

Stakeholder involvement: Making strategies workable

Involving stakeholders in formulating workable strategies for managing invasive species. **Ana Novoa** and **Ross Shackleton** share lessons from two very different plant groups – cacti and mesquite.



American Giant: One of the spineless cultivars of Opuntia ficus-indica (cactus pear). Image: A Novoa



Open discussions between stakeholders who benefit from cactus species in South Africa and stakeholders who want to reduce their negative impacts. Image: A Novoa

Humans have moved species to areas outside their native ranges for millennia, and alien species are now common components of most ecosystems. Agriculture, forestry, pet and horticulture trade in most parts of the world are largely based on alien species. Some examples of valuable alien species that have been introduced globally are tomatoes, native to the South American Andes, chickens from Asia, and roses which are native to Asia, Europe, North America and northwest Africa.

Only a very small proportion of alien species become invasive. These invasive species have major ecological and socioeconomic impacts in their new areas. For example, famine weed (*Parthenium hysterophorus*), native to southern United States, has been accidentally introduced to South Africa and it has become an environmental and agricultural pest. It grows on all soil types and in a wide range of habitats. Famine weed suppresses native vegetation and crop yields and contaminates crop seed, meat from livestock that has eaten the weed is not fit for consumption, and regular contact with the plant produces allergic dermatitis

and asthma in humans. Another example of a harmful invasive species is the Asian fruit fly. The Asian fruit fly was accidentally introduced to Africa around 2003, and soon after the first introductions, it spread rapidly throughout the continent, carried in infested fruits. Currently, it is the world's worst destructive pest of fruit and vegetables, affecting the livelihoods of many farmers.

Costs, benefits and conflicts of interest

Despite the previously mentioned examples of 'desirable' and 'undesirable' alien species there are many that involve both benefits and costs. These can raise substantial conflicts of interests around their use and management. For example, alien conifers were introduced from Europe and North America over 300 years ago and have been widely planted in South Africa. These trees bring many benefits to the South African economy by providing timber and jobs. People also like them for aesthetic reasons. However, these trees cause several unintended problems: dense stands of invasive trees reduce water supply, grazing potential and lead to the loss of South Africa's natural habitats and species. These wide ranges of positive and negative impacts have created a conflict of interests between foresters (who make money from plantations), the public (who like the trees for aesthetic reasons, or whose land is negatively affected by them) and conservationists (who want to conserve biodiversity).

As a consequence of these kinds of conflicts, there has been increasing interest in assessing the perceptions of different stakeholders involved with alien species. However, in most cases there is still a lack of collaboration between different parties, such as scientific researchers, the commercial sector (e.g. nurseries, pet shops, landscapers, and farmers), invasive species managers, policy makers and the public. This can result in the failure to develop and implement successful management strategies for invasive species.

In this article we explore approaches for facilitating interactions between stakeholders involved with alien species. We use the family Cactaceae (cacti) and the genus *Prosopis* (mesquite) in South Africa as study cases to find solutions for this problem.

Cacti

The problem

Cactaceae is a family of 1919 plant species that are almost all native to the Americas. The first alien cactus species arrived in South Africa early in the 18th century. Over the following two centuries many species were introduced to produce fruit for human consumption and fodder for livestock and are still being used for this today. Over the last 60 years, hundreds of new species were introduced to South Africa, almost exclusively for ornamental purposes. Food-science researchers (specialising in a wide range of crops) are also looking to develop the agro-industry around cactus in South Africa. Their fruit can be processed into jams, marmalades, juices, syrups, and cladodes (the fleshy leaf-like structures) can be consumed as vegetables, pickles and flour.

However, many of the introduced species have naturalised and 35 cactus species are currently listed by the government as invasive in South Africa. The negative impacts of invasive



Dense stands of *Prosopis* species (mesquite) fringe water courses in many parts of the arid interior of South Africa. Image: R Shackleton



A survey was done across the invasive range of mesquite in South Africa to determine the perceptions of stakeholders regarding the benefits and costs associated with the species. Image: R Shackleton

cacti on South African biodiversity, ecosystem functioning, resource availability, national economy and human health have been recognised for well over a century. These benefits and costs have resulted in numerous conflicts.

The solution

To address the conflicts surrounding cacti in South Africa, we identified relevant stakeholders (nursery owners, farmers, land managers, scientists) and assessed their perceptions through questionnaires. We found that those stakeholders who were positively affected by cactus species were not aware of some of the negative environmental and socio-economic impacts of cactus invasions, while those stakeholders who wanted to reduce the negative impacts of cactus species in South Africa were not fully aware of their positive impacts.

We then tried to enhance the interaction between stakeholder groups through open dialogue and discussions in a one-day workshop organised by the Centre for Invasion Biology. Surprisingly, one session of interaction and dialogue between stakeholders was enough to increase

Cactus pear vs prickly pear



The fruit of the prickly pear. Image: Wikimedia Commons

The prickly pear (*Opuntia ficus-indica*) was introduced from Mexico to South Africa early in the 18th century. Since then, many stakeholders benefitted from the species: households sell prickly pear jam in local markets, traditional medicines are used both domestically and sold, fruits are a source of income and nutrition for many local communities, and it is used as an important agro-forestry species for fruit consumption and animal fodder. However, in the 1980s prickly pear became invasive, displacing native vegetation and crops, negatively affecting livestock and humans (injured by its spines), and creating a conflict of interests between positively affected stakeholders and those stakeholders who wanted to reduce its negative impacts. This conflict of interests was soon addressed, thanks to the existence of a non-invasive alternative: the cactus pear. In the 20th century, an American nursery owner (Luther Burbank) developed spineless cultivars of *Opuntia ficus-indica*. Due to their lack of spines, these cultivars (known as cactus pear) are not invasive. Therefore, stakeholders positively affected by the prickly pear, could use a non-invasive alternative, the cactus pear. Nowadays, cactus pear is being widely used in South Africa and all over the world as an important agro-industrial crop. However, more awareness and transfer of knowledge are needed to stop the use of spiny *Opuntia* species in South Africa.

their 'cactus knowledge' and improve the willingness of all stakeholders to collaborate on cactus management actions.

After this first interaction, we arranged open discussions to help in identifying key barriers to cactus management in South Africa. Some of the identified barriers (e.g. 'lack of funding' or 'lack of prioritisation of control efforts') are common to all invasive species management. However, other barriers come from particular parties' interest, such as 'some invaded areas are not easy to access' identified by managers from South African National Parks (SANParks). It was only by involving all parties in the workshop that we could identify all the barriers to successful management. These discussions also allowed us to openly discuss potential solutions for each barrier and develop regulations to guide the management of harmful invasive cacti. As a result, management objectives were broadly supported by all stakeholders.

Mesquite

The problem

Prosopis species (mesquite) were introduced to South Africa from the Americas to provide fire wood, fodder and shade to farmers and rural communities in arid parts of the country. These trees still provide these benefits, but with time and increased invasion in the mid-1900s, numerous negative impacts on humans and the environment were observed.

These include: reduced water supply and impacts on natural grazing lands, loss of biodiversity, decreased property values, and breakage of infrastructure due to the strong roots. The wide range of positive and negative effects of mesquite stands had led to conflicts between those who want to use and promote mesquite trees (e.g. some farmers and NGOs) and those who want to reduce the negative impacts of mesquite (some farmers and conservation managers). But before alternative management approaches can be adopted (biological control) it was important to get a better understanding of stakeholder perceptions, wants and needs.

The solution

As explained in the previous example, we assessed the perceptions of stakeholders to get a better understanding of the issues regarding mesquite in South Africa. We found that some groups use and benefit from mesquite (farmers use the trees to provide fodder while poor communities harvest trees for fuel wood). However, other groups are predominantly negatively impacted by it (e.g. urban dwellers). People from urban areas (suffering impacts on their infrastructure and aesthetics) face different impacts as a result of mesquite invasions to people in rural areas (who experience loss of land). We also found that for all stakeholders the costs of mesquite were greater than the benefits, warranting the need for improved management.

Through workshops with different stakeholders, we are getting a better understanding of the factors that prevent effective management of mesquite. This work has highlighted the fact that different groups are facing different problems and have different perspectives on what is needed to manage mesquite. For example, Working for Water Programme managers highlighted the high expense of clearing mesquite and the fact that government departments are not working together as the biggest barriers to effective management, whereas researchers suggested that contrasting interests, lack of knowledge and poor prioritisation are the major issues.

What did we learn from *Prosopis* and Cactaceae?

Invasive species are a major driver of global change, affecting numerous groups of people in positive and negative ways. This situation can make understanding the roles of invasions difficult for society. Moreover, it can complicate the choice and/or application of different policy decisions and management options.

The case studies described (and others) have shown that we need to consult all interested parties to understand all dimensions of the problem, to identify misconceptions and gaps in knowledge, to understand how this knowledge can be transferred to the population, to solve conflicts of interests around alien species, and to build consensus and integrate different perspectives to arrive at sustainable strategies for managing invasive species. **Q**

Ana Novoa is a postdoctoral researcher at the Centre for Invasion Biology (C•I•B). She works on understanding the history of introduction, ecology, distribution, and management of succulent plants in South Africa.

*Ross Shackleton is a final year doctoral student at the C•I•B. Ross is looking into the impacts and management of *Prosopis* invasions in South Africa as part of his PhD.*