

Ecological Restoration Alliance of Botanic Gardens

Reversing the Tide of Ecological Destruction

Connecting People • Sharing Knowledge • Restoring Ecosystems



BGCI

Plants for the Planet

ERA



ecological restoration
alliance of botanic gardens

Brackenhurst Botanic Garden, Kenya. In just 15 years a eucalyptus plantation has been restored into a thriving forest (part of which is pictured here) with over 170 bird species, a wide range of mammals and hundreds of rare plant species.

What is the Ecological Restoration Alliance?



The Ecological Restoration Alliance of Botanic Gardens (ERA) is a global consortium of botanic gardens actively engaged in ecological restoration. Members of the

Alliance have agreed to support efforts to scale up the restoration of damaged, degraded and destroyed ecosystems around the world, contributing to the Sustainable Development Goals and the United Nations' target to restore 15% of the world's degraded ecosystems by 2020.

ERA member botanic gardens carry out ecological restoration projects in a diverse range of ecosystems and a wide range of cultural contexts. The network is coordinated by **Botanic Gardens Conservation International (BGCI)**.

ERA's mission is *'to mobilise botanic gardens, arboreta and seed banks to carry out science-based ecological restoration by marshalling their expertise, networks, and resources to help achieve the restoration outcomes needed for human well-being and a sustainable future for life on Earth.'*



ERA's mission translates into five main goals:

1. Work with local partners to set up, maintain and document a series of **long-term, sustainable, exemplar restoration projects** in diverse biophysical, political, and cultural contexts around the globe that provide training and demonstrate the value of a carefully designed, science-driven approach to ecological restoration.
2. Improve the quality and volume of science-based ecological restoration practice by deploying scientific and horticultural skills to **applied work on the ground**.
3. Conduct ecological restoration research, to **develop an enhanced knowledge base for restoration** and identify and inform best practice.
4. Disseminate research and lessons learnt from projects.
5. **Build expertise and restoration capacity** through collaborations between botanic gardens, large and small, as well as with partners in local communities, professional societies, academia, industry, government, NGOs and international bodies.

A recent audit of ERA activities indicates that considerable progress and momentum has already been generated by the Alliance between 2012-2016.

- **30** participating gardens and arboreta
- **148** restoration projects in a diverse range of habitats and cultural contexts
- **537** specialists engaged in restoration activities
- Restoration sites at scales ranging from **0.1 ha to 50,000 km²**
- **US\$158 million** of project funding leveraged in the past 5 years.

Why restore?

Humans have transformed 50% of the land surface area of our planet, mainly for crop and livestock production. In doing so, we have displaced the plants and animals that used to live in these areas and disrupted the ecology of these landscapes. The consequences are not only the loss of biodiversity but also the loss of vital ecosystem services such as clean water, erosion control and pollinators for our crops. Given the obvious need for restoration, the question is not 'Why restore?' but 'How do we restore?'

How do we restore?

The botanic garden sector is ideally placed to take a leadership role in the restoration of damaged, degraded and destroyed ecosystems. Collectively, the world's botanic gardens already manage at least one third of known plant diversity in their living collections – more by far than any other sector. Botanic gardens have the skills to lead botanical surveys, identify appropriate species and to collect and propagate plant material for restoration. Botanic gardens harbour the technical and horticultural skills required to grow the whole spectrum of plants from herbs and grasses to trees, including even the most difficult of plants. In short, botanic gardens have the skills to put whole ecosystems back piece by piece.



Botanic gardens are experienced at managing sites over the long-term, making them well-equipped to lead ecological restoration projects that require long-term input and monitoring. Their expertise in training and outreach, and their public service mission gives botanic gardens the capacity to work with governments, civil society, industry and local communities, providing the tools and knowledge to achieve long-term ecological restoration goals. The restoration sites set up by ERA members are used for demonstration and training purposes, highlighting the benefits of utilising appropriate species and horticultural techniques to adopt a science-based approach to restore degraded ecosystems.

Botanic gardens manage successful ecological restoration projects throughout the world, some of which are described in more detail in this prospectus.

