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

PRACTICE BRIEF

Integrating the control of invasive trees in land use and management plans

Invasive trees threaten biodiversity, ecosystem services, and the livelihoods of affected communities. If left uncontrolled, invasive trees will continue spreading, thereby invading and degrading valuable land. In this practice brief, we show that community organised management of invasive trees is possible when it is done in a joint effort of all concerned stakeholders. Using two examples, one in Kenya and one in Tanzania, we further show that a spatially explicit management approach is particularly suitable to complement existing land use and management plans.

Background

Invasive trees can colonize large areas of land within relatively short time. For example, *Prosopis juliflora* (hereafter called Prosopis) has invaded 1.2 million hectares of land within 35 years in the Afar region in Ethiopia. Invasive trees can have major impacts on the environment and human livelihoods. They can seriously reduce the availability and accessibility of water, which is particularly critical in semi-arid and arid regions in Sub-Saharan Africa. In addition, they negatively affect biodiversity, the availability of fodder for livestock and of medicinal plants for human health. Therefore, countries that have ratified the UN Convention on Biological Diversity have committed themselves to implement strategies to halt biological invasions and their

Key Messages

- Invasive trees and shrubs threaten biodiversity, ecosystem services, and the livelihoods of affected communities in many different ways.
- Management of invasive trees needs jointly defined spatial planning and coordination of management interventions across sectors and stakeholders, particularly when communal land tenure systems are affected.
- Spatially explicit management of invasive trees is especially suitable and effective when it is integrated in existing or newly developed land use and management plans.

negative impacts on nature and people. Implementing invasive species management directly contributes to achieving several targets of the Sustainable Development Goal (SDG) 15 (Life on Land) and their interactions with SDGs 1 and 2 (reduction of poverty and hunger), SDG 6 (availability of water), SDG 13 (mitigating and adapting to climate change) and SDG 16 (peaceful societies).

Management challenges

Management of invasive trees is particularly challenging due to the temporal and spatial dynamics of biological invasions (Box 1). It needs concerted efforts to reduce current cover below an economically and ecologically acceptable level, to slow down spread to new areas, or to prevent invasion of priority areas, such as national parks or drought-season grazing land in semi-arid and arid regions.

Most importantly, these temporal and spatial dynamics of invasion require a spatially explicit management concept that indicates when and where to implement which management approach (see Box 2). Such an approach needs to consider the main environmental, economic and social values of all major stakeholder groups. This is particularly relevant in those cases where communal (range) land is affected.

Successful implementation of spatially explicit invasive trees management is particularly likely when it can be integrated in existing or newly developed land use and land management plans. Below, we present two examples from communities in Tanzania and Kenya who have joined forces and are currently implementing invasive tree management on their land.

