

Environmental Education in Botanic Gardens

Guidelines for developing
individual strategies

Education Guidelines



BGCI

Plants for the Planet

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Summary

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Botanic gardens are important centres for education. There are over 1,600 botanic gardens in the world which, between them, maintain the largest collection of plant species outside nature. In the wild as many as 60,000 of these plant species may be threatened with genetic impoverishment or even extinction within the next 30-40 years. Threats include such factors as habitat loss and fragmentation, introduced species, over-exploitation of plant and animal species, pollution of soil, water and atmosphere, global climate change, industry, agriculture and forestry.

Botanic gardens have an obvious and vital role to play in conserving plants but conservation cannot succeed without education. Gardens are uniquely placed to teach people about the importance of plants in our lives and in the global ecosystem. By highlighting the threats that plants and habitats face, gardens can help people look at ways in which biodiversity can be protected.

This document was originally published as a complement to The Botanic Gardens Conservation Strategy (WWF, IUCN, BGCS, 1989). Since then BGCI has published the International Agenda for Conservation in Botanic Gardens (Wyse Jackson, P.S. and Sutherland, L.A., 2000). As a consequence, these guidelines have been revised and updated. The aims of these Guidelines are to:

- highlight the role of botanic gardens in implementing the major international strategies for biodiversity conservation
- outline ways in which botanic gardens can set up and implement environmental education programmes
- offer guidelines to botanic garden educators on marketing, fund raising and publicity
- offer suggestions and guidelines for setting up local national and international education networks

The document identifies the principal elements for setting up an environmental education programme, recommending that botanic gardens:

- Identify the major plant conservation messages and sustainability issues to be addressed.
- target and evaluate their programmes carefully
- make best use of resources and facilities
- provide staff with adequate training and support
- adopt suitable educational approaches
- Collaborate with local, national and international organisations striving towards the same goals.

All the major international strategies for biodiversity conservation and sustainable living (Convention on Biological Diversity, Agenda21, International Agenda for Conservation in Botanic Gardens, Global Plant Conservation Strategy), have emphasised the importance of education in the fight to stop biodiversity loss. Botanic gardens have an important role to play in implementing these strategies. These guidelines are designed to help ensure that they fulfil this role.

1 Introduction

1.1 About these Guidelines

This document is a revised form of the original publication 'Environmental Education in Botanic Gardens: Guidelines for developing individual strategies', which evolved out of a stated need by botanic gardens for direction in setting up and developing environmental education programmes. These guidelines provide botanic gardens with a framework within which to develop their programmes.

The guidelines took two years to complete and were prepared as a complement to the Botanic Gardens Conservation Strategy. The first draft of these guidelines was discussed at the Second International Congress on Education in Botanic Gardens held in 1993 in Las Palmas, Spain. All BGCI members and many non-governmental organisations were invited to comment on the draft of the document, which was finalised, with the help of the Las Palmas Congress workshop leaders.

Examples have been included on various aspects of biodiversity conservation/education programmes currently run in botanic gardens worldwide. These serve to illustrate the variety of approaches and methods used by botanic gardens to get their message across.

BGCI views this as a significant document which can be used to push forward the development of environmental education in botanic gardens worldwide.

1.2 Why Publish Guidelines?

Botanic gardens and arboreta offer a unique window to the wonders of the plant kingdom. There are more than 1,600 botanic gardens worldwide. Together they receive over 200 million visitors each year. For some people the gardens may present the only opportunity they have to be close to nature and to learn about plants.

Plants are of fundamental importance for all life on Earth. They interact with animals, micro-organisms and the non-living components of the planet - oceans, atmosphere, freshwaters, rocks and soils - to form one interdependent system, of which we are an integral part. The vast variety of species means that we can use plants in every aspect of our lives, enabling us to adapt to changing circumstances and environments.

But, despite this, tens of thousands of plant species are at risk of genetic impoverishment. Estimates suggest that as many as 60,000 are in danger of local or even total extinction within the next 30-40 years unless action is taken to conserve them.

These Guidelines support the public education and awareness aims of the International Agenda for Botanic Gardens in Conservation, which states that botanic gardens should:

- i) Develop themselves as centres for environmental education and sustainability by having well planned environmental education programmes with appropriate resources allocated.
- ii) Employ appropriately qualified professional education staff and establish education sections or departments within their organizational framework
- iii) Develop an environmental education strategy stating what they want to achieve, how they aim to achieve it, identify the attitudes, behaviour and social change to be encouraged and identify and prioritise the target groups, conservation messages, sustainability and development issues to be addressed and facilities and resources needed
- iv) Ensure that their programme is flexible, taking into consideration different cultural and community values
- v) Develop and promote botanic gardens as centres for environmental education to schools and:
 - work with national and regional education authorities to promote the inclusion of conservation, sustainability and development goals into school curricula
 - collaborate and support teachers to bring their classes to the garden
 - develop child-friendly policies and train staff in these policies
 - conduct regular audits to ensure that the garden is 'child friendly' e.g. Access points, eating areas, storage areas, activity/play areas
 - in collaboration with regional education authorities develop and deliver curriculum based programmes in environmental education within the botanic garden
- vi) Establish strong marketing and communication skills within the botanic garden to support effective communication with the community about their mission, and to seek to influence a broad target audience,

including decision makers, politicians, teachers, technicians, practitioners, students, children, professionals, consumers and communities.

- vii) Develop and implement a range of activities, using a variety of techniques, that target a broad audience and convey messages that not only reach those who visit the garden but the whole community including non traditional botanic garden users.
- viii) Identify themes for their programmes and activities that are relevant to their local and regional environment and conservation issues
- ix) Use their programmes to raise awareness of their role in providing a sanctuary/refuge in urban areas and support local communities to 'green' their neighbourhoods
- x) Offer a variety of informal education opportunities that complement the garden's mission and target a broad audience with diverse interests using holistic and experientially based techniques that aim to achieve practical outcomes.
- xi) Evaluate the techniques used in the visitor, interpretive and educational services to ensure that they are effective in achieving their objective.

As well as being a commitment to the above aims, this document has been produced in response to an expressed need by botanic gardens worldwide to set up and develop environmental education programmes.

1.3 Aims of this document

The aims of the Guidelines are to:

- provide help and guidance to botanic gardens setting up environmental education programmes
- emphasise the essential role that education in botanic gardens has to play in the conservation of plants and their habitats
- highlight the significant role of botanic garden education in implementing the major international strategies for biodiversity conservation (International Agenda for Botanic Gardens, Convention on Biological Diversity, Agenda 21, Global Strategy for Plant Conservation)
- equip botanic gardens with a document that can be used to help raise funds for environmental education programmes.

1.4 The users

This document is primarily intended for:

- those who have, or expect to have, responsibility for education in botanic gardens

It may also be of interest to:

- those who have responsibility for botanic gardens: government policy makers and their advisers, state officials, local authorities, university administrators and members of governing bodies
- those who use botanic gardens for education: schools, colleges, universities, groups etc.

2 Environmental education - the role of botanic gardens

2.1 An international context

Although environmental education is a relatively new discipline, it is growing in importance as people realise the seriousness of biodiversity loss. Environmental education is now incorporated in all the major international strategies for biodiversity conservation and sustainable development (see References). People need to understand ecological systems in order to make the best decisions on natural resource use.

Botanic gardens have a key role to play in implementing these strategies. They are not working in isolation, they are part of a growing worldwide movement working to make environmental education accessible to everyone.

The following international strategies and conferences mark the increasing recognition of the importance of environmental education:

1977 - United Nations Intergovernmental Conference on Environmental Education in Tbilisi, Georgia, called for a holistic and bio-political approach to environmental education.

Goals of environmental education:

- to foster clear awareness of, and concern about, economic, social political and ecological interdependence in urban and rural areas;
- to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment;
- to create new patterns of behaviour of individuals groups and society as a whole towards the environment.

Tbilisi recommendations

1980 - World Conservation Strategy published by the World Wildlife Fund (WWF), the United Nations Environment Programme (UNEP) and IUCN - strengthened the call for a holistic approach to environmental education.

1985 - International Conference on Botanic Gardens and the World Conservation Strategy held in Las Palmas de Gran Canaria, Spain. The conference recognised the vital importance of community understanding and awareness in achieving conservation of biological resources. It called on governments, conservation organisations, schools and colleges, industry and concerned people to support educational programmes in botanic gardens by funding, moral support and direct involvement.

1989 - Second International Botanic Gardens Conservation Congress held in Réunion Island. The Congress recommended that all botanic gardens endeavour to communicate the valuable research aspects of their conservation work to the widest possible audience.

1991 - Caring for the Earth, A Strategy for Sustainable Development, published as a complement to the World Conservation Strategy by WWF, UNEP and IUCN, re-stated the need for the world community to change policies, reduce excessive consumption, conserve the life of the planet and live within the Earth's carrying capacity.

'...people must re-examine their values and alter their behaviour...Information must be disseminated through formal and informal educational systems so that the policies and actions needed for the survival and well-being of the world's societies can be explained and understood.'

Caring for the Earth 1991

1992 - Global Biodiversity Strategy, published by the World Resources Institute (WRI), IUCN and UNEP, emphasised the importance of education in developing human resource capacity for biodiversity conservation.