By 2020

Over the next five years ERA will mobilise botanic gardens on six continents to:

- Expand our portfolio of exemplar, long-term restoration projects
- Improve restoration practice on the ground
- Address gaps in ecological restoration research
- Disseminate research and lessons learnt
- Build expertise and restoration capacity both within and beyond our sector.

Drylands

The loss of drylands is a growing global problem and has a huge impact on the well-being of millions of people. However, the importance of drylands is often overlooked and, as a result, the specific skills required to restore dryland areas are often lacking. ERA members have experience restoring dryland areas that have been degraded as a result of land conversion to agricultural or mining activities.

The unique expertise that ERA members hold can be applied to restore dryland areas across the globe and to deliver training in propagation and horticultural techniques specifically required for dryland species.



Case study: Australia

Mine restoration

Koolanooka iron mine (left) is a severely degraded dryland landscape in Western Australia. The growing global demand for raw materials is accelerating mining of coal, aluminium and rare earths. This, combined with the fact that these deposits often lie below species-rich forests and shrublands, has meant that knowing how to restore mined landscapes is an absolute priority. Work carried out by **Kings Park and Botanic Garden** in Perth, Australia, in collaboration with mining companies, has successfully restored several mined areas, such as Koolanooka, using cutting-edge science and modified mining procedures. Over 90% of plant species were restored in the mined Jarrah Forest (above), substantially reducing the risk of erosion in the area, and safeguarding Perth's water catchment.



Case study: Jordan

Restoration to combat soil erosion

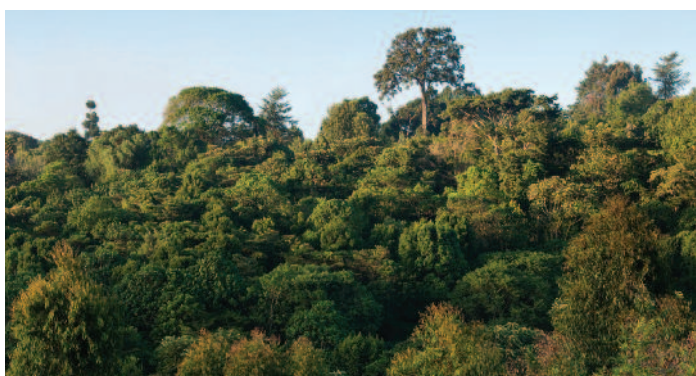
Desertification and food security are two major challenges facing the Middle East. The **Royal Botanic Garden Jordan** launched a community-based project in 2007 to address pressures such as soil erosion and low productivity created by excessive grazing on its site. A managed grazing programme was established with the local herding community, alongside a programme to collect seed and cuttings from native tree species, develop propagation protocols and deliver training in propagation and planting techniques to the local community. The condition of the soil has improved and there has been a significant increase in plant diversity. Whilst regenerating the land, the project has brought a greater understanding of sustainable land management practices to the local communities involved.



Tropical forests

Huge areas of tropical forest have disappeared in the past century, and although some reforestation has taken place, much of this has been through the planting of commercial monocultures. These plantations often fail to provide adequate biodiversity conservation and ecosystem services that the original forests offered.

Restoring the high levels of biodiversity that characterise these forests is a challenging task, however after almost two decades of tropical forest restoration research, ERA members have managed to achieve considerable biodiversity recovery. This specialised knowledge can be applied to restore more tropical forests around the world.



Engaging with local communities is essential for the long-term success of restoration initiatives. ERA members are experienced with working in partnership with local communities to renew their sense of forest stewardship and to encourage sustainable development.



Case study: Kenya

Restoring native forest

Brackenhurst Botanic Garden located near Nairobi, Kenya, has become a model for East African habitat restoration initiatives. Established in 2000 the garden is restoring 40 ha of former exotic eucalyptus plantations back to indigenous forest. The forest restoration plots are of varying ages and include nearly 1,500 species of East African plants, including understorey species. The site boasts 170 species of birds, double the number that were present when restoration began, and Colobus monkeys have returned to the site after 60 years of absence. Having restoration plots of differing ages provides a unique opportunity for demonstrating the timescale and benefits of forest restoration, and research has enabled top performing native tree species to be identified. These species are now being promoted to other restoration practitioners in the region. This project also provides livelihood opportunities in an area where unemployment is high, by training and employing local people.

