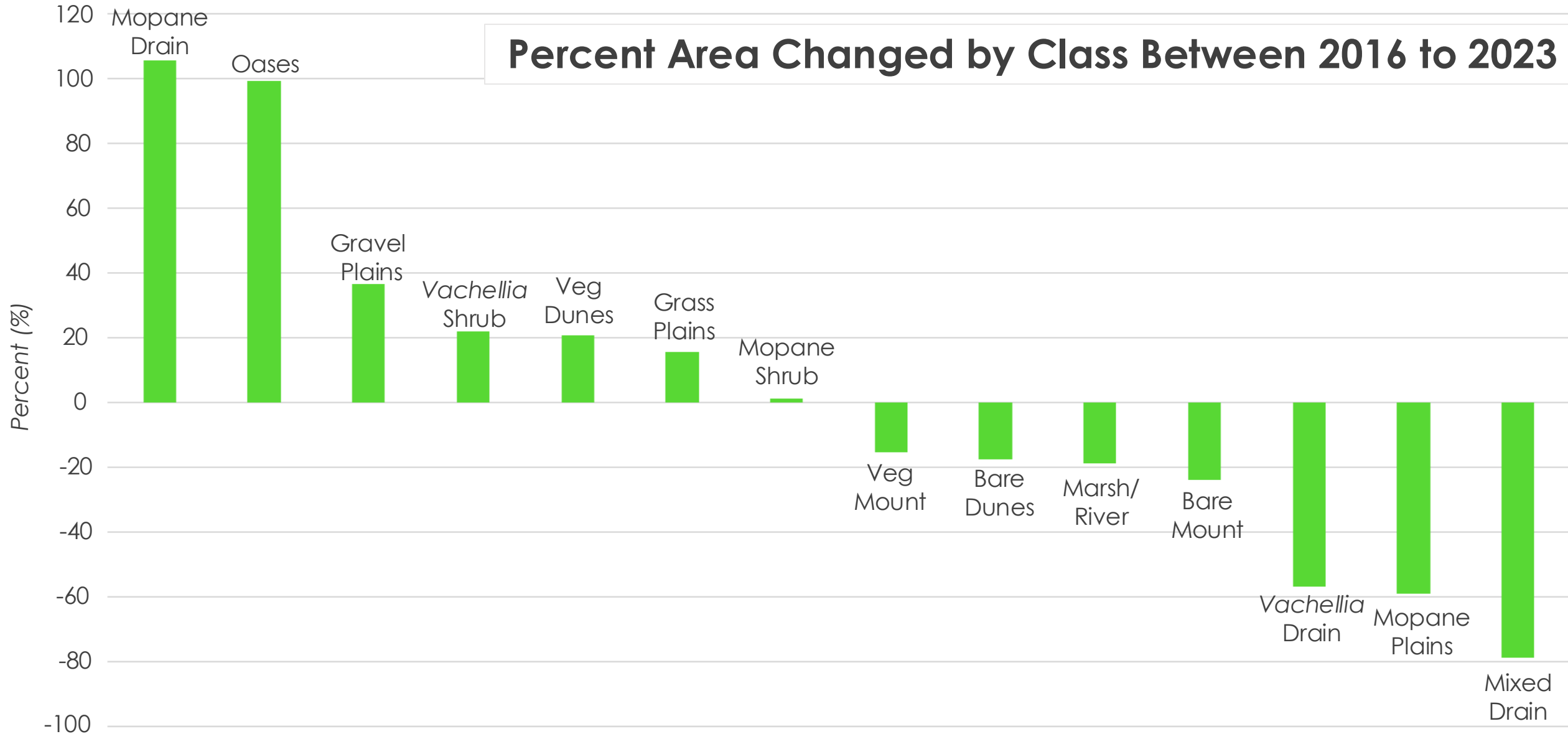


Results - Change Detection Analysis

Percent Area Changed by Class Between 2002 to 2016



Results - Change Detection Analysis



Limitations

1.

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

2.

Spectral inconsistencies in satellite data quality

3.

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

Errors and Uncertainty

1.

Extremely **arid regions** make vegetation detection difficult

2.

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

3.

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

Feasibility & Partner Implementation



Feasible



Provide new ways to **observe** the present and to **understand** the past of the park.

Communicate with policy makers and individuals to further invest in INP and its rehabilitation

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

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.

