The control of invasive vegetation on Olifants West Nature Reserve

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1. Introduction
Vegetation is a primary driver of the ecosystem in Olifants West Nature Reserve (OWNR), and managing all aspects of this are important for a successful reserve. A key aspect of healthy flora in the species composition and a direct threat to this is invasive alien plants. In 1997 the IUCN stated that invasive vegetation is the second largest threat to global biodiversity (Sinclair and Walker, 2003). Invasive vegetation competes for the same finite resources as indigenous vegetation and is a danger to a reserve’s natural flora impacting vegetation structure and biodiversity. Invasive vegetation faces no natural predators giving it a major advantage in outcompeting native vegetation.

Invasions by non-native flora has been widely studied in South Africa, with the aim of eliminating invasive species and restoring ecosystems to their natural state through the reestablishment of natural biodiversity. Kruger National Park Management concluded that invasive vegetation is one of the largest threats to biodiversity (Lotter and Hoffmann, 1998).

Invasive species are a serious threat to biodiversity and should be treated as such within OWNR. The best-case scenario when dealing with invasive species is the total eradication of said species. However, this is not always a feasible goal, instead a more realistic aim is to control these species at acceptable levels by reducing their density and preventing them from spreading further across the landscape as these plants can spread and colonize a landscape very quickly.

2. OWNR
Olifants West Nature Reserve (OWNR) is occupied by a number of different invasive species that occur throughout the different vegetation types of the reserve, from riverine areas to sodic sites. However, we are currently focused on dealing with invasive cacti and the most abundant cacti are sweet prickly pears (Opuntia ficus indica) and queen of the night (Cerus jamacaru) while jointed cactus (Opuntia aurantiaca), harrisia cactus or moon cactus
(Eriocereus martinii), and boxing glove cactus (Cylindropuntia fulgida) can also be found within the reserve.

All the invasive cacti recorded within Olifants West are category 1 plants according to CARA (Conservation of Agriculture Resources Act, 1983), which states that under no circumstances may category 1 plants be allowed on any land or inland water areas outside of biological control reserves. The responsibility of controlling category 1 plants lies with the land user. No person is permitted to grow or cultivate category 1 plants. Moreover, land users are legally required to control category 1 plants through several methods including;

1. Mechanical removal – uprooting, cutting, or burning the plant.
2. Chemical – treatment with a chemical designed to kill the plant.
3. Biological – control the plant using biological methods.
4. Combination of the previously mentioned methods (1), (2) and (3) in a way that the biological control is not tampered with to the point where the biological control is inactive.

These methods must be completed in such a manner that category 1 plants are prevented from re-growing or spreading in any form. In order to accurately control category 1 plants, follow up procedures are obligatory to realize the achieve result. When dealing with category 1 plants, careful execution is necessary to have the least possible impact on the environment. In terms of mechanical removal, the plant needs to be small enough for a successful removal. If any roots or even a single cladode is left behind then the plant can resprout, negating all efforts to control said plant. Transfrontier Africa (TA) has combated invasive vegetation since 2012 and this report gives an overview of the areas recently monitored and treated.

3. Method

As stated above, there are 3 primary options in combating invasive vegetation; biological, chemical and mechanical. The biological and chemical methods are the most effective in combating invasive vegetation. The manual/mechanical removal of plants is impractical as all of the plant including the root system needs to be removed in order to prevent regrowth, making this task extremely labour intensive. Biological treatment relies on a species of insect that are host specific initially preventing the production of reproductive parts, as well as retarding the plants growth, and ultimately killing the plant.

Biological control is done by leaving a (part of an) infected plant next to the alien. As the infected host becomes utilised the biocontrol spreads to the new plant and the infection is established. This method is slower than the others, however once infected the plant can then spread the bio control to other plants close by thereby avoiding the need to infect all plants initially by hand.

Chemical control is done using MSMA (Monosodium methanearsonate) and is used at 5% concentration mixed with water and a drop of liquid soap. There are other options in terms of biological control for these invasive species. A number of incisions are made in the plant after which the plant is sprayed with the mixture.
Mechanical removal requires the plant to be dug up with all the roots in tact and removed from the reserve. The plants can then be left on a hard surface in the sun to desiccate before being burnt, or planted in the alien nursery to serve as hosts for biological control agents.