Case study: Madagascar

Community-based restoration

Over the last decade, **Missouri Botanical Garden's** Madagascar Research and Conservation Program has implemented community-based forest restoration at twelve sites scattered throughout the country. In total these sites encompass 61,650 ha and include an array of native vegetation types. Restoration activities have included:

- Reducing or, if possible, eliminating destructive activities such as wildfires and shifting cultivation
- Establishing nurseries that produce seedlings of native trees for forest restoration projects, as well as fruit and spice trees to provide food and income for local people
- Planting fast-growing trees as sources of fuel wood and timber for local people, to provide an alternative to felling native forest.

Grasslands

Grasslands cover approximately 40% of the world's land surface and are amongst the most species rich ecosystems in the world. However, to feed the world's rapidly growing population, a large proportion of the world's grasslands have been converted to agricultural use. ERA members have played a pioneering role in the ecological restoration of grasslands.

Case study: United Kingdom

Lowland meadow restoration

Since the 1940s, 97% of the species-rich lowland meadows of England and Wales have been lost, largely due to changes in agricultural practices. The **Royal Botanic Gardens, Kew** has been exploring different methods of reintroducing native wildflower species into degraded grassland habitats. Evidence-based advice is now being shared with others embarking on grassland restoration. Demonstration plots allow visitors to observe different grassland restoration techniques, teaching them how to restore their own wildflower meadows at home.



Case study: United States of America

Prairie restoration

Dixon Prairie, a 6 ha mosaic of prairie communities containing over 250 native plant species, was established in 1980 by **Chicago Botanic Garden**. The creation of the Dixon Prairie was an impressive operation with gravel, sand and topsoil being brought in to establish the appropriate soil composition and thousands of prairie plants were planted. Chicago Botanic Garden continues to carry out research to improve on the restoration outcomes of this innovative project. For example, certain native species have proved difficult to establish due to competition from exotic invasive species from the surrounding urban landscape. Researchers and practitioners within the botanic garden are leading pioneering, interdisciplinary scientific research to solve this and other challenges to restoration success.



Riparian and wetland areas

Riparian areas are ecologically important as they act as wildlife corridors, provide aquatic habitat and reduce the risk of bank erosion and flooding. Many riparian areas have been degraded through human activities such as river diversion for irrigation, and deforestation. The consequences of these actions, such as increased flooding, have only recently been fully appreciated and have led to a surge in demand for riparian restoration. The technical expertise of ERA members can be used to improve the quality and success of riparian restoration initiatives.



Case study: United States of America

Riparian restoration

Deer Creek, which flows through **Denver Botanic Gardens** Chatfield Farms, has been managed intensively since the 1800s and is an example of a degraded riparian habitat. It is now being restored to a more natural state by improving man-made channels to return the creek to its historic, meandering flow. The installation of three man-made structures using natural materials will enable bank overflow which is essential for the regeneration of native riparian species. So far over 1,150 native willows and cottonwoods have been planted in the 2.2 ha area and weed removal is ongoing. A key objective of this project is to create a riparian demonstration garden and an interpretive trail to educate the c.150,000 visitors that come to the garden annually, mostly from nearby urban areas, about the need for restoration work to protect waterways.



Wetlands have been greatly exploited throughout history, often diked and drained to make way for agriculture and human settlements. This is of great concern as wetlands are an incredibly important resource, able to protect water quality, provide flood control and support unique wildlife and vegetation. The rate of loss and degradation of wetlands is accelerating across the world and is only likely to increase further as the global demand for land and water grows. ERA members have the skills and experience available to help address this loss.



