

Working towards environmental sustainability at the National Botanic Gardens of Ireland

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Contributing to environmental sustainability is acknowledged as a high priority for the National Botanic Gardens of Ireland and in recent years new efforts have been made not only to reduce the detrimental impact of the institution on the environment but also to promote sustainability as part of the outreach programmes and amongst visitors.

At its most basic level, sustainability means ensuring that we use the Planet's resources in a wise way to guarantee that we pass on a healthy environment, rich in the biological diversity, natural habitats and the natural resources that will be needed by future generations. In Ireland and worldwide there is increasing realization of the urgent need to care for our environment, to sustain it and nurture it for the future. This includes all the efforts made to reduce, recycle and reuse waste, conserve energy, as well as conserve threatened plants and animals and their habitats. Our underlying philosophy is that sustainability is everyone's responsibility. At the National Botanic Gardens it is accepted that the institution should make strenuous efforts to ensure that its activities are not detrimental or damaging to the environment. However that is not going far enough. We also believe that we have a considerable responsibilities and a duty to help promote sustainability amongst our visitors. The intention and hope is that over the coming years we can develop the National Botanic Gardens of Ireland as a model of sustainability, leading by example and playing a real and significant role in ensuring that we sustain our planet for future generations.

The efforts of the institution to achieve sustainability can be broadly divided into four key components:

1. Developing environmentally friendly practices in horticulture and Gardens management

This includes reduction and eventual eliminating the use of herbicides and pesticides that are potentially damaging to wildlife and the environment. For example, in the tropical glasshouses, cockroach infestation is being addressed very effectively using simple pitfall traps baited with sugar solutions, rather than resorting to potentially dangerous chemicals. Integrated pest management solutions to pest infestations are used as much as possible.

New composting programmes are also being developed which include composting garden waste and making our own composts, leaf mould and mulches. At the present time we are undertaking a cooperative community project with a local urban regeneration body to trial composts made from kitchen waste gathered in a deprived area of Dublin city. Horticultural trials are testing the suitability of these composts for use with vegetable crops and for home use in the same area. Demonstrations and lectures on compost making are included in our regular

programmes of events, and plans are in place to provide a public viewing area for the Gardens' own composting operations, including appropriate interpretation. The use of peat in the Garden is being reduced significantly, recognizing that in Ireland many important peatland habitats continue to disappear through their exploitation for milled peat for horticulture. The replanting of the Great Palm House, restored and reopened in 2004, was undertaken entirely without the use of peat in soils and composts.



Figure 1: On-site large-scale compost making provides an important resource for the National Botanic Gardens of Ireland.

The Gardens also have an active policy and programme to encourage wildlife. In recent years this has included the placing of bird breeding nest boxes throughout the Gardens and reducing the number of feral cats, which predate on the wildbird populations. A heavy infestation of introduced North American grey squirrels remains a major problem, having contributed to the extinction of the native red squirrel in the Gardens. The latter have not been seen since the mid 1990s. The grey squirrel continues to spread throughout Ireland and is now the subject of an All Ireland Red Squirrel Conservation Action Plan, proposed in 2007. If suitable control measures can be found or developed for grey squirrel control, the Gardens hope to undertake experimental reintroduction of red squirrels.

2. Promoting and supporting Biodiversity Conservation

Biodiversity conservation is an important part of the Gardens' mission, objectives and programmes, including conservation of national flora and supporting international efforts, particularly towards the achievement of the Global Strategy for Plant Conservation (GSPC). Botanic gardens worldwide have become leaders in plant conservation, not only growing rare and endangered plants but also working to restore rare plants in the wild. Botanic gardens are also helping to raise public awareness of the importance of plants and the plight of so many that face extinction. The Gardens is a member of the Global Partnership for Plant Conservation (GPPC) – a network of some of the world's major 30 organisations working for plant conservation. In October 2005, the Gardens hosted the first conference of the GPPC, attended by experts from 35 countries.



Figure 2: The 1st conference of the Global Partnership for Plant Conservation was held in Dublin in October 2005.

In cooperation with the GPPC and the Secretariat of the U.N. Convention on Biological Diversity, in October 2006, it also organized and hosted an international Liaison Group meeting reviewing progress on the implementation of the GSPC worldwide and considering priorities for the future, including plant conservation needs and strategies after 2010.



Figure 3: Participants in the international GSPC Liaison Group meeting held at the Gardens in October 2006.

Internationally, the Gardens have expanded their cooperative plant conservation programmes in recent years to work with a range of new partner institutions in several countries around the world, (including Belize, Brazil, Chile, China, Colombia and Russia) to support their efforts to conserve native floras. Priority is given to capacity building and training, particularly in aspects of botanic garden development, living collections management and horticultural training. For example, in 2007 the Gardens are cooperating with the Botanic Garden of the University of Talca in Chile to present a horticultural training workshop for botanic garden staff throughout that country. A long-term collaborative partnership with the Belize Botanic Garden continues, with regular staff exchanges and joint activities both in Belize and Ireland, particularly focused on plant conservation, education and orchid research.