The are several factors which determine the method of treatment that can be used; size of the plant, density of the infestation, season and likelihood of spreading. Mechanical removal is preferred for small plants as this is a feasible and provides new plants for the alien vegetation nursery. Larger plants are either infected with bio control or sprayed with MSMA. Chemical treatment cannot be used on a day rainy day as the chemical will wash off the plant.

In order to treat invasive vegetation accurately and efficiently within OWNR, a roadside survey is conducted along the road network of OWNR. The roads are grouped according to the 1KM² security grid references with the grids covered systematically. This allows for an accurate and detailed record of which areas of the reserve have been covered. The roads and grids covered during the survey are tracked and monitored using a GPS and Avenza maps in the field, and subsequently recorded in Quantum GIS (QGIS). QGIS is used to calculate the area of the reserve covered through the roadside survey and the area that has not been surveyed. Areas that could not be surveyed during the roadside survey, i.e. either the vegetation is too dense, or the area is not accessible by road, will be surveyed on foot in search of invasive species.

While conducting the road surveys there must be a driver and at least 2 spotters in the car. When an invasive species is located from the car, data is collected on the invasive plant. The data collected is the GPS location, species, size, and if the plant shows signs of previous biological or chemical treatment. Once this information has been gathered the plants are then treated or removed. Once this is complete, a 50-metre area around the plant is surveyed on foot in search of other invasive species. If any other invasive plants are found during this walk the same method (data collection, treatment and 50 metre walk around the plant) is applied.

These data are logged in Avenza maps app when conducting the roadside survey or when an invasive plant is found within the reserve. This roadside survey consists of three main strategies; primary detection which is detecting an invasive species from the car, secondary detection which is detecting an invasive species on foot while searching near a species found through the primary detection, and tertiary detection which is when an invasive plant is found while conducting other research projects on foot in the reserve.
4. Results

Over time it has become clear that the season has a significant impact on both the detectability and the efficacy of the control method. Summer, being the wet season, has the least visibility as well as a higher chance of rain washing off either the bio control or the chemical treatment. For this reason there has been less time spent on alien vegetation in this quarter compared to previous quarters. Figure 1 shows the detection and treatment of aliens over the last 5 quarters.

Locations and treatment of alien vegetation species on Olifants West per quarter
Other species include boxing glove, jointed, and moon cactus

Figure 1. Overview of species found and treated per quarter in OWNR.

As the season is not favourable we have focussed our efforts on increasing the biological control in our alien vegetation nursery and obtaining more control agents for other species. We now have bio control agents for 4 different cacti species and will be resuming our efforts during the dry season.

To ensure a more successful spread of biocontrol we will also be conducting some experiments of the spread of bio control agents in a controlled environment to determine the maximum distance the bugs can spread as well as the season that they are more or less likely to spread.

5. Riperian aliens

OWNR is located on the Olifants river which carries many seeds in its waters. Coming from outside protected areas the seeds are a mix of indigenous and alien plants. A survey of the riverbank as well as the major drainage line, Mohlap, shows a significant increase in red sesbania *Sesbania punicea*, large cocklebur *Xanthium strumarium* and common apple thorn *Daruta stramonium*. These species spread easily and need to be controlled as soon as
possible. The first control will be done in the next quarter but as it is already late in the season many of the plants will have gone to seed already and control will need to be repeated next season before the plants have been able to seed. This is a very labour intensive process as there are no biocontrol agents and being in the riparian zones chemical treatment is not advised. Removal of the plants by hand is the best option, with as much of the upstream area included to prevent respreading during the wet season.

6. Conclusion

The method for controlling alien cacti in OWNR has been used for several years now and almost the entire reserve has now been covered. The coming 2 quarters the efficacy of the methods will be explored and experiments conducted to optimise the method for future. This will allow for a more efficient use of resources. Revisiting plants is vital to ensure that the control method was effective in exterminating the plant. A representative sample of plants will be selected of each species to revisit and assess the efficacy of each.

Not all landowners are willing to grant access to our fieldwork teams which reduces our ability to eradicate the species on the reserve. We hope that by deploying biocontrol in the most favourable time of year the chances of them spreading to these areas increases.

A strategy will be formulated to deal with other aliens that enter the reserve via drainage lines and the river and this will be included in the next report.