Case study: Canada

Wetland restoration

Since 1993, **Royal Botanical Gardens**, situated in Ontario, Canada has been restoring freshwater wetland at the western end of Lake Ontario. The combination of extremely high densities of the invasive common carp, nutrients and pollutants from urban sources and artificially elevated water levels, had resulted in the breakdown of ecosystem function and the loss of 85% of wetland vegetation. However since restoration efforts commenced, native aquatic vegetation has doubled to 131 ha and water clarity has improved significantly. This project is an excellent example of how a botanic garden can address large-scale habitat degradation and invasive species management.

Supporting services

Botanic gardens also play a key role in supporting restoration efforts by providing a number of services and resources such as baseline floristic surveys and inventories, development of propagation protocols for individual species, reintroduction of threatened species and advice on how to store and germinate seeds. Botanic gardens can also build capacity for ecological restoration through provision of training and can raise awareness of the importance of ecological restoration through public outreach programmes.

Survey work

Throughout the restoration process reference and restoration sites need to be surveyed and monitored. Botanic gardens have the taxonomic expertise and herbarium resources necessary to complete this work to a high standard.

Case study: *The Centre for Middle Eastern Plants*

The **Centre for Middle Eastern Plants (CMEP)** was established at the **Royal Botanic Garden, Edinburgh** in 2009 to provide expertise in plant identification and field surveying across the Middle East and South West Asia. Some of the services offered by CMEP include: habitat and species surveys, Environmental Impact Assessments, Convention on Biological Diversity (CBD) compliance, soil surveying and ecological modelling.



Collecting, storing and germinating seeds

For large-scale restoration efforts, large quantities of appropriate seed are needed. Lack of sufficient native species stock has been identified as a major obstacle to ecological restoration. Botanic gardens can help address this gap. Many of the world's botanic gardens play a leading role in collecting and storing seed, as well as undertaking seed research.



Case study: *The Millennium Seed Bank Partnership*

The Millennium Seed Bank Partnership launched by the **Royal Botanic Gardens, Kew** in 2000, is now the world's largest wild plant seed bank and works with partners in 80 countries to identify and share best practices in collection, storage and germination of seeds.

Training and public outreach

The Ecological Restoration Alliance of Botanic Gardens runs a series of training workshops in restoration-related disciplines, making full use of the expertise within its network.

Over the past two years, the following training courses have been run by BGCI in support of the ERA programme:

- Native seed collection and planting - **International Institute of Tropical Agriculture (IITA) Forest Unit, Nigeria** (June 2016)
- Tropical forest restoration - **Brackenhurst Botanic Garden, Kenya** (March 2016)
- Native seed collection and planting - **Wondo Genet College Arboretum, Ethiopia** (December 2015)
- Native seed collection - **Argentina** (November 2015), **India** (May 2016) and **Panama** (September 2016).

In addition, ERA maintains a Directory of Expertise on its website. See <http://erabg.org/expertise-directory>

Case study: *Restoration ecology training courses*

In March 2016, BGCI and the ERA held a 5 day training course on tropical forest restoration at **Brackenhurst Botanic Garden** in Kenya for 20 participants from East African botanic gardens, NGOs and government representatives carrying out tree planting and forest restoration programmes.



ERA Members



Atlanta Botanical Gardens, USA



Brackenhurst Botanic Garden, Kenya



Botanic Garden Meise, Belgium



Chicago Botanic Garden, USA



Denver Botanic Gardens, USA



Fairchild Tropical Botanic Garden, USA



Jardín Botánico Francisco Javier Clavijero, Mexico



Jardín Botánico Regional de Cadereyta "Ing. Manuel González de Cosío", Mexico



Kadoorie Farm and Botanic Garden, Hong Kong



Kings Park and Botanic Garden, Australia



Korea National Arboretum, Korea



Missouri Botanical Garden, USA



National Tropical Botanical Garden, USA



New York Botanical Garden, USA



Paignton Zoo Environmental Park, UK



Jardim Botânico do Rio de Janeiro, Brazil



Royal Botanic Garden Edinburgh

Royal Botanic Garden Edinburgh, UK



Royal Botanical Gardens, Canada



Royal Botanic Gardens, Kew, UK



Royal Botanic Garden Sydney, Australia



South China Botanical Garden, China



The Dawes Arboretum, USA



The Eden Project, UK



The Morton Arboretum, USA



The Royal Botanic Garden, Jordan



Tooro Botanical Gardens, Uganda



University of Oxford Botanic Garden and Arboretum, UK



Xishuangbanna Tropical Botanical Garden, China

How you can help

Your support will enable the ERA to continue and expand its vital work of restoring damaged, degraded and destroyed ecosystems around the world. Below are some examples of projects that are in need of funding:

