



Linking Ecology and Horticulture To Prevent Plant Invasions II

PROCEEDINGS OF THE MEETING
AT THE CHICAGO BOTANIC GARDEN,
CHICAGO, ILLINOIS, 31 OCTOBER 2002

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Foreword

Plants are essential to our existence, yet thousands face extinction. One of the largest threats to native plants and their communities is invasive species; in fact their toll on the environment is second only to habitat destruction. Most experts agree that the keys to managing invasive species are prevention, early detection, and control or eradication. In October 2002, the Chicago Botanic Garden was honored to host the second in a series of workshops addressing the first part of this management triad, the critical issue of preventing invasive plant introductions.

The Chicago Botanic Garden and the Missouri Botanical Garden convened this workshop which was entitled *Linking Ecology and Horticulture to Prevent Plant Invasions*. Exciting progress was made in several areas. A list of organizations which have endorsed the voluntary *Codes of Conduct* developed at the first workshop was produced. Two topics critical to the successful implementation of the *Codes* were discussed in concurrent sessions. The first focused on defining “regions of concern”. It is commonly agreed that plants can be invasive in some regions and relatively benign in others, and this needs to be considered when developing invasive plant lists. The second session discussed non-invasive alternative lists. When horticultural plants are recognized as invasive, it can be very useful to offer producers and users alternative plants that satisfy similar requirements in the landscape but are not invasive. Finally, the workshop identified education as one of the most important motivating factors for the public, businesses, and institutions. The development of educational materials targeted to different audiences, including the media, was set as a goal for the future.

The Chicago Botanic Garden is committed to the conservation of plants and plant communities. We are pleased to have assisted the efforts of scientists and green industry professionals addressing the crucial and timely issue of invasive plants and believe that through this collaboration significant progress can be made in preventing future plant invasions.

Barbara Whitney Carr

President and C.E.O., Chicago Botanic Garden

Executive Summary

A meeting was held in Chicago on October 31, 2002 to follow-up on the first *Linking Ecology and Horticulture to Prevent Plant Invasions* meeting (St Louis; December 2001) where codes of conduct designed to minimize the horticultural spread of invasive plants were first proposed. The second meeting provided an opportunity to formally assess achievements in publicizing and promoting voluntary adoption and implementation of the codes by various institutions and businesses and to discuss some important next steps. It was convened by the Chicago Botanic Garden and once again brought together some of the most respected leaders from botanical gardens, the nursery industry, landscape architecture, garden clubs and conservation organizations (See **Appendix A**, List of Participants).

The December 2001 meeting had already garnered significant interest and tangible results¹. The purpose of the Chicago Meeting was to build upon this success. In particular, participants at this meeting: **1)** Reviewed the status of endorsements of the *Codes of Conduct* by institutions and other organizations; **2)** Discussed experiences implementing the *Codes of Conduct*; **3)** Explored the role “regionality” plays in addressing the invasive plant species problem; and, **4)** Developed rough guidelines for selecting alternative plant species that could be used in place of horticultural species recognized as invasive. **Appendix B** presents the *Codes of Conduct* developed at the St. Louis meeting.

The key **Findings and Recommendations** evolving from the Chicago Meeting are:

1. The initiative taken by The Missouri Botanical Garden, The Chicago Botanic Garden and all the participants of the two meetings entitled “Linking Ecology and Horticulture to Prevent Plant Invasions” is making a difference. The major national societies and professional associations for botanic gardens and arboreta, the nursery industry, garden clubs and landscape architecture have endorsed the appropriate “*Codes of Conduct*” and are now taking steps to encourage their members to adopt and implement them. Three prominent botanical gardens (North Carolina, Chicago, Missouri) have already implemented protocols based on the codes and specifically designed to minimize the spread of invasive plants through their

¹ The initial meeting was convened by the Missouri Botanical Garden and the Royal Botanic Gardens, Kew. Please go to www.mobot.org/invasives for further details and products from the St. Louis meeting.

own activities. Other institutions, organizations and businesses will be encouraged to implement the codes.

2. Education is among the most important factors in motivating people, businesses and institutions to address the invasive species problem. High quality materials targeted to different audiences by appropriate leaders are necessary. The media needs be encouraged to play a more active role.

3. Alternative and invasive plant species lists are useful and worth developing provided: **1)** all stakeholders participate in their development; **2)** there are clear and accepted criteria for listing invasive plants and alternatives for them; **3)** the specific horticultural needs of different audiences are considered and addressed; and, **4)** regional considerations are given a priority. There are already some good examples to build from.

4. Scientific research and risk assessment (economic and environmental) models need to be further developed to provide a stronger foundation for identifying (and listing) plant species as invasive or as non-invasive alternatives. Less anecdotal information should be used in making these determinations.

5. Lists of invasive species and of alternative should be developed for states or regions (e.g. based on The Nature Conservancy's "ecoregions" or the USDA's hardiness zones). Some very useful examples of collaborative efforts to develop such lists are underway in Florida and Massachusetts and these may serve as models for similar efforts elsewhere.

6. It may be appropriate to formalize the existence of this group and acknowledge the need for continued communications and efforts among the groups represented. Steps to formalize the group could include giving it a name, defining a mandate and plan of action for the next 1-5 years, and evaluating funding opportunities to support future meetings.

Historical Perspective: Progress Towards “Linking Ecology and Horticulture to Prevent Plant Invasions”

The initial meeting designed to address the global problem of invasive plants was entitled: “*The Workshop on Linking Ecology and Horticulture to Prevent Plant Invasions*” and hosted by the Missouri Botanical Garden and the Royal Botanical Garden, Kew (England). Participants from around the world met in St. Louis in December 2001 and collaborated to create the *Saint Louis Declaration*, which consists of two major components:

1. **Findings and Principles** that frame the invasive species problem and present the underlying basis for successful efforts to address it; and,
2. **A set of five Voluntary Codes of Conduct** for government agencies, nursery professionals, the gardening public, landscape architects and botanic gardens and arboreta. These codes were drafted by representatives of each respective groups and were designed to minimize the spread of invasive plants by these groups and their activities.

These products were an important first step in responding to the global invasive plants species problem. The *Findings and Principles* were developed by the entire group to provide a consensus statement on the severity of the problem and outline a general approach to address it. The *Findings* include: **1)** recognition of key sources of the problem; **2)** its regional nature; **3)** consensus that invasive plants are a real threat to natural systems and biological diversity; and, **4)** that the problem’s magnitude is large. The *Principles* inform responses by key stakeholders, including landscape architects, botanic gardens and arboreta, garden clubs, garden writers, regional planning groups and trade groups. Specifically, the *Principles*:

- Address how future plant introductions should be pursued;
- Emphasize the importance of a national problem response framework that leaves room for regional solutions;
- Encourage the use of available assessment tools, resources and voluntary codes of conduct;

- Establish the importance of public education and professional training;
- Stress the fundamental value of broad-based collaboration.

Representatives of each group at the St. Louis meeting created voluntary professional *Codes of Conduct* designed to curb the use and distribution of invasive plant species through self-governance and self-regulation for nursery professionals, government agencies, the gardening public (specifically Garden Clubs), landscape architects, and botanic gardens and arboreta.

Reprints of the *Findings and Principles* can be reviewed and downloaded from www.mobot.org/invasives. As mentioned, The *Codes of Conduct* are presented in **Appendix B**.

By October 31, 2002, the *Codes of Conduct* were endorsed by the most prominent national professional associations and societies for each of the groups mentioned above. Many other conservation and horticultural organizations also endorsed the codes. **Appendix C** contains lists of all endorsement and articles on this topic to date. Updates are made to this list periodically and placed on the website (www.mobot.org/invasives).

Using Codes of Conduct: Status of Endorsements, Code Development, Education and Outreach

Although developing the *Findings and Principles* and *Codes of Conduct* are certainly major steps toward addressing the threats posed by invasive plant species, endorsing, communicating and applying them is just as important. A principal reason for holding the meeting in Chicago was to discuss experiences of those who have initiated efforts to adopt, explain and use the *Codes of Conduct*. The following groups were represented at the Chicago Meeting and offered summaries of their recent experiences²:

- The Nursery Industry
- The Gardening Public
- Landscape Architects
- Botanical Gardens/Arboreta

These groups face varying challenges and opportunities as they explore how best to build awareness and acceptance of the *Codes of Conduct*. In all cases they have made a commitment to explore how best to advance the *Codes of Conduct* equitably and effectively. This takes time and patience. Following are summaries of what these groups have experienced to date:

The Nursery Industry

The Nursery Industry has been educating its constituency on the *Codes of Conduct* so that endorsements and subsequent implementation can occur. This industry's emphasis during the past year has been on the following *Codes of Conduct*:

Code 2: Work with regional experts and stakeholders to determine which species in your region are either currently invasive or will become invasive. Identify plants that could be suitable alternatives in your region.

² Federal and state government was represented at the initial meeting, *Linking Ecology and Horticulture to Prevent Plant Invasions*, held in St. Louis. However, representatives were unable to attend the meeting in Chicago. As such, there is no discussion in these proceedings of government activity to respond to the invasive species problem. This does NOT mean that no activity has occurred. We suggest you visit www.invasivespecies.gov for an update on such activity.

Code 4: Where agreement has been reached among nursery associations, government, academia and ecology and conservation organizations, phase-out existing stocks of those specific invasive species in regions where they are considered to be a threat.

There is little opposition within this industry to endorsing and using the *Codes of Conduct*, as long as three key considerations are fully explored: **1)** Regional groups must be allowed to develop their own responses to regional invasive plant problems, including guidance on or lists of invasive plant species, since plants may exhibit invasive characteristics in one region and not in another; **2)** Efforts to place invasive plant species on official lists must include research, where needed, to ensure “listed” plants do, in fact, have invasive characteristics. Lists that use anecdotal information to determine the “invasive” potential of a species are not preferred by the nursery industry, since this highly important approach could cause some plants to be deemed “invasive” without sufficient basis; and, **3)** Well understood criteria for listing a plant as “invasive” must be developed prior to completing invasive plant species lists. Industry representatives emphasized the distinction between processes for *identifying and ranking* invasive plants, and processes for selecting and applying non-regulatory or regulatory management measures.

The Florida Nurserymen and Growers Association is working particularly diligently on this issue. Since last year, this organization has identified a number of research goals they would like to pursue before implementing the *Codes of Conduct*. Florida recently adopted and published its research goals which are a major entrance to directing research to meet the industry’s needs. The process involves identifying needs and promoting those within the research community. They currently are working with the University of Florida to “advertise” these goals. There are several goals that deal specifically with invasive plant issues. The industry will encourage research to determine:

- How to manage the development of species and cultivars that will not cause pest plant invasions.
- How to develop science-based best management practices for landscape maintenance and contractor professionals.
- How to develop and improve plant material to protect and fit Florida’s changing environment, specifically.

- How to develop genetically altered plant material that will prevent invasion of economically important plants.
- What plants will aid quality of life while minimizing impacts on the environment.

Also, the Massachusetts Nursery and Landscape Association is participating in efforts with the state's Department of Fisheries and Wildlife to establish criteria for identifying invasive plant species in Massachusetts.

In short, the diverse nursery industry is working hard both at the national level and in key regions to lay the foundation for their active and effective role in a broad effort to reduce the harmful effects of plant species with invasive characteristics. Their leadership role in initiatives such as the establishment of a \$5.5 million nursery and floriculture research partnership with the USDA's Agricultural Research Service, and those mentioned above, are essential collaborative steps.

The Gardening Public

The Garden Club of America (GCA) established its leadership position in the fight against invasive plants when it became one of the first national organizations to endorse the *Codes of Conduct*. Since endorsing them, the GCA has been communicating with their 197 member clubs located across the Country, including Hawaii. Each club is being strongly encouraged to endorse the *Codes of Conduct* for the Gardening Public and then to implement them with positive actions in the form of education and community outreach. The *Findings and Principles* and *Codes of Conduct* have been carefully explained along with other pertinent information in order to communicate a strong message regarding the nature and severity of the invasive plant problem. The GCA website (www.gcamerica.org) will offer excellent tools for further education and club projects such as informed speakers listed by region, recommended websites and publications, characteristics to consider for plants to replace invasive species and examples of organizations for collaborative projects. The GCA publication will feature some of the most creative projects developed by individual clubs.

Other groups representing regional gardening public organizations have also endorsed the *Codes of Conduct*. They include the Federated Garden Clubs of Missouri and Connecticut; and have published their progress in newsletters to their membership. During its next national board meeting, the Federated Garden Clubs of America will consider adopting ways to encourage other regional groups to take active steps toward addressing the invasive species problem.

Landscape Architects

The American Society of Landscape Architects (ASLA) was also among the first national organizations to endorse the *Codes of Conduct*. It has placed a high priority on communicating efforts underway to address the invasive plant species problem. The ASLA determined that more education on the topic was needed since many landscape architects lacked an in depth awareness of the nature of and solutions to the invasive plant species problem. The ASLA has increased efforts to bring about awareness through publishing a series of articles in *Landscape Architecture* magazine, advocating for federal legislation proposed to help curb the threats, and hosting a successful education session at the ASLA annual meeting held last fall in San Jose, CA. (The article detailing the Missouri Workshop is Listed in **Appendix C** and included in materials posted on the invasive plant species website (www.mobot.org/invasives)).

Recognizing education and leadership both play a key role in successfully addressing the invasive plant species problem, the ASLA has asked their policy committee to consider developing a policy that will encourage landscape architects to consider the issue of invasive species when designing and specifying plants in the landscape. The ASLA's code of ethics encourages its members to seriously consider all policies it develops.

A landscape architect based in Kentucky described ways that the *Codes of Conduct* are being considered or implemented in specific regions.

Examples include:

- Local planning commission regulations that actually disallow using existing invasive species;
- Incentives in the planning and zoning regulations to use alternative species instead of those with invasive characteristics;
- Suggested continuing education credits for landscape architects who attend seminars on invasive plants and the problems they can cause;
- Pursuit by public sector employees of contracts with local nurserymen to produce and market local native plants;
- A joint outreach campaign by the Southeast Exotic Pest Plant Council and a local arboretum which identifies invasive plants and offers alternatives;
- And, the formulation of possible research initiatives to further develop scientific bases for identification of a plant's invasive potential in a given region (based on the plant's behavior, rather than its origin).

In summary, landscape architects and their regional and national representatives are committed to advancing thoughtful and effective measures to better understand and curb the threat of harmful invasive plant species.

Botanical Gardens and Arboreta

The American Association of Botanic Gardens and Arboreta (AABGA) endorsed the *Codes of Conduct* in early 2002 and several botanic gardens have already taken steps to implement them. The North Carolina Botanic Garden had anticipated development of codes, and for several years has been implementing protocols designed to minimize the institution's use and distribution of invasive species. Following the 2001 meeting two other prominent botanic gardens, The Chicago Botanic Garden and The Missouri Botanical Garden, followed suit, developing and implementing protocols based on the *Codes of Conduct*. Below are summaries of what The Chicago Botanic and Missouri Botanical Gardens have accomplished to date and what they have learned so far from their accomplishments.

Chicago Botanic Garden (CBG)

Shortly after the December, 2001 St. Louis meeting, CBG decided to actively address the invasive plant species problem by developing and implementing an Invasive Plant Policy for itself. In doing so, they acknowledged the following factors regarding invasive plant species:

- Invasive species are the 2nd largest threat to biodiversity;
- We depend on biodiversity for our food, shelter, medicines and ecosystem services;
- Invasive species cost the US \$138 billion annually;
- Horticulture (in the broad sense) is a key pathway for invasive plant introductions; as many as 85% of our invasive species were introduced for horticultural use;
- Most exotic plants do not exhibit harmful invasive characteristics;
- A primary goal of any invasive plant policy should be to determine the risk of new introductions.

CBG then assembled an interdepartmental team to develop a policy that could strengthen its conservation position without compromising its horticulture mission. A synopsis of this policy is presented on the following pages and included in its entirety in **Appendix D**. The policy was adopted by the CBG Board in early 2002 and implementation is underway.

Chicago Botanic Garden Invasive Plant Policy Synopsis

(See Appendix D for complete policy)

1. Species known to be invasive in the Chicago region* will not be added to the collection. When species are determined to present a risk of becoming invasive, they will be removed from the collection and destroyed. Whenever possible, interpretation about invasive species removal will be provided. The Garden will also develop, utilize, and promote a list of acceptable noninvasive plants with similar landscape utilizations as the plants being removed as part of its interpretive efforts.
2. Attached (Appendix 1 of **Appendix D**) is a current list of known invasive species. All species on the list have been assigned one of four courses of action: (1) Remove – for known invasive species/cultivars - remove as soon as possible, including all cultivars, and/or do not add to collection in future; (2) Phase out – for species that pose a lesser invasive risk, form significant structural features in landscape, and will be costly and time-consuming to replace - phase out over a five to ten-year period; (3) Evaluate – for taxa where invasiveness is suspected but the risk posed by each cultivar is not known – evaluate wild type species and all cultivars, then remove invasive taxa, or (4) Watch List – taxa that are potential or suspected invasive species. The Watch List includes taxa that are weedy in the Chicago region but not yet invasive, as well as taxa that are invasive in similar climates but have not become problematic in this area. If taxa on the Watch List are found in the collection, they will be monitored for invasiveness. Addition of Watch List taxa to the collection should be avoided, especially when suitable landscape/display alternatives are available.
3. Interpretation about many of the species under evaluation will be provided. The list will be reviewed annually by the Garden's Invasive Species Working Group and will be revised as needed. Invasive species removal in Garden areas will be the responsibility of the Horticulture Department in consultation with the Collections Department. A reasonable timeframe will be established for the removal of plants that are key components of designed displays such that those landscapes are not unduly impacted.
4. The Chicago Botanic Garden will follow all laws on importation and quarantine of plant materials across political boundaries. The Garden will perform risk assessment for all plants introduced to the Garden via the Plant Exploration program, to help ensure that new harmful

species do not escape cultivation (as outlined in Appendix 2 of **Appendix D**). Species new to the United States, whether herbaceous or woody, will also be evaluated for at least four years after reaching reproductive maturity. The evaluation will follow the protocols developed by the Plant Evaluation Program and must be completed prior to the species' inclusion in the permanent collections.

* The Chicago region as defined by Swink and Wilhelm (1994) in *Plants of the Chicago Region*, includes the following 22 counties: Walworth, Racine, and Kenosha counties in Wisconsin; Boone, McHenry, Lake, DeKalb, Kane, DuPage, Cook, Kendall, Will Grundy and Kankakee counties in Illinois; Lake, Newton, Porter, Jasper, LaPorte, Starke, and St. Joseph counties in Indiana; and Berrien County, Michigan.

5. The Chicago Botanic Garden will not distribute plants, seeds, or cuttings or other propagules of any germplasm within its collections (research or permanent) that is on the Invasive Species List (R or P) or under evaluation for invasiveness (E on list or taxa from plant collection trips). Plants that are, or would likely become, invasive in the Chicago region, or the upper Midwest, will not be distributed via the Garden plant sales or the Chicagoland Grows plant introduction program. The Garden will no longer continue the Index Seminum (seed exchange) program, but will consider individual requests for propagules on a case-by-case basis.
6. The Garden will work to control invasive species in the Native Habitat Areas and lakes and on Garden grounds generally. Staff training in recognition and removal techniques of invasive species will be implemented. The Garden will disseminate information about invasive species control based on our experiences.
7. The Conservation Science Department will conduct research on the biology of invasiveness and assist with the design and implementation of evaluation studies on the invasive potential of untested plant species.
8. The Ornamental Plant Development Department will evaluate the invasive potential of untested plants, and when appropriate, strive to develop noninvasive forms of known-to-be invasive landscape plants.
9. The Chicago Botanic Garden will educate the public and the nursery industry about preventing the introduction and spread of invasive species. Instructors for the School of the Chicago Botanic Garden will be provided with a list of regionally-invasive species and will be asked to provide information about invasiveness to course takers, and to not recommend plants that the Garden is removing or has removed from the collections based on the issue of invasiveness.

Among the most controversial aspects of this CBG effort has been developing the invasive species list itself. Debate has centered around what criteria was/should be used to list a particular plant? Among the recommendations by participants at this meeting is to clearly develop and use **listing criteria** before actually placing a plant on an invasive plant list. A balanced combination of anecdotal, scientific, risk-based and regional habitat influences should become the basis for listing plants. CBG is considering all these criteria as it proceeds. Further discussion on this topic can be found below under “Using the Codes of Conduct: Further Considerations and Challenges”.

The Missouri Botanical Garden (MBG)

MBG has consistently assumed a leadership role in conserving biological diversity. Following the December, 2001 Workshop, MBG was quick to form a policy-level committee with representatives from its varied programs and charged with developing a comprehensive “invasive species policy” and specifically to plan for and see to the implementation of *the Codes of Conduct*. The primary goal of this effort was to incorporate proceedings of the December, 2001 Workshop into a comprehensive invasive species policy for MBG. This “Invasive Species Policy Committee” included representatives from the Director’s Office, Conservation Committee, Horticulture Department, Research Facility, Shaw Nature Reserve and Education Department. It first scrutinized the *Codes of Conduct for Botanical Gardens* and then tailored them to meet MBG’s individual needs. Below is an example of how MBG took the *Codes of Conduct* for botanical gardens and tailored them to meet their needs; followed by a complete listing of MBG’s draft Codes of Conduct:

<p align="center">Sample Voluntary Code of Conduct For Botanical Gardens February 2002</p>	<p align="center">Draft Missouri Botanical Garden Modified Code of Conduct Spring 2002</p>
<p>Code 1: Conduct an institution-wide review examining all departments and activities that provide opportunities to stem the proliferation of invasive species and inform visitors. For example, review or write a collections policy that addresses this issue; examine such activities as seed sales, plant sales, book store offerings, wreath-making, workshops, etc.</p> <p align="center">See www.mobot.org/invasives for the complete set of <i>Codes of Conduct</i> developed in St. Louis</p>	<p>I. Develop a collections policy that addresses the invasive species issue for all departments and campuses.</p> <p>II. Conduct an institution-wide review examining all departments, activities, and “intellectual property” which provide opportunities to stem the proliferation of invasive species and inform visitors</p> <p>a. Examples include, but are not limited to, seed and plant sales, book store offerings, living material premiums and education hand-outs, wreath making workshops, Hort Line, MBG publications, Kemper answer desk and newspaper articles.</p> <p align="center">See the following two pages for complete Code of Conduct drafted by the Missouri Botanical Garden</p>

Missouri Botanical Garden
Code of Conduct Relevant to Invasive Species

Draft

- I. Develop a collections policy that addresses the invasive species issue for all departments and campuses.

- II. Conduct an institution-wide review examining all departments, activities, and “intellectual property” which provide opportunities to stem the proliferation of invasive species and inform visitors.
 - a. Examples include, but are not limited to; seed and plant sales, book store offerings, living material premiums and educational hand-outs, wreath-making workshops, Hort Line, MBG publications, Kemper answer desk, and newspaper articles.

- III. Establish an invasive plant assessment procedure.
 - a. Create regional lists of concern (list relevant to the Garden and its properties, and list for the general public).
 - b. Assessments should include responsible monitoring on all garden properties.

- IV. Develop and implement a comprehensive awareness and training program for all staff and volunteers.
 - a. Particular emphasis should be given to training those staff and volunteers who directly interact with the public.

- V. Develop and implement a management response for all invasive species in the MBG plant collections.

- VI. Assist “neighbors” in controlling invasives on their property, when possible.
 - a. Tower Grove Park and surrounding Neighborhood Associations.
 - b. Land owners adjacent to Shaw Nature Reserve and other Garden campuses.

VII. Promote non-invasive alternative plants.

- a.** Evaluate natives for potential use as alternatives.
- b.** Through trials and testing identify other non-native alternatives.
- c.** Collaborate with “plant material centers” to develop non-invasive alternatives through plant selection or breeding.
- d.** Identify niches that need to be filled (*e.g.* plants that produce bee pollen in April, with fall color).
- e.** Develop audience profile (*i.e.* who will be the users of alternatives... gardeners, bee-keepers, landscapers, etc.).

VIII. Do not distribute or recommend known invasive plants, except for bona-fide research purposes.

- a.** All Garden staff involved in dissemination of live material for research purposes must attach a statement of caution. If the taxon is known to be invasive, this information must be conveyed to the recipient. If the taxon has not been fully evaluated for invasive potential this must also be conveyed (*e.g.* “although this taxon has not been fully evaluated for invasive potential, other members of its family/genus are known to be invasive”).
- b.** Develop a distribution policy for the Index Seminum that considers the consequences of distribution of material outside our biogeographic region.

IX. Increase public awareness about invasive plants.

- a.** Inform the public about why invasives are a problem, including the origin, mechanisms of harm, and need for prevention and control (including the importance of not disseminating plants from one region to another).
- b.** