Sustainable management of rangelands: An assessment of invasion cover trajectories and their contribution to invasion management in Marigat Sub-County, Kenya

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Woody invasive alien species in Eastern Africa
Assessing and mitigating their impacts on ecosystems and rural livelihoods

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Background

- Invasive alien species (IAS) adversely affect biodiversity and livelihoods.
- IAS have complex spatial-temporal patterns of spread.
- Ineffective implementation of sustainable land management practices is a key driver of failing IAS management.
- This calls for coordinated management approaches that are spatially explicit and extends beyond individual plots.
- A good understanding of land users' management decision helps designing strategies to promote coordinated IAS management.

Objectives

To develop a methodology for identifying and linking spatial-temporal *trajectories* of invasive species with land users management decisions.

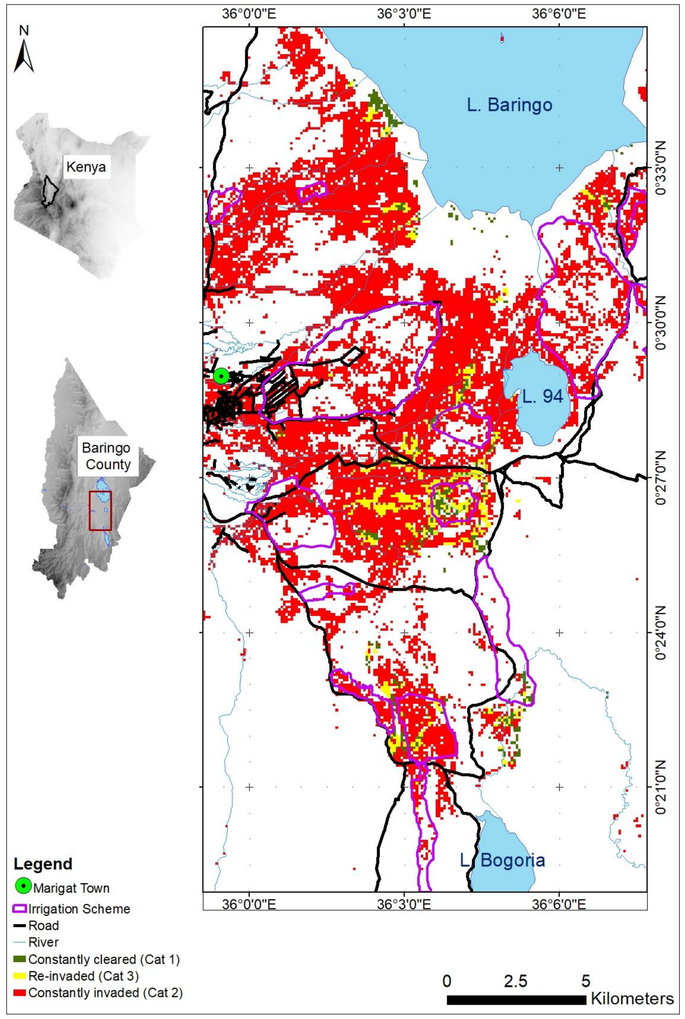
Methodology

- Identify presence or absence of *Prosopis juliflora* (highly invasive alien tree) by reclassifying land cover data of 1988 to 2016.
- Identify invasion trajectories by combining the reclassified datasets.
- Filter trajectories based on relevance for invasion management, distribution pattern, and spatial cover.
- Overlay trajectories with spatial features (roads, water bodies, settlement, irrigation schemes) for analysis of potential spatial correlation.

No.	Pixel count	1988	1995	2002	2009	2016	Area (km²)	Area (%)
	Category 1: Constantly uninvaded after clearance							
1	8448	1	0	0	0	0	7.60	76.08
2	1259	1	1	0	0	0	1.13	11.34
3	1120	1	1	1	0	0	1.01	10.09
4	277	1	1	1	1	0	0.25	2.50
							10.00	**3.00**
	Category 2: Constantly invaded after the first appearance							
5	295397	0	0	0	1	1	265.86	83.48
6	52289	0	0	1	1	1	47.06	14.78
7	6165	0	1	1	1	1	5.55	1.74
							318.47	**95.00**
	Category 3: Cleared and then reinvaded							
8	3108	1	0	0	1	1	2.80	40.05
9	2268	1	0	0	0	1	2.04	29.23
10	1428	1	0	1	1	1	1.29	18.40
11	522	1	1	0	1	1	0.45	6.73
12	237	1	1	1	0	1	0.21	3.05
13	197	1	1	0	0	1	0.18	2.54
							6.97	**2.00**
						Total of 13 trajectories:	**335.44**	**100.00**

Table 1 Categories of spatial-temporal invasion trajectories: Zero and 1 show absence and presence of Prosopis in a given year. Pixel count indicates the number of 30m x 30m pixels in the study area falling under a trajectory. The most widespread trajectory (no. 5) covers an area of 266 km².

Calculated by the author based on Mbaabu **et al.** (2019).



Map 1 Spatial distribution of trajectory categories.

Key findings

Trajectory categories are not randomly distributed in space (Figure 1). Thus, chances are high that they are determined by factors such as land users' management decisions.

Category 1: Constantly cleared

- Continuous implementation of SLM practices
- Small overall area, declining with time.
- Dominant along water bodies.
- Indication of clearance on cultivated lands.

Category2: Constantly invaded

- Most widespread and increasing with time
- Indicates that land users and communities tend to remain passive in managing invasion processes.
- This could be due to high initial costs of management relative to expected revenues

Category 3: Re-invaded

- Second most widespread category.
- Usually close to constantly cleared areas.
- Indicates land users experience challenges in implementing SLMs e.g. natural disasters, and price fall of products,

Conclusions

- Spatial-temporal trajectories of IAS are key to identify drivers of land users' decisions
- Current efforts to manage IAS at the landscape level are unsustainable.

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