Jardín Botánico Regional de Cadereyta “Ing. Manuel González de Cosío” is currently seeking funds to restore degraded land close to urban areas in the semi-arid region of Querétaro in **Mexico**. The project will test different approaches to restoration, provide training and produce handbooks to promote the most successful methods, including how to propagate high performing species.

Required funds: \$125,000 over four years



Restoration of habitat degraded by destructive invasive species, wildfires and a changing climate, is occurring on a large-scale in the arid regions of the western **United States of America**. These restoration initiatives are often limited by a lack of knowledge about which species are best able to combat the region’s growing threats (known as ‘native winners’), and an inadequate supply of native seed. Research at **Chicago Botanic Garden** is being carried out to identify native winners and seed sources that can help improve restoration outcomes. Chicago Botanic Garden is seeking funding to continue this important work.

Required funds: \$150,000 per year



Tanga Coastal Forest Botanical Garden in **Tanzania** is seeking funds to undertake large-scale mangrove restoration. Extensive areas of mangrove forest have been lost in the region due to illegal logging and agricultural expansion. Mangrove forests are of great ecological importance as they act as a coastal barrier to storms. As storm frequency is predicted to increase with climate change, being able to implement effective mangrove restoration is a conservation priority. This project will scale up mangrove restoration in the region with community participation.

Required funds: \$100,000 over three years



Tooro Botanical Gardens is seeking support to restore 40 ha of illegally cleared forest in **Uganda**. Good progress has already been made, with 16 ha of forest currently under restoration. However more funds are needed to complete this work and to establish an on-site training centre which will enable the garden to deliver training courses, workshops and publications on forest restoration to the surrounding region.

Required funds: \$75,000 over three years



For more information or to
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Work undertaken at **Brackenhurst Botanic Garden in Kenya, Tanga Coastal Forest Botanical Garden, Tanzania** and **Tooro Botanical Gardens, Uganda** is part of a broader BGCI initiative to enhance forest restoration in Africa. The aim of this project is to mobilise more African botanic gardens to use their botanical collections and skills to engage in restoration projects and provide training, advice and native plants to support government, NGO and private sector restoration programmes. Your support will allow us to expand this work further across Africa.

Required funds: \$650,000 over three years



The **National Tropical Botanical Garden** is seeking funds to restore one of the last native coastal hala (*Pandanus tectorius*) forests which also includes Pi'ilanihale, the largest ancient place of worship in **Hawaii**. This 50 ha of coastline provides many essential ecosystem services and is of great cultural importance. However, the influx of hala scale (*Thysanococcus pandani*), a pest affecting the hala tree in the Hawaiian Islands has put increasing pressure on these hala forests. The project aims to eliminate carriers of the pest in the reserve and then outplant endemic species, many of which are threatened.

Required funds: \$50,000 over one year



Royal Botanical Gardens needs your support to expand its current restoration efforts in **Canada**. In collaboration with local partners, the aim is to protect, connect and restore almost 1,900 ha of natural habitat from Lake Ontario to the Niagara Escarpment. This region is one of the most biologically rich in Canada, home to nearly a quarter of the country's wild plants with more than 50 species at risk of extinction.

Required funds: \$250,000 over five years



ERA members deliver tailored training courses to engage additional botanic gardens, NGOs, government and communities and equip them with the skills required for ecological restoration.

Required funds: \$25,000 per training course





**Ecological Restoration
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YEARS
1987-2017



Connecting people, sharing knowledge and saving plants since 1987