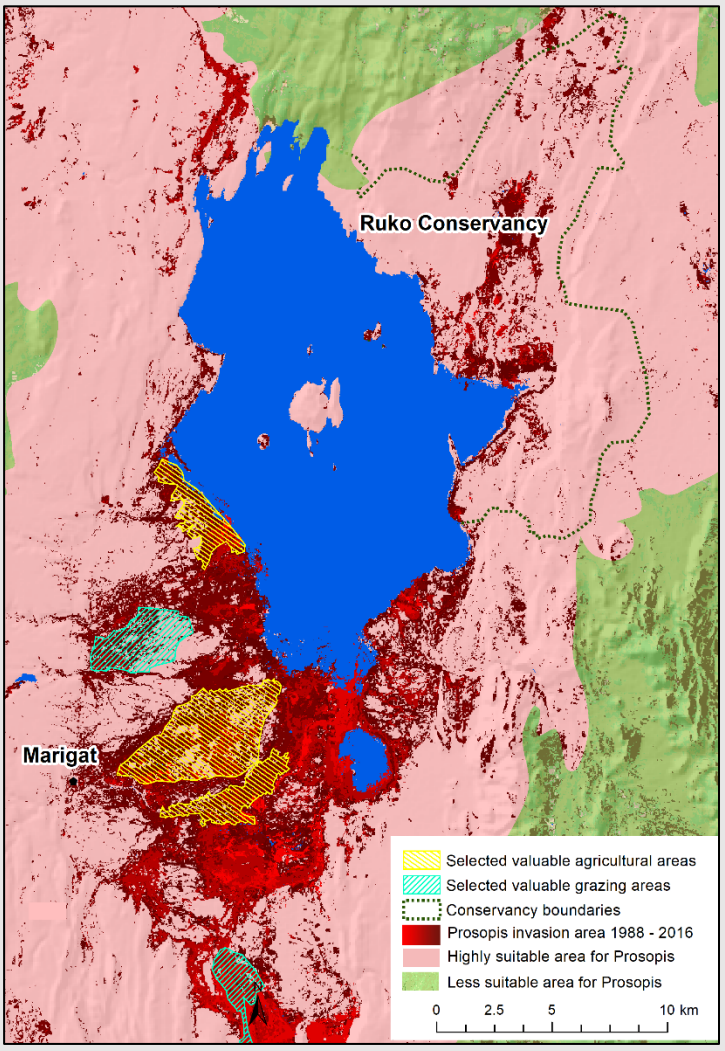
Simanjiro, Tanzania

Iltoto is a communal rangeland formed by an association of three villages in Simanjiro District, Tanzania. Building on the national Land Use Planning Act, the villages set aside

Box 1 - *Prosopis juliflora* in Baringo, Kenya

Trees in the genus *Prosopis* are native to Central and South America. In the introduced range, *Prosopis* is invasive. Once the trees establish, their seeds are dispersed by livestock and along watercourses to new sites. They can rapidly form impenetrable stands that displace valuable grazing areas. *Prosopis* is also deep-rooted, and it depletes vital groundwater resources in arid and semi-arid regions. It displaces native plants, mammals, birds and invertebrates, with severe impacts on biodiversity and ecosystem functioning. The costs associated with these negative impacts rapidly exceed any benefits, and this gap grows as the plants continue to spread.

In Baringo County, valuable conservation areas, agricultural and grazing areas have been invaded by *Prosopis* (see map below). This alien tree provides wood, but causes massive losses of other ecosystem services and high costs for land reclamation. If left uncontrolled, *Prosopis* will most likely continue spreading into large areas. Continuous control and management are needed to reclaim already invaded land and to prevent its further spread.

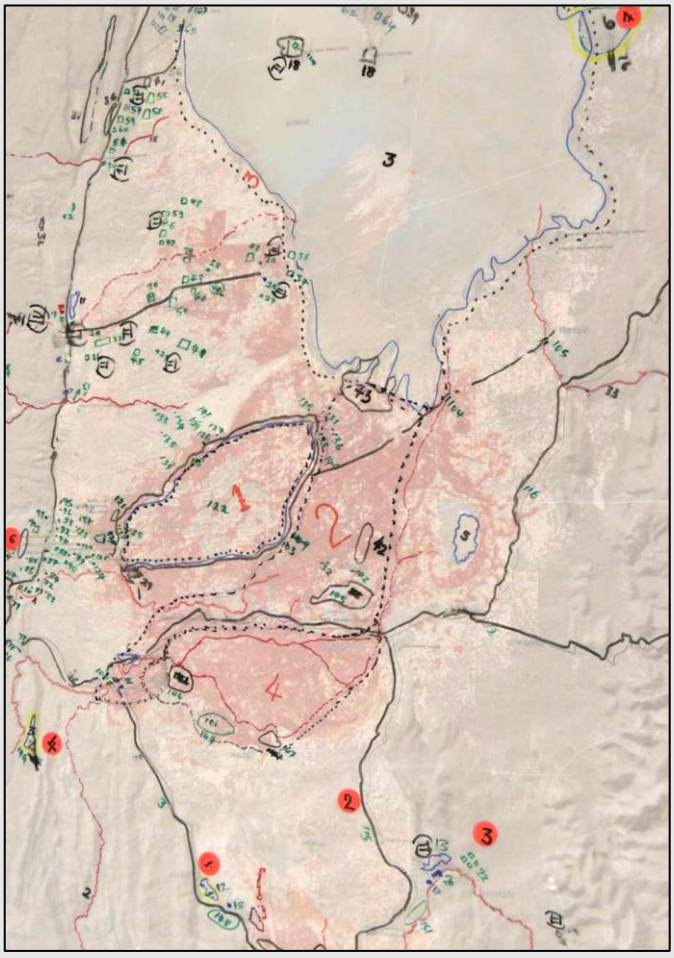


Box 2 - Spatially explicit management

A spatially explicit approach towards managing invasive trees is based on the assumption that the selection of concrete practices needs to be based on a set of spatially defined and complementary management objectives and interventions: (a) early detection and rapid response, (b) prevention, and (c) control. In order to achieve this, it is important to start by developing a common understanding, among the concerned stakeholders groups, about:

