

Leveraging Technology In Invasive Species Mapping



Edward Ouko¹⁾, Steve Omondi ¹⁾, Anastasia Wahome ¹⁾, Robinson Mugo¹⁾, Africa Flores²⁾

¹⁾ Regional Centre for Mapping of Resources for Development, Nairobi, Kenya, ²⁾ The SERVIR Coordination Office, ²⁾ NASA Marshall Space Flight Centre, Huntsville, Alabama, USA.

Why this project?

Kenya has had several invasions of alien species that have had negative impacts on biodiversity, agriculture and human development. For instance, prickly pear out-competes native plants, precludes grazing and browsing near it, and inhibits the proliferation of indigenous species. The Northern Kenya Rangelands in the recent decades has experienced increased infestation by invasive plant species shrinking forage space available for both livestock and wildlife. An Invasive Species App has been co-developed and is currently being used in tracking locations and sightings of invasive species of trees or shrubs and the extensiveness of their effects. The App is customized to include any list of local invasive plants present in an area, take photos of the invasive species and is also able to work offline in cases of no internet connection in the remote areas.



Fig. 1: A section of wildlife/livestock forage land infested with *Acacia reficiens*, degrading and narrowing space for conservation.

Objectives

- ▶ To enable tracking locations and sightings of invasive species of trees or plants.
- ▶ To map extensiveness of the invasive species effects on forage lands.
- ▶ To enhance paper-less field data collection and transfer; securing and delivering data to the office in near real-time.
- ▶ Improving quality and accuracy of data for monitoring invasive species.

Earth Observations and Other Inputs

Field data collection on invasive species occurrence and distributions, and predictor variables data: Mapping and modelling the current and future habitats of invasive species requires data on their occurrence and distribution. Besides explanatory variables (roads, degradation, settlements etc.) provide information on species distributions;

Acquisition and processing of Earth observation, climatic, bioclimatic and GIS data: Acquiring and conducting image processing of remote sensor data to extract invasive species habitats information. Climatic data is essential in future suitable habitat projections.

Approach/Project Activities



Fig. 2: Android Application's Main Page

Results

	fname	ftcnt	ftiar	ftgar	ftcc	fttab	ftabd	ftown
☐	Edit Copy Delete Acacia Reficiens	400 Acres	400 Acres	Moderate (5.1% to 25%)	Edge: Lake	Scattered Plants	Unknown	
☐	Edit Copy Delete Acacia Reficiens	100 Hectares	100 Hectares	Trace (less than 1%)	conservancy	Scattered Dense Patches	Commun Land	
☐	Edit Copy Delete Acacia Reficiens	500 Acres	500 Acres	Trace (less than 1%)	conservancy	Scattered Plants	Commun Land	
☐	Edit Copy Delete Acacia Reficiens	200 Acres	200 Acres	Low (1.0% to 5.0%)	conservancy	Scattered Dense Patches	Commun Land	
☐	Edit Copy Delete Acacia Reficiens	200 Acres	200 Acres	Moderate (5.1% to 25%)	conservancy	Dense Monoculture	Commun Land	
☐	Edit Copy Delete Acacia Reficiens	200 Acres	200 Acres	Moderate (5.1% to 25%)	conservancy	Dense Monoculture	Commun Land	
☐	Edit Copy Delete Acacia Reficiens	200 Acres	200 Acres	Moderate (5.1% to 25%)	conservancy	Dense Monoculture	Commun Land	
☐	Edit Copy Delete Acacia Reficiens	200 Acres	200 Acres	High (25.1% to 100%)	conservancy	Dense Monoculture	Commun Land	
☐	Edit Copy Delete Acacia Reficiens	400 Acres	400 Acres	Moderate (5.1% to 25%)	conservancy	Dense Monoculture	Commun Land	
☐	Edit Copy Delete Acacia Reficiens	400 Acres	400 Acres	Moderate (5.1% to 25%)	conservancy	Dense Monoculture	Commun Land	

Fig. 5: Snippet of data storage table in the spatial database

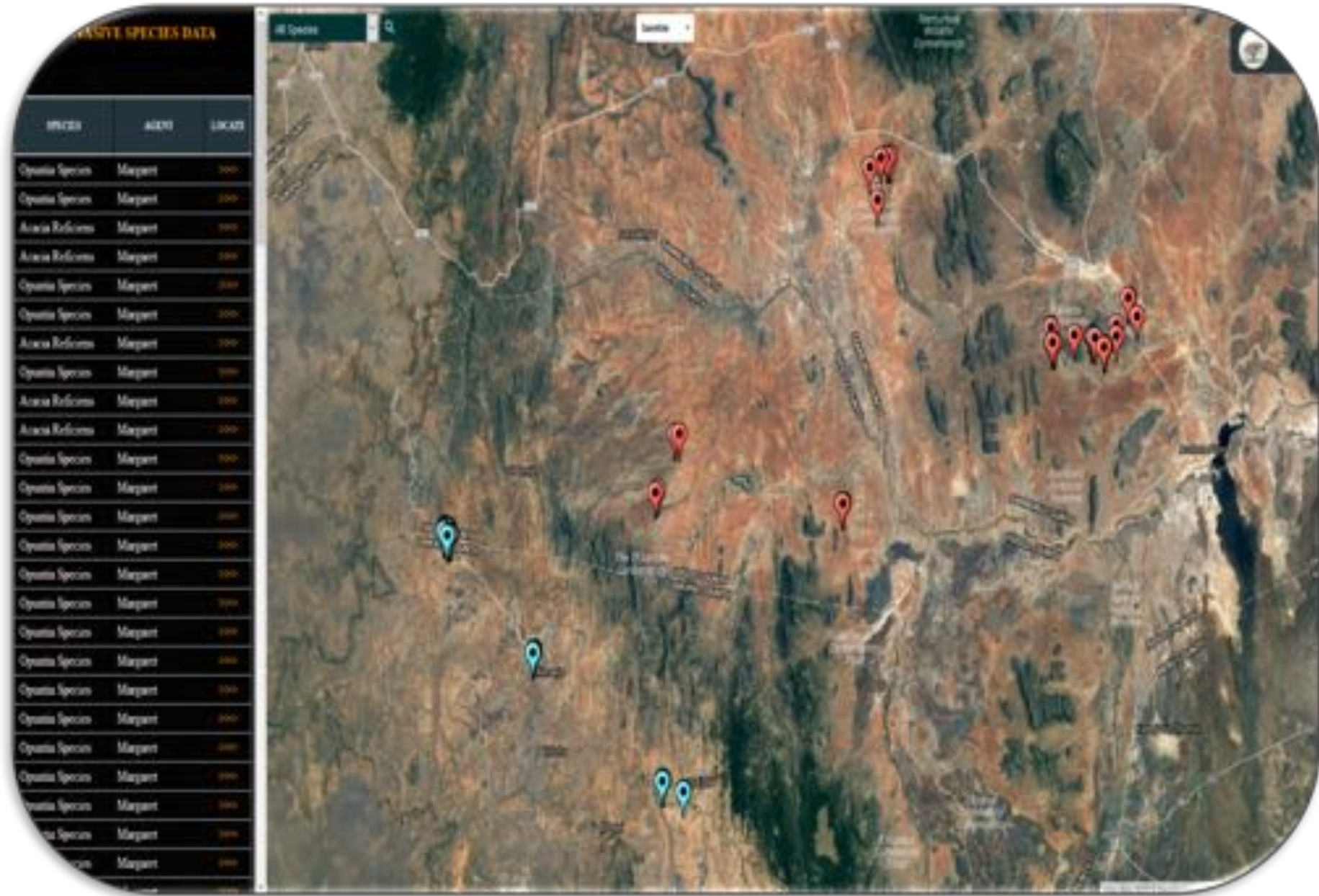


Fig. 6: ISMS web geoportal, leveraging GEE; this is handy in validating the collected field points

	A	B	C	D	E
1	Species	Infected Area	Gross Area	Canopy Closure	Habitat
2	Opuntia Species	2 Square Metres	2 Square Metres	Low (1.0% to 5.0%)	bareland
3	Opuntia Species	2 Square Metres	2 Square Metres	Moderate (5.1% to 25%)	Edge: Roadside
4	Acacia Reficiens	2 Square Metres	2 Square Metres	Moderate (5.1% to 25%)	Open Field
5	Acacia Reficiens	1 Square Metres	1 Square Metres	Low (1.0% to 5.0%)	Open Field
6	Opuntia Species	2 Square Metres	2 Square Metres	Trace (less than 1%)	Open Field
7	Opuntia Species	1 Square Metres	1 Square Metres	Low (1.0% to 5.0%)	Open Field
8	Acacia Reficiens	2 Square Metres	2 Square Metres	Low (1.0% to 5.0%)	Open Field
9	Opuntia Species	2 Square Metres	5 Square Metres	Low (1.0% to 5.0%)	Open Field
10	Acacia Reficiens	2 Square Metres	2 Square Metres	Moderate (5.1% to 25%)	Open Field
11	Acacia Reficiens	2 Square Metres	8 Square Metres	Moderate (5.1% to 25%)	Open Field
12	Opuntia Species	6 Square Metres	6 Square Metres	Low (1.0% to 5.0%)	Open Field
13	Opuntia Species	5 Square Metres	5 Square Metres	Low (1.0% to 5.0%)	Open Field
14	Opuntia Species	3 Square Metres	3 Square Metres	Low (1.0% to 5.0%)	Open Field
15	Opuntia Species	3 Square Metres	3 Square Metres	Low (1.0% to 5.0%)	Open Field
16	Opuntia Species	10 Square Metres	10 Square Metres	Low (1.0% to 5.0%)	Open Field
17	Opuntia Species	12 Square Metres	12 Square Metres	Low (1.0% to 5.0%)	Edge: Roadside
18	Opuntia Species	13 Square Metres	13 Square Metres	Low (1.0% to 5.0%)	Open Field
19	Opuntia Species	15 Square Metres	15 Square Metres	Low (1.0% to 5.0%)	Open Field
20	Opuntia Species	15 Square Metres	15 Square Metres	Low (1.0% to 5.0%)	Open Field
21	Opuntia Species	15 Square Metres	15 Square Metres	Low (1.0% to 5.0%)	Edge: Roadside

Fig. 7: Snippet of Downloaded data from ISMS (Invasive Species Mapping System) web geoportal

Outcomes/Anticipated Impacts

- ▶ Improved capacity for stakeholders trained in the usage of an application system for near real-time field data collection.
- ▶ Improved utilization of the App for invasive species data collection and analysis.
- ▶ Increased awareness on ISMS (Invasive Species Mapping System) tool and invasive species distribution data.

Project Partners

- ▶ NRT – Northern Rangeland Trust
- ▶ LWF – Laikipia Wildlife Forum
- ▶ KWS – Kenya Wildlife Service
- ▶ LEWA – Lewa Wildlife Conservancy
- ▶ ZSL – Zoological Society of London
- ▶ Marwell Wildlife
- ▶ Mount Kenya Trust

Project End Users

- ▶ Academic & Research Institutions
- ▶ Non-governmental
- ▶ Learning Institutions
- ▶ Community-based organizations
- ▶ Local communities
- ▶ Conservation organizations
- ▶ County governments

Fig. 3: Application's Conceptual Framework.



Fig. 4: A rangeland coordinator collecting Opuntia Spp distribution data using invasive species app