1992 - United Nations Conference on Environment and Development (UNCED), 'the Earth Summit', held in Rio de Janeiro, Brazil. Two of the outputs - Agenda 21 and The Convention on Biological Diversity - emphasised the need for more education, public awareness and training.

1993 - 29 December, The Convention on Biological Diversity came into force.

2000 – The International Agenda for Botanic Gardens in Conservation, published by BGCI, stressed the need for all botanic gardens to develop themselves as centres for environmental education and sustainability.

2002 – Global Strategy for Plant Conservation. Target 14 states that ‘The importance of plant diversity and the need for its conservation [should be] incorporated into communication, educational and public-awareness programmes’.

There is now worldwide acknowledgement, at the highest levels, that biodiversity is threatened. Governments and United Nations agencies are recognising that to address this issue they need to make a commitment to education. These stated commitments mean that botanic gardens are in a strong position to press for and obtain the support they need to implement environmental education programmes.

2.2 Environmental education in botanic gardens

Botanic gardens have long been associated with education. Many botanic gardens were established primarily for the teaching of botany and some European gardens have a tradition of biological and medical training, which goes back, hundreds of years. Horticultural education and training has also been an important function of botanic gardens and many of the people now responsible for the management of parks and gardens around the world received their training at botanic gardens.

In addition to these more traditional education programmes, gardens are increasingly turning their attention to the general public. The aim is to increase environmental knowledge and awareness and to educate people about the urgent need to conserve plants. Education is a set of processes that can inform, motivate and empower people to support plant conservation, not only by making lifestyle changes, but also through promoting change in the way that institutions, business and government operate.

All botanic gardens hold large collections of living plants and so lend themselves perfectly to teaching about:

- the incredible diversity of the Plant Kingdom
- the complex relationships that plants have developed with their environment
- the importance of plants in our lives economically, culturally and aesthetically
- the links between plants and local and indigenous peoples
- the local environment and its global context
- the major threats that face the world’s flora and the consequences of plant extinction

The facilities and resources that botanic gardens have to offer mean that visitors can:

- learn about the work being carried out by the gardens to save and conserve the world’s flora
- gain first hand experience of plants and appreciate ‘nature’ as a whole
- acquire practical skills and theoretical aspects of plant conservation, propagation and landscaping.
- develop the attitudes, behaviours and skills necessary to solve environmental problems

3 Developing an environmental education strategy for your garden

3.1 Vital elements of an education strategy

In order to develop an effective environmental education programme, the garden must decide what types of programmes it will run, who it will aim the programmes at, and which particular aspects of conservation and environmental awareness it will concentrate on.

To do this each botanic garden needs to prepare a written education and awareness plan identifying and prioritising:

- the conservation and sustainability messages of the garden
- groups to be targeted
- the facilities needed
- the facilities available
- the knowledge required for each group to understand the conservation messages
- the skills that each group needs
- the attitudes and behaviours to be encouraged
- the programmes to be developed

Educators need to consider not only the present situation in the garden, but also the capacity for development of education programmes over the next 2, 5, even 10 years. Ideas which are not seen as a priority should be set aside.

Each garden is unique and so will have particular aspects of environmental and conservation education that it is best equipped to teach. For this reason, and because the development and running of the education programme will affect everyone, it is a good idea for all members of staff to contribute to the formation of the plan.

3.1.1 Deciding on the message

The process of deciding on the particular programmes to be run will involve determining the conservation message to be conveyed to each group. A garden may want to present different aspects of plant conservation to different target groups. Each garden also needs to take into account the facilities available.

A 'whole garden' approach

It is important to link the education programme aims and objectives with the overall aims of the botanic garden. Each garden should have a mission statement (see The Botanic Gardens Conservation Strategy, Chapter 8) which the education staff should have been involved in drawing up. Garden staff need to be familiar with the mission statement when they put together the education programme. Education will be most successful when the institution as a whole adopts a co-ordinated and focused approach. To decide on the message some questions need to be asked, such as:

Locally

- Has your garden signed up to the International Agenda for Botanic Gardens in Conservation?
- What plant collections does the botanic garden have?
- Are local plants threatened and by what?
- Are their habitats peculiar to the region and are any under threat?
- Are there local developments that might threaten plant biodiversity?
- Are people familiar with local plants?
- Are there local areas in need of restoration or revegetation?
- Are there areas of natural vegetation within the garden or associated with it?
- Are there any plants the botanic garden can make available to the local community - for example could they provide plants for schools to revitalise their playgrounds?
- Do local growers produce plants for local uses, or are they mainly for export?
- Where is the garden situated geographically - in a rural or urban environment?
- What resources does the botanic garden have for education both inside and outside the garden?
- What sort of contact do local people have with the land?
- Are there other local organisations that have a similar message to impart?
- What effective local environmental action can the garden inspire?

Nationally

- Has your country signed up to the Convention on Biological Diversity?
- Is there a national biodiversity strategy?
- Is there a national environmental education strategy? How will this affect your botanic gardens education plan?
- Is there a national plant genetic conservation strategy?
- How much of the country's plant biodiversity is endangered?
- Which habitats and/or plant species are under threat and how are they threatened?
- Which plants are important in the national economy and what are the implications for conservation?
- Does the country trade in endangered plant species? What are the implications for their conservation?
- Tourism. What are the implications for conservation?
- Population growth and movement (immigration and migration). What are the implications for conservation?
- Pollution. In what way is the nation polluting its own environment and to what extent?
- Which other botanic gardens are active nationally or regionally in plant conservation? To what extent do they co-operate and share resources?

Internationally

- Some scientists estimate that up to a quarter of all higher plant species (250,000) will be threatened with extinction or serious genetic erosion in the next 30-40 years. What effect could this have on the local environment and population?
- Pollution. Does the country suffer from the effects of another country's pollution? What effect does this have on the environment and on the country's habitats and plants?
- Changing weather patterns. What are the likely consequences for the country's habitats and plants?
- World food and other trade patterns. What are the implications for plant conservation?
- Deforestation. What relevance is this to your country, region?
- What international co-operative role can/does your garden play?
- What is the role of your botanic garden in saving plant biodiversity?

Some of these issues are very wide reaching. One garden will not be able to tackle them all. The important point is that educators are aware of and look at these issues when devising the education programme. Not every issue will be appropriate for every group. Young children probably will need practical, 'hands on' sessions whereas older children and adults may find the wider, more philosophical issues, interesting. Groups of teachers may be well informed on the scientific issues but less aware of practical activities that can be used with their classes and vice versa

3.1.2 Identifying target groups

An important step in the formation of an education plan is to decide exactly whom the programmes will be targeted at. A garden may decide to target groups of people who already visit the garden or they may hope to reach people who have not previously visited. Part of deciding on who to target may involve carrying out a visitor survey but the main target groups for most gardens will include at least some of the following:

- schools - infant, primary and secondary.
- teachers - both in-service and pre-service (by training 30 teachers, a garden can reach 30 times the number of children in each class)
- colleges and universities - plant science, botany in particular, as a subject in tertiary institutions is diminishing in many countries and botanic gardens are increasingly being called on to fill this role.
- youth clubs - most countries have a co-ordinating body.
- parents - many parents help out in schools and clubs and botanic gardens are beginning to recognise the potential of this group for spreading the conservation message.
- farmers and horticulturists - botanic gardens could work with farmers and horticulturists to develop more sustainable ways of farming the land.
- businesses - the economies of most countries are based to a substantial degree on the exploitation of plants, gardens have an important part to play in educating the business community and in developing partnerships with them.
- general public - including a) visitors to the botanic garden b) non-visitors to the botanic garden.
- potential sponsors - business, the education authority, local and national government, charitable trusts, non governmental organisations (NGOs)

- botanists and conservationists at botanic gardens and elsewhere - their collaboration is often vital to the success of education programmes
- botanic garden staff - it is important to involve all garden staff. This will mean internal staff training on education.
- landscape architects - gardens could work with landscape architects to design landscapes which include a variety of plants including species which are endangered in the wild.
- amateur or home gardeners - gardens can encourage environmentally responsible gardening, involving organic methods, composting etc.
- gardens can educate tourists about the trade in plants and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- 'friends' of the garden - friends are important ambassadors for many gardens
- community groups - gardens can work with local groups on local greening issues

Financial constraints usually mean that it is almost impossible to target all these groups. Each garden has to set priorities according to the message they want to get across and the facilities that are available.

3.1.3 Resources and facilities

The way an education programme develops will depend on:

- **Education staff.** A successful programme needs staff assigned specifically to education although other staff, e.g. horticulturists, can also make a valuable contribution. The number required will depend on what the garden hopes to do and the size and number of groups targeted for education
- **Volunteer Culture.** Some people are keen to offer their voluntary services for the cause of nature conservation. Volunteers through their skills, knowledge and commitments can support the botanic gardens to achieve its objectives in environmental education. Student groups (both lower and higher level), morning walkers and senior citizens are groups that may be interested in offering their time to the botanic gardens on a voluntary basis. Educators could prepare a brochure stating the agenda of the garden for biodiversity conservation and environmental education and explaining the ways in which volunteers could support these programmes. As volunteers require some returns, the brochure should outline the benefits to volunteers, for example, honorariums, plants, compost, flowers, free entry, etc. For a volunteer programme to be successful, time needs to be invested in selection, training and organisation of the volunteers. A questionnaire may be used in the selection of volunteers.
- **Time.** Time must be given specifically to the development and running of the education programme. The amount of time will depend on the number of staff available.
- **Support.** It is important for other members of staff to support the education officer/s in whatever way they can. There needs to be good communication within the garden about the role each member of staff can play in education. Frequent meetings of staff involved in environmental education are necessary to assess the progress of work carried out in this area and to avoid possible miscommunication.
- **Budget.** The garden must allocate a budget, however small, to education and someone must be responsible for managing this budget. It is impossible for the education staff to make decisions and plans about what kind of programme to run if they have no idea of the amount of money available. A garden may decide to take on additional fundraising activities to finance the education programme.
- **Garden collections.** In order for the education programme to be effective and relevant, educational plans should be linked with the garden's plant accession and collections policy. (see The Botanic Garden Conservation Strategy, Chapter 8)
- **Facilities.** Educators need to look at the garden in terms of educational facilities. Is it possible to plan an area in the garden specifically for education? For example, an area for gardening, trees for climbing, plants for touching. Are there implements; tools, pots, plants, soil, buckets, etc. that can be used? Additional facilities such as indoor spaces, visitor centres, shops, cafes and toilets considerably support an education programme, but they are not essential for the development of good education programmes.
- **Educational materials.** It is important to remember that resource production should be needs led. Front-end evaluation will ensure that any material produced will support the aims and objectives of the education programme. Botanic garden educational materials (books, education packs, slides, videos etc.) could be catalogued and made available to all those interested in using the garden as an educational resource.

3.1.4 Background knowledge

Educators need to be aware of the background knowledge necessary to understand the points being made. This means knowing the standard of education and experience of each group. For example, to teach children about the importance of plants in preventing soil erosion educators must first make sure the children understand why it happens and why we need to stop it. Some popular misconceptions that educators in botanic gardens have come across include:

- plants make food from soil
- trees are not living things
- botanic gardens are just amenities

A carefully thought out questionnaire could be used to collect baseline data on the target group's present knowledge, values and misconceptions. This information could then be used to shape programmes.

3.1.5 Attitudes and behaviour

Environmental education is not simply about supplying people with information. If botanic gardens are going to get the conservation message across then they need to encourage a change in attitudes and behaviours. Everyone interprets the world from within a particular framework of perception and thought. Age, class, creed, culture, ethnicity, gender, geographical context, ideology, language, nationality and race all shape personal perspectives. Education programmes can provide opportunities in which students can safely examine their held attitudes and behaviour.

3.1.6 Skills

In order to take part in an education programme, learners may need to acquire new skills. These may be specific 'botanical' skills of propagating, planting or identifying, but education programmes may also help children and adults to develop, social skills such as co-operation and communication. Educators need to think about the particular skills they want to encourage and develop, especially when working with children.

3.1.7 Developing programmes

An enormous variety of educational programmes can be developed inside and outside a botanic garden. These include:

- interactive exhibitions
- simulation games
- tours
- drama
- discovery trails
- natural crafts
- demonstrations of collections
- botany courses
- field excursions
- conservation landscaping
- practical horticulture and arboriculture.
- interpretive signs

It is often a good idea for educators to begin with small pilot programmes which can be evaluated with the help of those involved before expanding to larger programmes.

Involving teachers in the development of programmes and material is also important as this will give educators an insight into the priorities and needs of teachers. As many of the activities developed will be related to school or college curricula it is important to involve or inform those institutions responsible for developing curricula.

4 Educational approaches

4.1 Deciding on the approach

As well as looking at the particular programmes they intend to implement, educators need to consider the type of educational approach they wish to adopt. This will vary from garden to garden and will depend on the message to be communicated, the audience to be reached the activities to be carried out and a host of other factors. Educators need to be aware that the perception of education varies from person to person, from group to group and from culture to culture. To introduce unfamiliar teaching methods as well as a lot of new information and concepts can be confusing.

Being aware of learners' expectations and their experience of education is a part of sensitive teaching.

The most important role an educator in a botanic garden can play is that of facilitator. Good environmental education needs to allow individuals to question, set goals and decide on their own values and practices.

4.2 Communicating your message

Successful teaching depends on effective communication between teacher and student. Every teacher encounters problems sometimes but good practices relating to the management of learning can go a long way towards avoiding pitfalls.

The importance of a student's self perception and self-esteem about his or her ability to learn cannot be underestimated. Students may be confronted with a wide variety of learning situations and yet walk away with little or no change in their behaviour or state of knowledge. Students may not attend to matters that appear to have no bearing on their views of the world or that they consider to be irrelevant to their lives. This is one reason why it is important to target education programmes effectively.

4.3 Equality in education

Even with targeting care needs to be taken to see that certain groups are not being overlooked or somehow excluded. When looking at educational materials some questions need to be asked: Are both sexes represented fairly? Are the women engaged in 'important' tasks not just represented as helpers and observers? Are people from various ethnic backgrounds included? Are the marginalized communities included? Are there any disabled people included? Are the materials and the teaching available in appropriate languages, so that all sections of the community can benefit? Is there a religious or cultural bias to education: for example, is there always an elaborate programme developed around certain religious or cultural festivals while others are ignored?

4.4 Motivation - a learner centred approach

The learner must want to learn, be exposed to an appropriate learning environment and be interested in the learning material to maintain attention. Motivation, interest and attention are very closely interrelated.

Learners' perceptions of what they are being taught are affected and altered by motivation. It is important that the teacher tries to provide a learning environment designed to attract the learners' attention and stimulate their interest. Learners need to feel confident to ask questions and explore solutions. They should be made aware of the links between the immediate learning objectives and the general aim of the instruction and also the benefits they will to derive long term.

Learners also need to know what is required of them. Teachers may set standards and targets for the learners to achieve. This gives learners a method by which they themselves can judge and take responsibility for their own learning.

4.5 Learning through experience

We probably all learn best by experience. Where appropriate, educators should try to devise programmes that encourage learners to see, hear, feel, taste or smell the objects under discussion. A student will learn more about the structure of a flower by dissecting it than by copying a drawing from a book and labelling it. A child may remember the smell of a plant, and what it can be used for, even if he or she does not remember the name. If children are allowed to touch the trees they may feel more urgently the importance of protecting the environment in which they live. Signs need not only be for reading, they can also invite visitors to smell or touch plants. Comparative studies are very important to understand the interdependencies of living organisms, the relationship between living and non-living components of ecosystems, protected areas and non-protected areas.

We learn by trial and error. If students are set a problem they will not necessarily always come up with the correct solution first time round. This is fine. Students need to be encouraged to discuss their results, look at where they went wrong and work out what they would do next time. It is a good idea to plan time into teaching sessions for students to repeat the task and build on their experiences. Students need space to be creative and to explore solutions without the fear of failure.

Botanic gardens must lead by example and be aware of the role model that they are providing to the public. Materials can be produced in an environmentally responsible way. Gardens could for example, use recycled paper and organic fertilisers, implement non-environmentally damaging pest control including biological control and compost garden waste.

5 Implementing an education programme

5.1 Planning the programme

The success of any educational approach depends on good planning but this does not mean that education officers must follow the programme rigidly. The programme needs to be flexible enough to allow students to be creative. Remember learning is fun!

The model on page 12 provides a guideline as to how a programme can be planned, promoted, organised and evaluated.

5.2 Making educational resources available

Educational resources that could be made available to visiting groups and schools include:

- classroom space
- a library of books, slides or videos
- scientific or gardening equipment
- educational packs and materials (E.g. leaflets, interpretative signs).
- staff able to offer help or guidance to visitors

Facilities that can be made available need not depend totally on finance. Even simple facilities such as an area set aside for schools to use for lessons will be appreciated.

5.3 Outreach programmes

Distance, financial constraints, and a host of other factors may mean that certain schools and organisations are unable to visit the botanic garden. Whether or not this is the case the garden may decide to develop an outreach programme that will fit in with the overall education plan. Careful consideration needs to be given to the number of garden staff required to run an outreach programme, and how much time the programme would take up. There may be other equally effective ways of reaching the wider community, such as increased publicity or teacher training programmes.

5.4 Evaluation of education programmes

Education programmes need to be evaluated. Everyone involved in the programme, from the participants to the organisers, should be offered the opportunity to evaluate it. Various evaluation methods can be used. These include:

- written evaluation sheets completed by visitors
- interviews with visitors
- observations of how well learners complete the tasks and apply the skills and knowledge they have acquired
- post-visit evaluation. For example teachers could be asked to send samples of students' work pertaining to their visit.

A good evaluation will provide information about how well target audiences are being reached and how effective education programmes are. Evaluations are essential for deciding how a programme can be developed.

5.5 Training and support for education officers

Educators themselves need regular training. The type of training an education officer needs will depend on the audiences he or she works with and the messages he or she is trying to get across.

Education officers may benefit from training in:

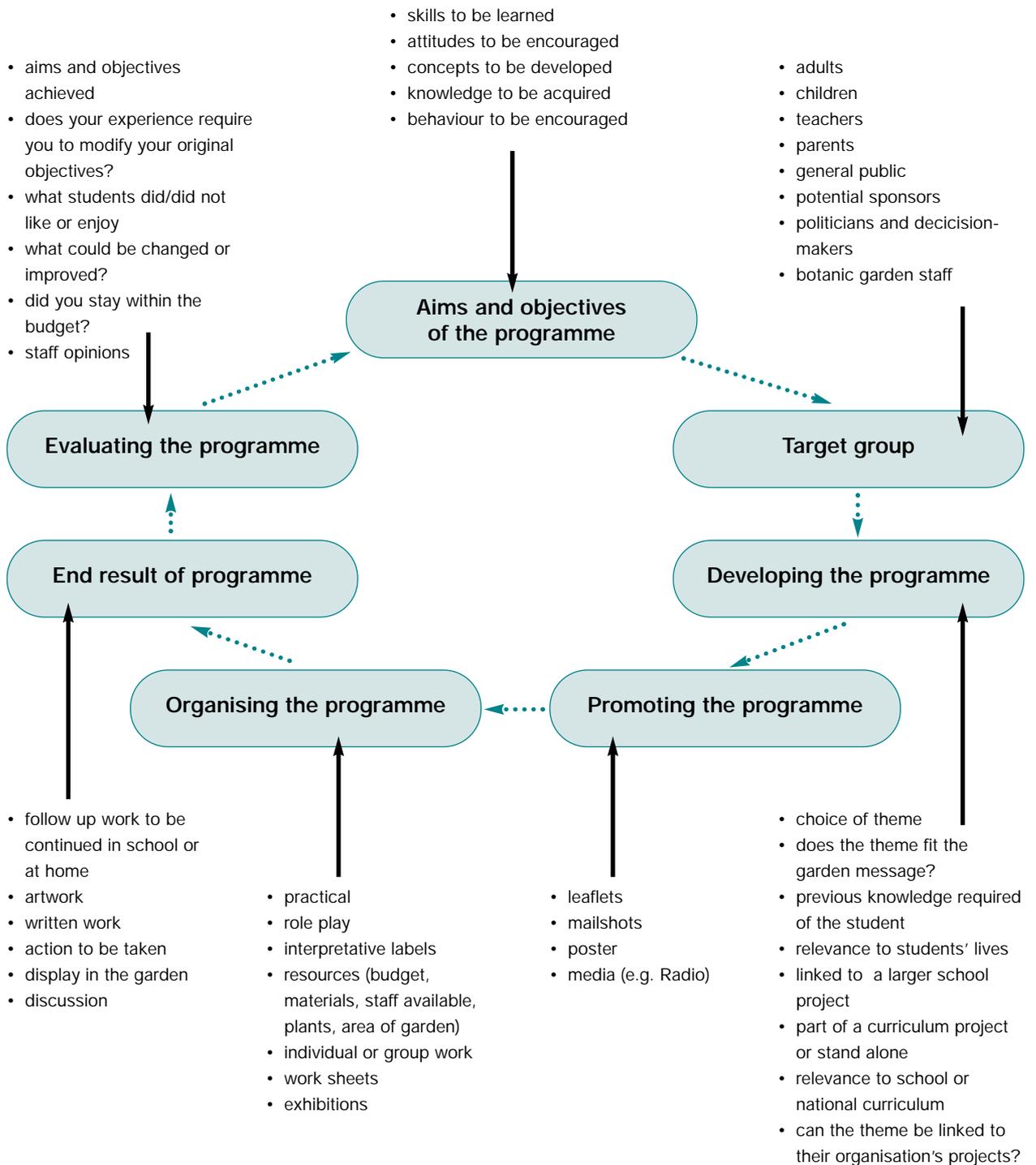
- educational approaches and methods
- new techniques in conservation and how they can be applied to botanic gardens.
- management skills

Not every garden will be able to afford formal training courses run by colleges, schools and universities for their educators but less formal methods are also worth considering.

It may be possible to set up exchanges with other botanic gardens, arrange for education staff to attend national and international education congresses and encourage them to share ideas and experiences with educators from other gardens.

One educator working alone in a botanic garden can feel isolated. Education officers need to integrate themselves fully into the staff structure of a botanic garden and play a central role in the decision-making processes. It is vital that the garden fully supports and endorses the efforts and actions of its education staff as part of a total garden-based strategy.

Planning the programme



6 Marketing, Fundraising and Publicity

6.1 Marketing

Education staff will probably need help and guidance if they are to market their programmes professionally. It may be possible to link with the overall marketing strategy of the garden, or at least to get some advice from whoever is responsible for marketing. If there is no marketing department and no resources allocated to marketing in the garden then educators may need to go outside the garden and try to find help and guidance elsewhere. At the most simple level this could be talking to and visiting other organisations working with the public such as, zoos, nature reserves, art galleries, museums.

Educators could ask themselves the following questions:

- who is the target audience?
- what do they perceive as their needs?
- what do we perceive as their needs?
- what are their constraints? e.g. literacy, geographical isolation, finance etc.
- how will we let them know about our programme?
- can they see ways in which they will benefit from the programme being offered?
- if not are we failing to explain the potential benefits clearly?

6.1.1 Market research

Thorough research needs to be conducted to establish who the main target(s) could be and what they perceive their needs to be. How aware are they of environmental and botanical issues? What is their current level of interest? Are there any programmes in which they are or have been involved upon which the education programme being offered can build? How do they hope to benefit from the programme being offered? How active are they willing to be?

The answers to the above questions will determine the approach and content of the programme offered and the mode and content of the publicity campaign and materials. The size of budget available will also be a crucial factor. A garden needs to be aware of undertaking too ambitious a project on too small a budget, as funds will not be available to complete it and all the investment will be wasted. Each garden needs to formulate a good short and long term education plan, project its likely expenditure against

confirmed income (remembering to take into account staff time required, facilities required etc). A danger is trying to undertake too much too soon. A constant careful check must be kept on projected expenditure against actual expenditure to ensure that the budget is not being overreached.

6.2 Fund raising

Due to financial constraints, botanic garden educators are increasingly having to look at ways of funding their education programmes. Fund raising is a skill that has to be learned. There is enormous competition for charitable funds and donations. If educators are to do the job successfully they need:

- time set aside particularly for this purpose
- access to materials such as directories of grants and social funds
- access to some kind of training in this area
- access to specialist advice.

Organisations and companies that are not in a position to give money may be able to give sponsorship in the form of equipment, time and materials.

As well as applying for fund through companies and trusts, education officers could raise funds for education through:

- Educational consultancies
- Lecturing
- Training courses
- Tours for tourists

6.2.1 Writing fund raising proposals

Before writing a proposal, whether it be to a company or a grant making trust, the following points need to be addressed:

- what exactly is funding being sought for: e.g. education project, newsletter, staff costs, office equipment?
- has the budget and its complete breakdown been determined?
- are the benefits to the donor clear, e.g. company logo on a publication, invitation to a reception, visits to gardens?

When targeting a company or a trust, it is helpful to know what their areas of interest are. Many charitable directories and trust/grant guides will specifically state that company or trust "X" only gives to education or the arts or the environment, etc.

When making an approach to a company, it is important to be creative and see if there is a natural link with company. For example, botanic gardens could link with garden centres, seed companies, nurseries, fine china (floral patterns)...

When proposals are sent to companies or trusts, they need to be very brief and to the point. If guidelines are laid down by the company these should be adhered to. If not, then proposals need to include:

- a brief background section,
- a description of the project and
- the approximate cost.

If a company/trust is then interested in further information, a fully detailed proposal would be submitted including budget specifics.

Well prepared fund-raising efforts can not only create income for the garden but also promote and publicise the garden's objectives, instilling goodwill – even if funding is not forthcoming. Success rates in fund raising are not always high, but continued efforts will invariably pay off.

6.3 Effective publicity

Successfully publicising an education programme need not be complicated or expensive. It can be publicised through those channels most appropriate to the target audience, for example education staff in gardens could:

- make contact with formal structures and umbrella organisations e.g. teacher associations, education authorities, botanical/scientific associations etc.
- make contact with community and youth groups using any informal structures which may exist
- mail a launch leaflet, and thereafter regular information to schools. These leaflets need only be black and white and fairly concise.

- seek free editorial opportunities in suitable newspapers or journals
- seek free coverage on suitable local radio and television programmes or create an angle interesting enough to appeal to the media as a story worth featuring in its own right as a news or 'filler' item.
- send publicity leaflets or detailed information, with a personalised covering letter, to a selected list of key individuals and organisations likely to be able and willing to give good publicity to the education programme.

It would be ideal if the botanic garden already has a good list of contacts that could form the basis of a mailing or contacts list. They could also use the contacts list of other local organisations. However, the final list will be specific to the requirements of each garden and it will be necessary to draw information from a range of sources.