At the national level, the institution is playing an increasing role in supporting plant conservation. The Gardens provide Ireland's GSPC national focal point (Dr Matthew Jebb) to guide and support Ireland's response to the GSPC and has supported the development of a 'National Plant Conservation Strategy for Ireland' that is due to be published in 2007. The Gardens have also facilitated stakeholder consultations of the strategy as well as meetings to promote cooperation between the national botanical community and local environmental managers.

In the Garden itself a series of native plant habitats are maintained to demonstrate the diversity of Irish native flora and ecosystems, which will be significantly expanded between 2007 and 2010. At the Gardens' satellite garden south of Dublin, the Kilmacurragh Arboretum in Co. Wicklow, the restoration of an area of native oak (*Quercus*) woodland is being planned, as well as a new species-rich meadows and other native plant displays. To support public awareness and the appreciation of Ireland's native flora, an annual course for the general public on Irish Botany is offered each year, including night classes, field excursions and guided tours of the native plant collections. A comprehensive pot-grown collection of native plants is being created too, used for educational purposes.

New practical projects in plant conservation and species recovery are also being developed to conserve some of Ireland's most endangered plants. For example, the Garden maintains the last surviving material of a native Irish sedge, *Carex buxbaumii*, now extinct in the wild in its only known former location in Northern Ireland. It is hoped to collaborate with the Northern Ireland environment authorities to conduct a reintroduction experiment on this species and re-establish it in a suitable natural habitat. The Gardens are also involved in the recovery of another endangered Irish species, *Inula salicina*, the Irish fleabane, known from one surviving non-fruiting clump on a lakeshore in the Irish midlands. Working with local community groups, the species has been reintroduced into a number of former locations on the lakeshore and their re-establishment is being monitored.



Figure 4: Reintroduction of *Inula salicina* to the lakeshore of Lough Derg, Co. Tipperary in the Irish midlands in 2006.

In addition, the Gardens contain probably the largest remaining population of another native Irish endangered plant, the Meadow saxifrage, *Saxifraga granulata*, which is being conserved, researched and monitored closely. The institution is also playing a part in existing and proposed All Ireland Threatened Species Action Plans on the orchid, *Spiranthes romanzoffiana* and a filmy fern (the Killarney fern) *Trichomanes speciosum*. The hope is that by 2010 the Gardens can be involved in conservation and recovery programmes for all the most critically endangered in Ireland.



Figure 5: Threatened plants conserved in the National Botanic Gardens' collection: *Trichomanes speciosum* from Ireland (left) and *Ceratozamia fusco-viridis* from Mexico (right).

In addition to conservation of native plant diversity, the Gardens are also playing an increasing role in alien invasive species management, control and public awareness. Known invasive species are no longer included in the Gardens' *Index Seminum*. The Gardens' policy is also to carry out a risk assessment on the potential invasiveness of any new species added to the collections, as well as to support proposed All Ireland initiatives in invasive alien plant monitoring, management or control.

3. Education for and about the Environment

Sustainability is included as a key element of the Gardens' education programmes. Education at the National Botanic Gardens is undertaken by staff throughout the institution with interpretation and other educational projects developed by a range of horticultural, scientific and educational staff as appropriate. For example, in the Great Palm House the horticultural team led by Brendan Sayers, Glasshouses Foreman, have created an extensive ecological and educational interpreted display of tropical plants since 2005, demonstrating the complex structure of a tropical rainforest. The display includes a wide range of plants from Central America, particularly from Belize with which the National Botanic Gardens has close links. A diversity of tropical economic plants is also on show, surrounding a traditional Maya Indian house constructed by staff of the Belize Botanic Garden who visited Glasnevin in 2005.

Educational visits and tours for children and others to learn about our biodiversity conservation efforts are offered by the staff of the Gardens' Visitor Centre, led by Felicity Gaffney. In addition, there are special workshops on sustainability for children, particularly geared towards primary schools. Special themed guided tours are also available for primary and secondary school groups on various subjects both about plants and sustainability. In 2006 the first of a series of special workshops for second level school students were offered on the subject of sustainability. These workshops were bookable by schools and offered free of charge and consisted of a two-hour workshop on the theme of 'Sustainability'. The workshop explores forests, fuels, foods and our reliance on plants and the natural environment for life. The workshop includes presentations, tours, role-play etc. The aim of the programme is to be cross-curricular in emphasis covering aspects of geography, science and other subjects.



Figure 6: Education Workshop for primary school children on 'sustainability'.

For the first time, in 2006, a special 'Sustainability Week' was held. In Sustainability Week in 2006 'Fair Trade' coffee and tea were introduced to the Gardens' restaurant and since then only such products are offered to visitors. This policy is being extended to include offering organic foods wherever possible. During the week, efforts made by the National Botanic Gardens and its entire staff to promote environmental care, recycling and biodiversity conservation were showcased for visitors. The 'Sustainability Week' also provides an opportunity for the institution to examine its own practices; what we are currently doing to promote sustainability; to explain to visitors why we believe this is so important and, most importantly, to help us plan how we can become more effective in the future.

In 2005, gardening classes for the general public were offered for the first time, suitable for beginners. The course, led by Paul Maher, Curator, included a series of evening and Saturday morning classes held over an eight-week period from October to early December 2005 delivered by the horticultural staff. Subjects included an introduction to gardening, propagation, pests and diseases, soils and composting, choosing plants for your garden, garden design, managing a small greenhouse, indoor plants, planting trees and shrubs, perennials and grasses, roses, herbs, fruit and vegetables as well as basic botany for gardeners.

As a component of the Gardens' educational programmes, an innovative science education project for schools was launched in 2006. The project makes available educational information and live environmental data about the collections and displays of tropical and desert plants at the National Botanic Gardens to schools via mini-weather stations, connected to the internet with live wireless links. Researchers from the National Centre for Sensor Research (NCSR) of Dublin City University (DCU) developed mini-weather stations to monitor environmental factors in the Great Palm House, the Succulent House and the Orchid House at the National Botanic Gardens. The mini-weather stations, called "notes", have sensors to monitor temperature, humidity, light levels, atmospheric pressure and oxygen levels in the air in each of the different Houses. The network of sensors sends real-time environmental data via wireless connections to an interactive website, eco-sensor web (www.ecosensorweb.dcu.ie).

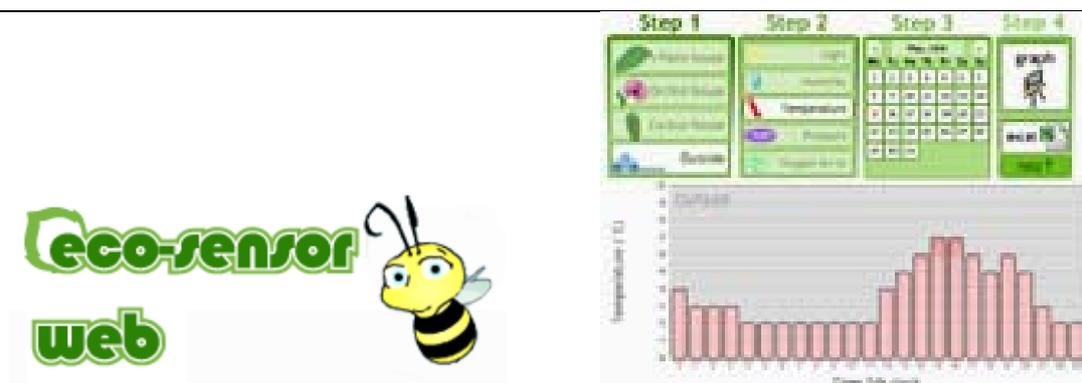


Figure 7: A science education project provides real-time environmental data for schools from the Gardens' glasshouses.

The eco-sensor web project provides schools with live environmental data and dynamic graphs that can be downloaded and used for classroom experiments and analysis. Environmental sensors also record the outdoor ambient environmental conditions too, so that students can contrast the environmental conditions outdoors with those necessary for tropical plants such as banana, sugarcane, vanilla orchid, cacti and other succulent plants to thrive.

A future priority will be to enhance the Gardens' website to include new web-based educational materials to promote environmental awareness, sustainability and understanding about the importance of plants and the threats they face.

4. Recycling and reducing waste and energy consumption

Efforts are made to reduce rubbish left by visitors to the Gardens and increasingly we aim to manage and recycle waste on-site. In the Gardens, we aim to recycle as much rubbish left by visitors as we can. This includes the collection of rubbish, transporting it off-site to a nearby commercially-operated Recycling Centre where it is sorted and recycled. Nevertheless, we also hope to reduce the quantity of waste produced and left by visitors in the Gardens by ensuring that products sold in the Gardens restaurant are sold without packaging or wrappers and by encouraging visitors to take their rubbish home with them for recycling.

In 2005 an experiment was undertaken during Sustainability Week whereby all the rubbish left by visitors was collected for a one-week period and displayed the following week, while at the same time, all rubbish bins in the Gardens were sealed. The experiment was a success and little increase in litter or rubbish left by visitors was detected. The experiment will be repeated in 2007 after which time it is hoped to gradually reduce the number of rubbish bins available for use by visitors and, if possible, eventually eliminate them entirely.



Figure 6: Collecting and displaying rubbish left by visitors in the National Botanic Gardens helped to reduce litter left during a special 'Sustainability Week' event in 2006. Encouragingly, sealed rubbish bins during the week resulted in little increase in litter problems.

Recycling paper and office wastes is now a well-established feature of the Gardens' operations. For example, much waste paper is shredded and forms a useful component of our composting programme. Nevertheless, the greatest challenge will be to achieve significant energy savings in the large gas-heated tropical greenhouses and to reduce our carbon emissions. However new measures such as the instillation of wood-pellet boilers, solar panels and the generation of electricity from water flow on our river (Hydro Electric Power) are being investigated. The first electric-powered vehicles were acquired by the Gardens in 2007. Many of the buildings and administrative offices are of historic importance and energy conservation in such older buildings is problematic. Nevertheless over the coming years as restoration of several such buildings goes ahead efforts will be made to upgrade their insulation and energy efficiency. Energy saving measures such as reducing electricity consumption are also being planned throughout the institution.