



Mapping mobility barriers in pastoral rangelands : Assessing the impact of *Prosopis juliflora* on access to grazing and water resources



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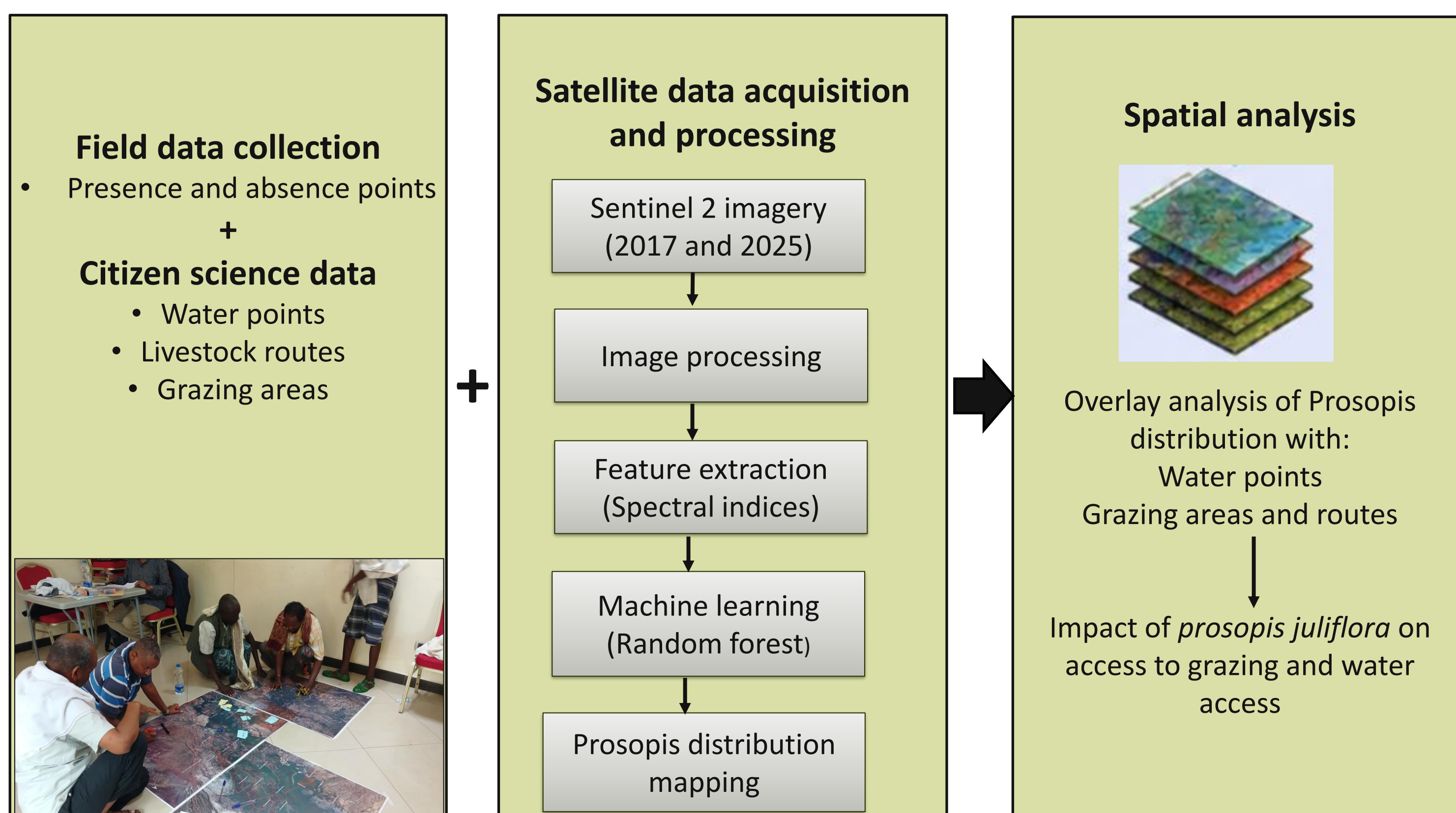
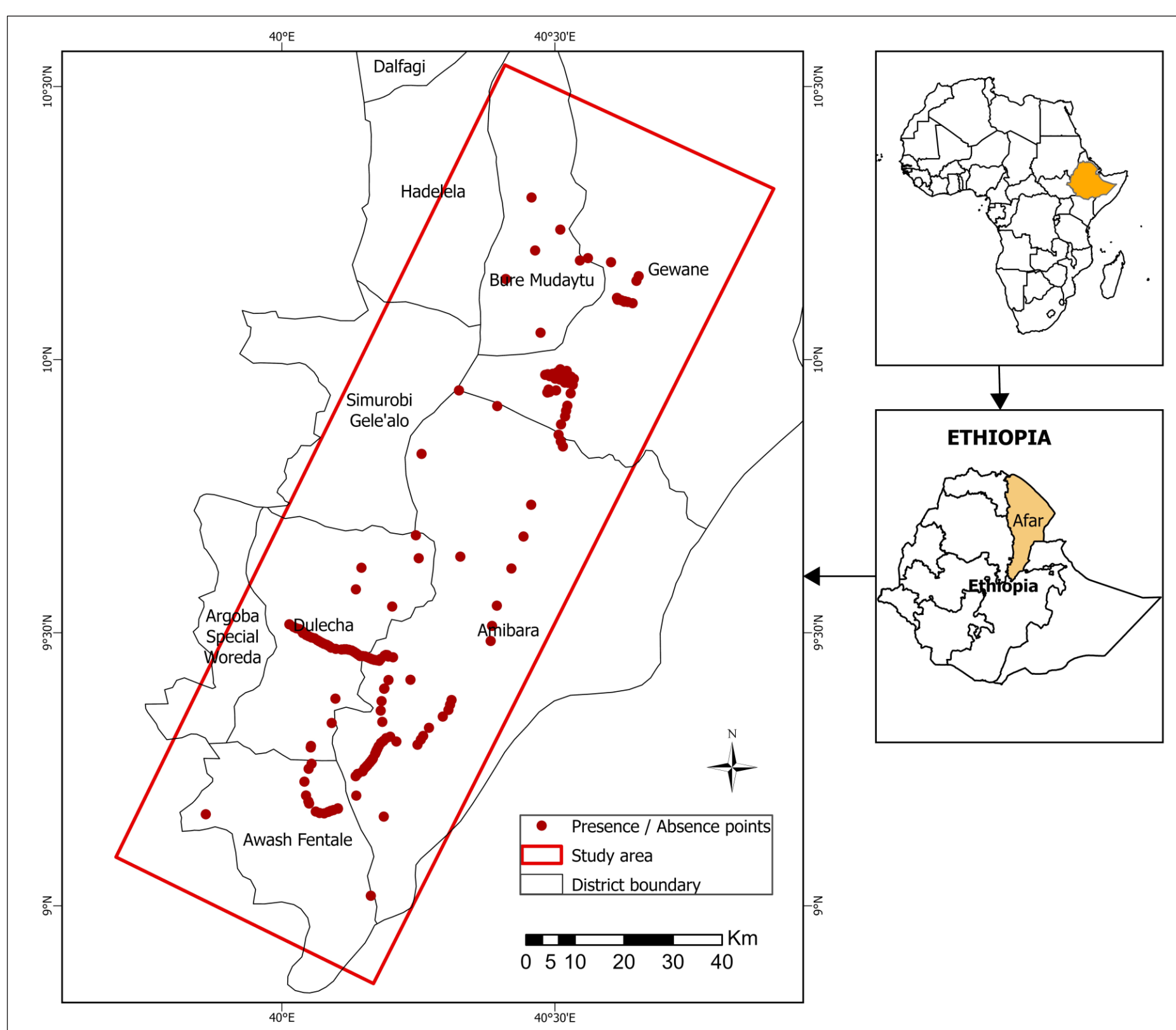
² Centre for Agriculture and Biosciences International

Introduction

- Prosopis juliflora* is a highly invasive woody species transforming dryland rangelands. Dense stands encroach on grazing areas, disrupt livestock movement, and restrict access to critical water resources. For livestock-dependent communities, this can reduce access to essential dry-season resources and increase the distance to water and grazing areas. However, the impacts of *P. juliflora* remain inadequately understood.
- This study aims to assess the impact of *P. juliflora* on access to grazing routes and water resources.

Materials and methods

The study was conducted in 2016 and August 2025 in Afar, region in Ethiopia, a dryland landscape where *P. juliflora* has encroached.



Conclusions

Prosopis invasion is not only an ecological challenge, it can reshape access to the resources that sustain pastoral livelihoods.

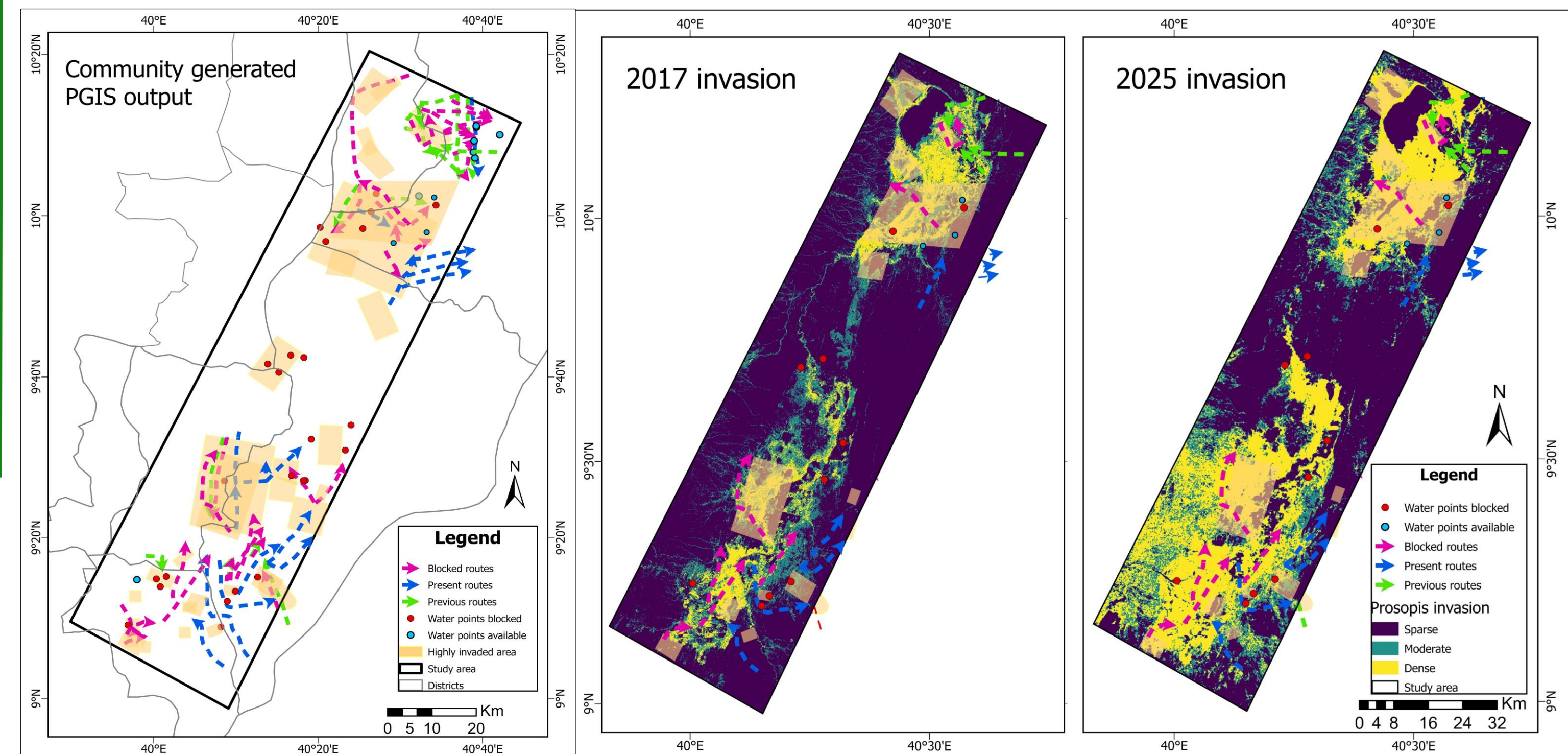
→ *P. juliflora* invasion is compromising access to critical water and grazing resources.

→ Integrate Earth Observation and local knowledge to strengthen monitoring of changing pastoral landscapes.

→ The integrated approach provides a practical basis for monitoring invasion and supporting community informed rangeland planning.

Results

Digitization of data and spatial analysis



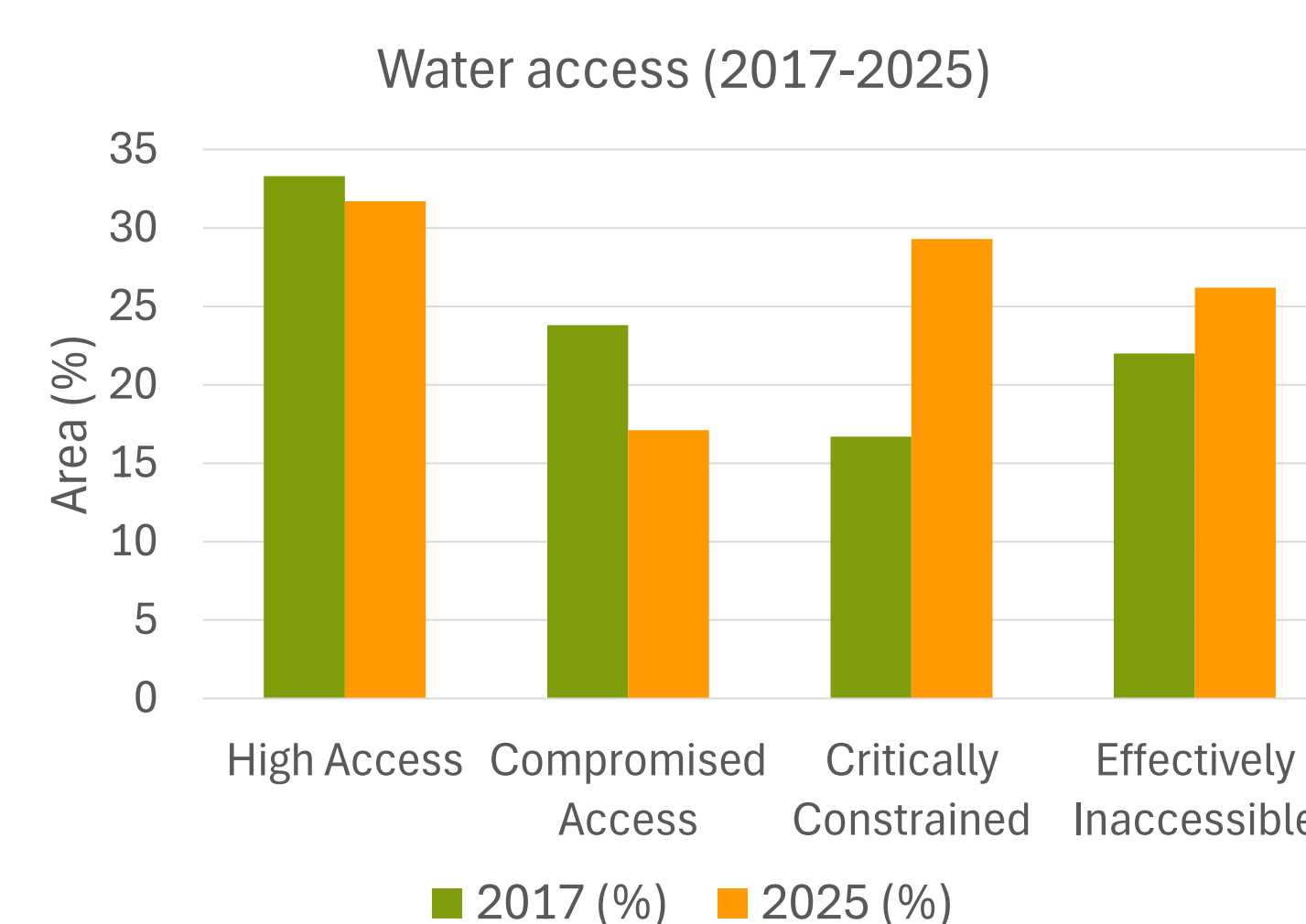
- Key landscape features were digitized, including water points, grazing areas, and livestock routes.
- The digitized datasets provided spatial inputs for assessing the impacts of *P. juliflora* on water access and grazing resources.
- P. juliflora* invasion density increased from 2017 to 2025, with dense invasion areas increasingly overlapping key grazing routes and water points, indicating growing pressure on critical livestock resources.

Confusion matrix

	All data	2016 data	2025 data
Accuracy (%)	77.84	78.79	87.50
Kappa	0.54	0.56	0.59
Sensitivity	0.70	0.81	0.58
Specificity	0.83	0.75	0.95

The classification model showed good overall performance, with accuracy ranging from 77.8% to 87.5% and moderate agreement (Kappa = 0.54–0.59). Model performance varied between years, with higher specificity in 2025.

Impact of *P. juliflora* on water resources (2017-2025)



Impact of *P. juliflora* on grazing routes (2017-2025)

	2017 (km)	2025 (km)	% change
Open	520	248	-52.3%
Compromised	206	278	+35.0%
Severely blocked	30.2	223	+638.7%
Severed		7.20	+7.2%

High access: good access to water resources; **Compromised access:** limited access to some resources; **Critically constrained:** very limited access to resources; and **Effectively inaccessible:** little or no access to resources.

Prosopis invasion is causing declining water access and disruption of grazing routes, with impacts concentrated around specific hotspot areas. These hotspots provide priority areas for targeted *Prosopis* management and restoration of critical resources.

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