6.3.1 Regular information and good public relations (PR)

Once the programme is launched and established it can be beneficial to produce a regular newsletter (termly or monthly) to give regular updates on what has been happening, to give advance information on what is to come and to constantly remind the target audience that the programme exists, is available to them and is working hard, efficiently and successfully. This is excellent public relations and could prove very beneficial for raising funds and securing sponsorship. The newsletter need not be glossy or expensive. It could develop in tandem with the education programme and become an important educational and communication tool in its own right, supporting the work of the education service.

6.3.2 Evaluation and reappraisal

Regular evaluation and reappraisal of the garden's marketing programme is essential. This will not be possible unless measurable short and long term targets have been set. The following need to be considered:

- How will the success of the marketing programme be evaluated:
 - by increased funding for the education programme?
 - by increased numbers of people attending the education programme?

- How will the garden respond to the results of the evaluation if the results indicate that the programme:
 - is a success?
 - is not a success?

- How will the garden attract funding to support on-going development?

No two situations will be the same and the above suggestions are not an exhaustive list. They are meant as pointers and ideas for each garden to consider in the light of its own circumstances. The importance of thorough planning, appropriate publicity careful monitoring, evaluation and reappraisal cannot be over-emphasised.

7 Developing networks

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networks

Botanic garden education officers can benefit from contact with other educators. A sharing of ideas can help development of education within the gardens and can extend knowledge about gardens to other institutions. Links could be established with educators in:

- other botanic gardens (e.g. BGCI members)
- field centres
- schools
- development education centres
- resource centres
- teacher training establishments
- pressure groups/campaigning organisations
- national parks and other protected areas
- forestry and agriculture departments
- museums
- art galleries

Educators in all these institutions will be covering a lot of common ground especially in terms of methods and approaches. A successful network allows people to exchange skills and information and prevents the unnecessary duplication of work that goes on when people work in isolation.

Through networks botanic gardens can develop shared strategies to ensure that education and training is accessible and affordable. They can also involve everyone from individuals and groups at grassroots to key policy-makers.

8 Conclusion

Botanic gardens have a unique and vital role to play in environmental education. Plant conservation is essential but it cannot succeed without education.

Botanic garden education can provide opportunities for people to learn about plants, their habitats and the threats that face them. It can help people understand the role of gardens in plant conservation and can play a major part in developing the attitudes, behaviours and skills necessary for solving environmental problems. Through botanic garden education people can learn about their place in the ecosystem and explore ways in which they can reduce their impact on the environment.

This document presents botanic gardens with the framework within which meaningful and effective education strategies can be developed. By working as part of the international network, botanic gardens can help precipitate a global change in attitude towards plant conservation.

A greening of the human mind must precede
the greening of our Earth.

A green mind is one that cares, saves, and shares.
These are qualities essential for conserving biological
diversity now and forever.

M S Swaminathan, Global Biodiversity Strategy 1992

Bronx Green-up

Case Study 1

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green-up

Abandoned apartment buildings, vandalized playgrounds, vast tracts of empty lots strewn with debris. These are the images that the world has come to associate with the Bronx, New York City, a borough that has become a symbol of the worst urban blight. People of many different cultural and ethnic backgrounds make up the local population but the two largest groups are African American and Latino.

In such an environment learning about ecology and conservation is not usually a priority but the New York Botanical Garden is attempting to change things. Situated in the heart of the Bronx, the Garden runs an innovative outreach programme, helping to turn some of the 10,000 vacant lots into community gardens and parks. The process of turning a trash-filled lot into a green oasis is not an easy one. Bronx Green-up is committed to a community led approach providing help and assistance to community groups who want to reclaim the environment of their surroundings.

The first step, once a piece of land has been identified, is to seek permission from the City to lease or use it. Bronx Green-Up (BGU) can help community groups to cut through the mass of 'red tape' that this usually entails and once permission has been granted, can provide: lessons in ecology, horticulture and conservation; tools, supplies, plants, seeds, transport; and technical assistance with the physical work of clearing the lots and creating green spaces.

Over 1,000 families have now worked with BGU staff, creating 170 neighbourhood gardens. Groups that BGU have worked with include senior centres, schools, social services, drug rehabilitation facilities, and special education learning centres. Many people working on the programme find that as well as developing horticultural and ecological skills and knowledge, they have learned about city politics, improved their problem solving skills and gained valuable insights into human relations.

Community gardens are enhancing neighbourhoods and providing residents with modern day commons where people can come together to plant and nurture, not only seeds of new plants and fresh vegetables, but also the seeds of understanding and friendship. Working together, residents are taking charge of their environment, building pride in themselves and their community.

In order that the work might continue, community volunteers are trained in basic horticulture and gardening so that they in turn can offer assistance to community gardeners. In this way the Bronx Green-up programme is helping to establish a reservoir of expertise that will serve the borough for years to come.

Perhaps the greatest and most lasting benefit will be for the children of the Bronx. Now these children not only have gardens and parks in which to work and play they also have a chance to learn their first lessons in environmental stewardship and to develop an appreciation of the natural world.

Terry Keller, Director, Bronx Green-Up, The New York Botanical Garden, Bronx, New York 10458-5126, U.S.A.

Nature appreciation through horticultural education

Case Study 2

A formal horticultural education programme was instituted in 1972 at the Singapore Botanic Gardens with the establishment of the School of Horticulture. Its primary mission is to provide trained horticulturists at all levels to develop and maintain Singapore's Garden City. Today the School of Horticulture, the educational arm of the National Parks Board, has enlarged its role to include the promotion of nature awareness and appreciation among Singaporeans.

An original piece of the equatorial tropical rainforest can be found within the heart of the Singapore Botanic Gardens. The four hectare forest, with 200 or more native plant species, offers visitors a unique and enriched experience of discovery and wonder. To manage this valuable piece of heritage, sponsorship was found to fund a three-year reforestation project. There are three phases to the project:

- survey of plant species in the Gardens' forest
- weeding and reforestation
- provision of interpretive plaques and educational materials.

The survey is being conducted by a taxonomist and an ecologist from the National University of Singapore. Based on the information from the survey, native species in danger of extinction are sourced and reintroduced. Exotic species are removed.

To help nature restore the forest composition, student volunteers are recruited through the scouts and the National Youth Achievement Award Council. The Council encourages youths to volunteer for activities which will lead to personal growth, self-reliance, perseverance and responsibility. Students are guided in their tasks of removing exotic species like the African yam (*Dioscorea sansibarensis*) and Dumb cane (*Dieffenbachia* spp.) They study the biology of these weeds to determine the best method for control. Students also collect seeds of native species for propagation and learn how to nurture seedlings for regeneration.

Since April 1991, about 250 volunteer students have participated in the "rescue" programme quickening new life to the forest. Another 200 students were invited from sixty-one institutions for the March and June school holidays in 1993. Participants follow a structured programme, which comprises fieldwork in the forest, talks on conservation, field tours and leadership training. The aim is to develop a core of well-informed and dedicated leaders who will support the National Parks Board's conservation programme.

The initial project ends in December 1993. Preservation of the forest will continue with public education and support.

Jennifer Ng, Commissioner of Parks and Recreation, Parks and Recreation Department, Botanic Gardens, Cluny Road, Singapore 1025

Designing gardens for education

Case Study 3

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designing

If botanic gardens are to be used for education they should be designed with teaching and learning in mind. A garden designed for education can be a living interactive display. If it is to be a valuable teaching resource it should be designed around clear educational concepts. This is true whether we are designing the whole or simply part of the garden. The success of the final design will depend on the care taken at the planning stage.

When designing a garden for education we need to decide on:

1. The knowledge, or 'facts' we want the garden to teach that is:

- what the garden demonstrates; e.g. permaculture practices, plant taxonomy.....
- what the garden is a source of; e.g. diverse dyeing and weaving materials...
- what can be compared and contrasted within the garden; e.g. flora of different countries/climatic zones...
- which plants displayed in the garden are significant to a given culture, for example, in their history, literature and folklore...

2. The concepts we want the garden to teach by for example:

- arranging plants systematically by families
- arranging plants which are used for their stem fibres and leaf fibres separately, according to their preparation or usage
- sequencing plants to tell a 'story'

3. The way we want adults, children, and students to interact with the garden, by, for example:

- featuring common local garden plants that visitors are already familiar with

- providing samples of prepared fibres along side the living plant source, which visitors can handle, see
- continuing to encourage school or college classes to grow and maintain crops and collections
- providing information on labels other than just names and distribution on labels.

4. Ways in which we can make a visit to the garden enjoyable and entertaining as well as educational, by for example:

- incorporating spaces for small displays or instructions for small groups (e.g. wider pavements or pathway junctions or corners)
- compiling information sheets highlighting just a few plants at a time, rather than long lists or numerous, lengthy labels on every plant.

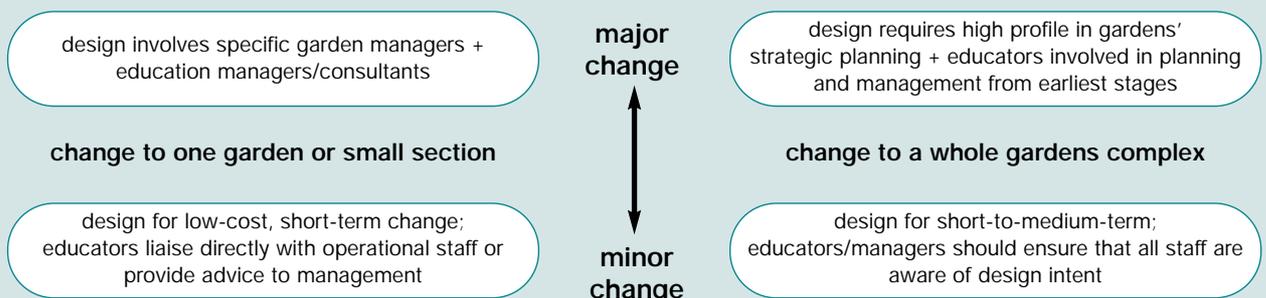
5. The ways in which we want this particular garden to be special or innovative by for example:

- presenting and explaining plants significant to local, culture or history
- developing the garden to allow children to play, explore and discover.

It is seldom that educators will have the opportunity to start from scratch and design a new garden from a purely educational standpoint. However, as is most often the case, even when we are working with and adapting what is already there, as educators, we need to keep these basic principles in mind.

Malcolm Cox, Education Officer, Mt Coot-tha Botanic Gardens, G.P.O. Box 1434, Brisbane, Australia 4001

Matching the area affected with the degree of change in educational design: some implications for planning and management of the design process.



Teacher training

Case study 4

Teacher training at the Royal Tasmanian Botanic Gardens Australia, concentrates on early childhood. We train teachers of kindergarten to grade 3, and Primary grades 4 to 6. We have chosen these age groups because at this level, the curriculum in Tasmania contains a major component on environmental education. We work both with fully qualified teachers and students training to be teachers. Our primary aims for the teacher training programmes are to:

- highlight the educational potential of the garden
- provide teachers with the knowledge, skills and confidence to develop education programmes at the garden
- demonstrate ways in which conservation education at the garden can be linked with other areas of the school curriculum
- motivate trainee teachers to include environmental education in their teaching practice.

Most work is done with teachers during full day seminars at the Gardens or after school at staff meetings. Lectures and practical sessions have a broad environmental education theme and using the garden as an educational site, provide information, resources, techniques and examples.

At the gardens we have just one full time education officer and so the emphasis in our teacher training is to encourage teachers to develop their own education programmes. We have a number of themed walks available as teaching kits and, at the training seminars, we demonstrate parts of these walks so that teachers can lead their own groups.

The real value of teacher training can be seen from the potential number of children reached. Each year our education officer conducts 5 day-long seminars with an average of 15 teachers each and 20 after school staff meetings with an average of 25 teachers. That makes 575 teachers. In Tasmania the average class size is 20. This means that the programme can reach 11,500 children each year compared with the 4,000 taught directly by the education officer.

Teachers receive a new class each year and so over their working life the skills they have learnt at the botanic gardens benefit many children. At the Royal Tasmanian Botanic Gardens we have definitely found that teacher training is an efficient and effective way of reaching a wider audience.

Andrew Smith, Education Officer, The Royal Tasmanian Botanical Gardens, Domain, Hobart 7000, Australia

Working with volunteers

Case Study 5

At Chicago Botanic Garden U.S.A, we have developed a comprehensive programme to train volunteers to deliver our Environmental Education Awareness Programme. The Junior League of Evanston/North Shore, a service organisation dedicated to community improvement through active volunteering, was involved in the initial conceptualisation of the training programme. The JNLE/NS continues to assist with programme implementation and programme funding.

There is no formal selection procedure. Any interested and motivated person is invited to join the programme. The training is rigorous and requires a high level of commitment and enthusiasm on the part of volunteers. Two permanent staff members are involved in the training of volunteers. This requires 10 to 25% of working time depending on the precise responsibilities involved.

The training programme includes:

- job descriptions for volunteers
- monthly meetings to discuss the content, concepts, and activities of the program
- instructional workshops and practice teaching sessions which encourage all volunteers to improve their teaching skills
- participation in three in-service teacher workshops conducted by the programme co-ordinator for the participating classroom teachers
- a sequence of supervised teaching experiences in the classroom and in the field.

Under the supervision of the programme co-ordinator, each volunteer gradually assumes full responsibility for the teaching of the programme. By completing the first year requirements, volunteers accrue points that lead to one of three levels of certification. With the approval of a committee, certification enables volunteers to deliver the programme - either as an assistant or full facilitator - beginning in their second year of service.

In the following year, training continues to encourage volunteers to increase their understanding of the programme content and to develop their teaching skills.

By training and working with volunteers, a botanic garden can extend the reach of its environmental education efforts into more classrooms than would otherwise be possible.

Allan Rossman, Director of Education, Chicago Botanic Garden, P.O. Box 400, Glencoe, Illinois 60022-0400, U S A

Catering for people with special needs

Case Study 6

People with disabilities have just as much right to enjoy our gardens as the able-bodied. Each of our target groups includes people with disabilities, but perhaps we ought also to target people with these special needs as a group in themselves.

We need to address two major issues:

- How are we going to reach those with disabilities, to get them to visit the garden in the first place?
- How can we adapt the gardens and our education programmes to meet their needs?

It is often the case that general mailings and public relations efforts do not reach special schools and organisations for children and adults with disabilities. We need to make a special effort to see that these types of organisation receive our attention and information on our relevant activities.

Making the garden more accessible

First of all staff in botanic gardens need to research the types of problems of access people with disabilities have. This may mean; providing wheelchair ramps, making sure that directional and interpretive signs are not sited too high up, providing tours using personal stereos and cassettes, setting up programmes where visitors can touch and feel the plants, providing pamphlets and educational materials in Braille, running tours and programmes in sign language.

Are there any guidelines that botanic gardens could follow? In some countries, recommendations and guidelines on providing access for people with disabilities are available. National guidelines may also be available from pressure groups and organisations working with disabled people. Other botanic gardens who have already tried to address the problem may also be useful sources of information.

To be more effective worldwide in providing access to environmental education in botanic gardens for the disabled we need to do the following:

- carry out research on the experiences of disabled people in botanic gardens.
- prepare a check-list of minimum standards and provisions to be aimed for.
- put together a bank of knowledge and expertise on this theme.
- find gardens that have been successful in catering for people with disabilities, that can serve as models for other gardens.
- set up special PR and information programmes for people with special needs.

The provision of access to environmental education within botanic gardens for people with disabilities is an important and wide-reaching issue which needs to be considered carefully if gardens are to be successful.

Herman H. Berteler, Bureau Aangepast Groen, Postbus 29 - 6560 AA Groesbeek, Haydnstr. 44 6561 EG, Germany

Earth-shrinking

Case Study 7

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Drama and role-play with school children at the Royal Botanic Garden, Edinburgh

Few of the thousands of school children who have taken part in the Earth-shrinking programmes at the Royal Botanic Garden will ever have the opportunity to visit Borneo or the Amazon. But still their lives can be touched by people living in these regions. The programmes help children to travel, in their imaginations, to another part of the globe and to feel what it is like to live a totally different kind of life.

In a recent project based on life in the Borneo rain forest, children were met off the bus with the words "Welcome to the rain forest, I hope you had a pleasant flight." They were then led into a Borneo-style longhouse to begin a day of activities which focused on the way in which rain forest people use natural resources.

Life-sized images of the family who normally inhabit the longhouse were projected on the wall of the longhouse. The visitors were told that they had gone on a hunting trip but had left food for their guests and an invitation to look at the various domestic items filling the house. After their curiosity had been satisfied the children went on their own expedition to the rain forest.

The large glasshouses at Edinburgh have been beautifully landscaped to create a very realistic atmosphere. In the rain forest houses tree branches are covered in epiphytes and climbing plants form a green canopy overhead. There is plenty of water about and lots of dark, secret corners - essential ingredients for stimulating a child's imagination. As in most botanic gardens there are also a large number of economic plants and this has inspired another successful adventure drama - "lost in the jungle". This drama has become so popular that children who return to the Botanic Garden now request it! The children are marooned in the middle of the Amazon rain forest and only have a short time to find their basic survival needs - drink, food and shelter for the night. The children respond by reading the information supplied on the labels and by using their own ingenuity to solve problems such as collecting, filtering and boiling water from the river or catching the fish, using only the natural materials around them.

Another drama is based on a school visit to China. When the children fall sick they visit a Chinese herbalist. They act out their complaint in mime to the non-English speaking herbalist who provides them with a remedy in the form of fresh, dried or processed herbs. As well as putting across an important point about the connection between plants and health, this drama has proved to be tremendous fun and an excellent way of adding humour to a programme.

A common feature in all the above dramas is the idea of the class visit to somewhere exotic. The children never lose their own identity as Scottish school children but they are transported, using their imagination, to other places. Realism is added by using living plants and genuine artefacts as props, although the essential factor is that the leader has to take part in the fantasy and must stay in character throughout. This means the teacher and parent helpers must be responsible for discipline and this needs to be explained to the teacher before the visit.

Although this type of drama works best with primary aged children (5 to 12 in Scotland) the Edinburgh Botanic Garden has used role-play with older secondary school groups with some success. An exercise based on a fictitious highway development proposal for an area of South American rain forest was first used with 16 to 18 year olds at Edinburgh and was subsequently included in Science for Survival plants and rainforests in the classroom (A. Cade, Richmond Publishing Co. Ltd., WWF-UK, 1988 page 225). This has proved an excellent way of generating a lively debate on the issues of deforestation and rights of tribal people. The role-play gave normally self-conscious teenagers a mask to hide behind and they became animated, even extroverted, when presenting some powerful arguments.

Ian Darwin Edwards, Senior Education Officer, Royal Botanic Garden, Edinburgh, EH3 5LR, UK

Implementing an Education Library

Case Study 8

Education functions in botanic gardens need to be supported by education libraries. Education libraries can provide information on botany, plant culture, ecology, conservation, natural history, principles and practice of teaching and outdoor education. Although it is normally only staff and volunteers that use such specialist libraries it is worth considering what other groups of people there are, such as community teachers, that can benefit from the information.

Education libraries contain the usual books and serials, but can also assist the education staff and teachers and other users by providing collections of curricula, audio-visual materials, hands-on kits, programme ideas and even equipment which will enable them to improve their classroom instruction. If the botanic garden is noted for special work in a special field, collections of materials on this subject can be developed to inform the public. Often such collections will draw people to the garden who otherwise would not come, because of the convenience and volume of information they offer. A good example is a special collection on the subject of tropical rain forests.

When resources are collected for use by staff and by the public, it is advisable to organise resource centres into proper libraries. Libraries have universal classification systems and are understood by people world-wide. They have tried and tested methods for acquiring, organising, circulating and maintaining collections of materials. As collections and user groups grow these methods will come in useful when handling new material.

An education library can link the botanic garden which supports it to other botanic gardens, education libraries, museums, community teachers and to the community at large by means of outreach programmes. Ideas for outreach programmes are as varied as the individuals who may come to use the library. All that is needed is a commitment to service, willingness to listen to users expressing their needs, and willingness to match those needs with existing resources. With even the ability to link-up library catalogues electronically, there are “no walls” to your education library.

How do you start an education library?

- survey your existing resources.
- organise these resources according to accepted libraries practices
- determine what makes your library unique.
- build on that individuality to attract users and show them that you have something worth using.
- build a satisfied clientele with a first-rate service. This will publicise your education library more significantly than any brochure can do.
- continually seek to grow, to develop, to initiate new and imaginative ideas which show users how they can benefit from your resources
- Concentrate upon using well what you have.

Remember, you are part of the information age, and that the information you have to share could be instrumental in saving life on Earth.

Pamela Pirio, Coordinator, Stupp Teacher Resource Centre, Missouri Botanical Garden, Saint Louis, Missouri, USA

Portable botanical educational cases in Mexico

Case Study 9

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outreach

In the Botanical Garden of the National University of Mexico (UNAM), the demand for guided visits has increased to the point that we have had to devise new approaches to meet the public's need. One solution to this problem has been to work with school teachers so that they can guide their own classes independently. Unfortunately, Mexican teachers are over-worked and under-paid so that they are unable to invest extra time in special training. In order to meet the challenge of bringing to the Mexican children quality educational programmes related to plants and Mexican culture without overburdening their teachers, we have designed a series of portable educational cases.

Objective

Each educational case serves to aid the instructor in explaining and demonstrating the importance of plants in everyday life.

The cases

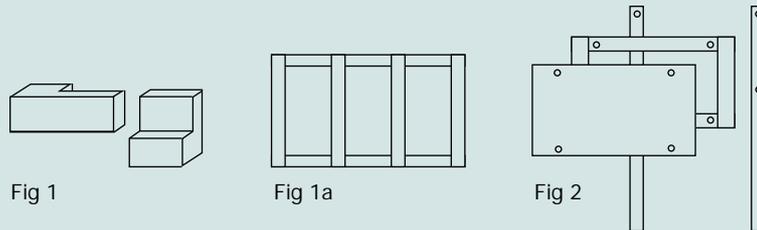
Each educational case includes original plant materials and processed products. These materials are accompanied by text and illustrative aids (e.g. slides, drawings) which are based upon academic bibliography and our own original research. The topics currently covered are flowers, seeds, fruits, candies, medicinal plants and spices and condiments. Special emphasis is placed on botanical information related to cultural history in order to show the children the importance of their rich and long-lived cultural heritage, as well as the necessity of preserving the diverse biological resources in Mexico. It is our obligation to promote in the Mexican children a functional awareness of their dependence upon Nature.

The cases are designed to be self-contained and easily transported. With elementary school teachers in mind, the use of the case and explanations of the contents are self-explanatory. Printed material includes a manual, a set of flip charts, a glossary of scientific terms, a list of activities, a set of slides and a recommended bibliography. In addition to standard demonstration cards, each student is supplied with an individual work sheet and samples for his/her personal use. This system has been used in both urban and rural settings. We believe it is a very useful technique to stimulate teachers to promote the importance of botany in an informal way.

Edelmira Linares, Carmen C. Hernández & Teodolinda Balcázar, Education Department, Jardín Botánico de U N A M, Apartado Postal 70614, 04510 Mexico D F, Del Coyoacan, Mexico

'Not Signs of Prosperity'

Case Study 10



Botanic gardens in developing countries commonly suffer, from a chronic shortage of funds. In such circumstances basic items such as signs or labels, often become a luxury. Here are two ways that signs can be produced economically and without much skill.

The three basic ingredients for the production are materials, labour and tools. Although the materials need to be as cheap as possible, it may be worth spending a little more so they are durable. Labour can be minimised by using simple production techniques which also cut down the tool requirements.

Interpretive signs of large and medium dimensions

Materials required:

- iron sheet (0.6mm thickness)
- strips of wood (6 X 2 - 10 X 4 cm breadth and thickness according to the size of the board)
- nails and bolts
- metal and wood primer
- paint
- tools: measuring-tape, hammer, saw, chisel, plate-shears, drill (a hand-drill will do), spanner, paintbrush.

The initial step is to make the wooden frame, which will support the iron sheet. Cut the lengths of wood to the required length, join them as in Fig.1 and secure with nails. For boards up to 1.5 X 1 m a simple rectangular frame will be sufficient, for sizes above this additional pieces can be attached for stability and fixed with the same kind of joint (Fig 1a).

Paint the frame with wood primer before the sheet is nailed on to it and then treat the sheet with metal primer. Pierce the sheet with a big nail along the edge (since it is difficult to penetrate it with small nails) and then pin with small nails to the wooden frame. Drill four holes through sheet and frame as in Fig.2 and then paint the whole structure. We find that it is more economical to mount the signs on iron legs as the climate and termites deteriorate wooden legs fast. Medium sized signs can also be hung simply on stems or horizontal branches of trees.

Small interpretive signs or labels

Materials required:

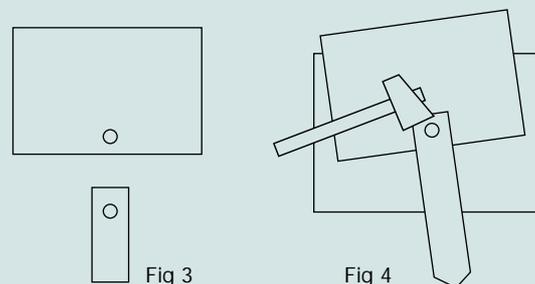
- tin plate
- aluminium nails or rivets
- metal primer
- paint
- tools: plate shears, hammer, brush.

Cut the tin-plate (0.3mm thickness) to the required size and pierce with a big nail (Fig 3). Since it needs to be firmer it is better to make piece 'b' from iron sheet. Join piece 'b' with piece 'a' using a rivet. We usually use aluminium nails, which are cut short, stuck through the holes and then banged flat on an iron block (Fig 4). Treat the signs with metal primer and paint. They can either be simply stuck into the ground or nailed to wood or walls.

Both kinds of signs are durable, even in tropical conditions. The former we have used for nearly ten years without deterioration. The latter will last for 4-6 years.

An additional thought for the design of the interpretive signs. We invite regular visitors from colleges or nature clubs to write and illustrate boards. A group of bird watchers, for example, was invited to prepare signs of bird species in relation to the flora and the type of forest they inhabit. This has the extra benefit of involving and interesting the artists in the plant world and conservation matters.

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Model Solutions

Case Study 11

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Education Programmes at the Limbe Botanic Garden

- The Model Chop-Farm
- The School Environmental Programme
- The Musa Genetic History Collection

The Model Chop Farm

The Limbe area is faced with limits on available land, with restrictions placed on the community by plantations and reserves. Because of these restrictions farmers need to be aware of and use intensive production techniques. We came up with the model chop (food crop) farm as a way to inform the public about some of these techniques.

The Model Chop-Farm is located on land rising from a narrow plain along the banks of River Limbe on to a steep slope on the eastern hill in the garden. Our aim is to initiate a dry season vegetable garden and so on the plain we grow plantain/cocoyams. Next to this, on the lower part of the adjacent slope, we grow maize, pulses, sweet potatoes, cassava and yams.

On this lower part we have constructed contour bands and practice flat cultivation. Hedges are planted in the area, while nitrogen-fixing trees are grown on the bands. Higher up we grow pineapples. Because they form a cover crop, the danger of erosion is reduced.

Towards the uppermost part of the slope the gradient forbids cultivation. Here we have established an orchard. We believe that this is a proper model for the locality because most farms around Limbe are on slopes.

We demonstrate and use fertility maintenance practices, including return of crop residue, crop rotation, intercropping, organic manuring (farmyard manure, compost, mulch), green manuring, fertilisers, minimum tillage and agroforestry. These practices provide a great diversity of produce for farmers, ensuring some security against crop failure, whilst helping dampen the “peaks and troughs” in the labour cycle, as well as increasing profits.

The School Environmental Programme

This was established in 1991 as an outreach programme. The aim of the programme is to carry an environmental conservation message to a greater number of school children than are able to actually visit the garden. It involves five schools, both primary and secondary, which have been involved in activities with a conservation theme. Activities include school landscape planning competitions, the formation of a nature club, the planting of a school orchard and a school nursery, and the organisation of various slide and video shows.

The garden staff have also worked with a local NGO, the Cameroon Environmental Education Programme of ‘CEEP’. CEEP specialises in environmental education in schools and communities within the south west province, and has been able to provide workshops for teachers in the gardens, as well as contributing other resources and advice on an ad hoc basis.

We have found that working with a specialist NGO, such as CEEP, which understands the educational sector, knows the local schools and their staff, and has already negotiated appropriate agreements with the ministry, has been an effective way to develop outreach educational programmes.

The Musa Genetic History Collection

This is aimed at educating the public about the history of the Musa species and their evolution. Bananas and plantains constitute one of the principal food crops of the tropical world. They are so common in our society that it is difficult to convince people that they are exotics. In the display, various levels of evolution have been arranged in a pattern to radiate from the parent stock in a sort of tree diagram. An information board with a planting map is provided.

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The Need for Interpretation

Case Study 12

The role of interpretation, as part of our education programme at the Royal Botanic Gardens, Kew, is 'to increase public knowledge and understanding of the value of plants and to increase recognition of, and support for the work of Kew'.

Interpretation is essential. Without it a botanic garden can seem little more than an attractive park. Signs, pictures, posters, displays, exhibitions, maps all help to provide the vital link between the work and mission of a garden and its visitors. Interpretation is about communication. It is an important way of telling the public about the work a garden is doing and of raising awareness about the importance of plants.

Developing interpretative material is demanding on staff time involving:

- research
- discussion
- drafting
- testing ideas – can the information be understood? is it accessible? entertaining? thought provoking?
- checking and clearing texts
- sourcing good photographs and illustrations
- high quality design
- product specification
- co-ordination of production
- installation
- evolution
- monitoring
- maintenance

Before any proposals are considered and developed at Kew, we always look carefully at our objectives and target audience. We decide what we want to interpret what interpretation methods we want to use and what costs we are likely to incur.

The Variety of Interpretative Methods

There are countless ways to interpret the work of a botanic garden. We interpret our collections using the following methods.

Live interpretation – we provide guided tours for the public. Our guides are volunteers, trained at Kew and Wakehurst Place, Kew's satellite garden south of London. Their tours offer fascinating insights into the work, history and collections of the gardens. We also interpret the work of the gardens through drama, workshops and special events.

Printed material – we produce a range of information sheets for visitors wishing to know more about certain plants and buildings. Self-guided trails, which suggest a particular route around the garden, are also available as are publications such as guidebooks, leaflets and maps.

Exhibitions – we use exhibitions to explain more complex biological ideals than would otherwise be possible with a small display and to also provide a focal point for other interpretation in the garden. In the Sir Joseph banks building, for example, the exhibition focuses on how plants are used by people and how Kew's work can benefit mankind.

Plant labels – in some areas we have modified basic plant identification labels by using colour coding and/or suitable symbols to highlight areas of interest. Such labels, for example, are used in the landscape area around the Sir Joseph Banks Building to categorise plant economic use. These labels could also form the basis of garden trails.

Information labels – these provide information on habitats, conservation issues and other items of interest. They are designed to a standard format and are featured throughout the gardens and glasshouses, highlighting particular plants and their uses.

Site-specific interpretation – examples of site-specific interpretation can be seen in Kew at the order beds and the rock garden and in Wakehurst Place at the Tony Schilling Asian Heath. The labelling and other display elements have been designed and developed specifically to suit the particular subject and location.

Before any labels or displays are installed we always consider the opportunities and constraints of the selected locations and discuss the suitability of the potential locations with all relevant staff. We aim to design our displays in a way that is sympathetic with the surroundings and locate them close to paths for easy access. The displays are positioned in a way that makes it easy for general garden work. By siting them in popular locations information can be disseminated to the maximum number of visitors possible, while encouraging them to explore less visited parts of the garden.

The material we use for outdoor displays and signs is duralite, a form of GRP (Glass Reinforced Polyester) panel. The resin permeates completely through the printed image which provides us with a rigid sheet which cannot split, crack or warp. The image is completely subsurface and protected from deterioration. The material has been tested and used at Kew for approximately 10 years. Although expensive, we find that our signs and displays require very little maintenance and are resistant to vandalism.

In conclusion, we decide what we want to say and select the most effective and practical way of saying it. Interpretation is essential for communicating the message that all life depends on plants.

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References

Key references for botanic gardens setting up and developing environmental education, training and public awareness programmes.

The Botanic Gardens Conservation Strategy, 1989. Botanic Gardens Conservation Secretariat (BGCS) (now Botanic Gardens Conservation International). World Wide Fund for Nature (WWF) and The World Conservation Union (IUCN). IUCN, Gland, Switzerland and Richmond, UK. Chapter 8.

Agenda 21. . 1992. United Nations. Chapter 3 (3.7), Chapter 5 (5.11., 5.12., 5.5.13., 5.14.), Chapter 8 (8.10., 8.11., 8.25.), Chapter 10 (10.9., 10.16.), Chapter 11 (11.20., 11.21., 11.22.), Chapter 12 (12.14. (b), 12.19. (a), 12.33., 12.55., 12.56., 12.58., 12.62.), Chapter 13 (13.11. (a) and (c), 13.12.), Chapter 14 (14.17. (a)), Chapter 15 (15.5. (m), 15.6. (f), 15.10. (b) and (c), 24.2. (e), 24.3. (i)), Chapter 25 (25.9. (g), 25.14. (c) and (d)), Chapter 26 (26.5. (c)), Chapter 27 (27.9., 27.10., 27.12.), Chapter 29 (29.12.), Chapter 31 (31.3., 31.4. (a) (i) and (e), 31.10. (c)), Chapter 32 (32.6. (c), 32.8. (a), 32.14.), Chapter 35 (35.21. (a), (b) and (d), 35.22. (a) and (g)), Chapter 36 (all), Chapter 40 (40.24., 40.25.)

Caring for the Earth. A Strategy for Sustainable Living. 1991. The World Conservation Union (IUCN). United Nations Environment Programme (UNEP), and World Wide Fund for Nature (WWF). IUCN, Gland, Switzerland. Chapter 2 (Action 2.3.), Chapter 4 (Action 4.10., 4.11., 4.12.), Chapter 5 (Action 5.1), Chapter 6 (Action 6.1.), Chapter 7 (Action 7.2., 7.5.), Chapter 8 (Action 8.10.), Chapter 17 (Action 17.1.)

Convention on Biological Diversity. 1992. United Nations Environment Programme. Nairobi, Kenya. Article 12 and Article 13.

Earthrights: Education as if the Planet really mattered. 1991. World Wide fund for Nature (WWF-UK) and Kagan Page Ltd. Godalming, Surrey, United Kingdom.

Global Biodiversity Strategy: Guidelines for Action of Save, Study, and Use Earth's Biotic Wealth Sustainably and Equitably. 1992. World Resources Institute (WRI), The World Conservation Union (IUCN) and United Nations Environment

Global Strategy for Plant Conservation. 2002. The Secretariat of the Convention on Biological Diversity and Botanic Gardens Conservation International, U.K.

International Agenda for Botanic Gardens in Conservation. 2000. Wyse Jackson, P.S. and Sutherland, L.A. Botanic Gardens Conservation International, U.K.

Making Your Garden Come Alive! – Environmental Interpretation in Botanical Gardens. 2000. Honig, M. Southern African Botanical Diversity Network Report No. 9. SABONET, Pretoria.

Programme (UNEP). Baltimore, USA. Chapter IV (Action 16), Chapter VII (Action 46), Chapter IX (Action 63), Chapter X (Action 72, 73, 74, 75, 83).

Rio Declaration on Environment and Development. 1992. United Nations Principle 10.

The Darwin Technical Manual for Botanic Gardens.1998. Leadlay, E. and Greene, J. (eds.). Botanic Gardens Conservation International, U.K.

World Conservation Strategy: Living Resource Conservation for Sustainable Development. 1980. The World Conservation Union (IUCN), United Nations Environment Programme (UNEP), and World Wide fund for Nature (WWF). IUCN, Gland, Switzerland.



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