1. dynamics and trends of the invasion process
2. existing and potential environmental, economic and social impacts of these invasion processes, and
3. the spatial distribution of local resources and important assets (for example infrastructure), and how this capital is threatened by invasion

In Baringo, stakeholders co-produced a map of intervention hotspots (e.g. grazing land, boreholes, and irrigation schemes). This map (see below) can be used, together with land use and land management plans, for management prioritization and for identifying synergies and trade-offs between invasive tree management interventions and key development targets in the local context.



about 2,000 ha of land for dry season grazing and agreed on a use plan and by-laws that facilitate effective management of the rangeland. The by-laws are enforced by a team of seven members from each village.

Iltoto is one of the first communal rangeland associations that have integrated invasive species management in their land use plan. Scientists of the Woody Weeds project developed a decision support tool to help stakeholders choosing the most adequate practices and the main objectives of the management strategy. In this case, the association set an objective to prevent Prosopis from invading the dry season grazing land. The three villages assigned members to a joint surveillance team, which was trained on detecting the species at an early stage of invasion and removing it from the defined area. Through this approach, many small stands of Prosopis have been removed from the dry season grazing land.

Ruko conservancy, Kenya

Ruko Conservancy in Baringo County is a merger of the Rugus and Komolion communities in a bid to resolve inter-communal conflicts over natural resources and channel energy towards conserving endangered species (including the Rothschild giraffe) which are vital for tourist attraction.

However, Prosopis has recently invaded the conservancy, threatening conservation efforts and the peaceful coexistence among pastoral communities. During a meeting with scientists of the Woody Weeds project, the conservancy's board decided to implement an 'early detection and rapid response' management approach. Forty community members and rangers were trained in removing Prosopis trees to prevent regrowth. Likewise, there is a plan to regulate movement of livestock from heavily invaded areas into the conservancy by establishing a quarantine zone. The Woody Weeds project has assisted the process through community sensitization and the provision of technical support and in buying tools for uprooting. The sustainable management of Prosopis, which includes regular surveillance of the territory and the removal of seedlings, has been integrated in the general land management plan of Ruko Conservancy.

Take home messages

1. Rapid spread of invasive species threatens ecosystem services and rural livelihoods.
2. Successful management of invasive species calls for their integration into land management plans and a better understanding of the spatio-temporal aspects of biological invasions
3. Participatory engagement of local actors in management efforts is key in enhancing ownership of management options.

Further reading

Linders, T et al. (2019) Direct and indirect effects of invasive species: Biodiversity loss is a major mechanism by which an invasive tree affects ecosystem functioning. Journal of Ecology 107: 3660-3672

Eschen, R et al. (2021) *Prosopis juliflora* management and grassland restoration in Baringo County, Kenya: Opportunities for soil carbon sequestration and local livelihoods. Journal of Applied Ecology 58: 1302-1313

Schwilch, G et al. (2012) Decision support for selecting SLM technologies with stakeholders. Applied Geography 34: 86-98

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The Woody Weeds project

The Woody Weeds project is funded by the Swiss National Science Foundation (SNSF) and the Swiss Agency for Development Cooperation (SDC). It aims to quantify the impacts of invasive woody plant species on biodiversity, ecosystem services, and human wellbeing in selected study areas in Ethiopia, Kenya and Tanzania, and to develop sustainable land management strategies in the invaded areas.

Project website: https://www.woodyweeds.org/ **Twitter:** @woodyweeds_org

The Woody Weeds project is implemented by CAB International, Kenya Forestry Research Institute (KEFRI), Centre for Training and Integrated Research in ASAL Development (CETRAD) (Kenya), Sokoine University of Agriculture, Tanzania Forestry Research Institute (Tanzania), Haramaya University, Water and Land Resource Centre (Ethiopia), Centre for Invasion Biology (South Africa) and Centre for Development and Environment, University of Bern (Switzerland).

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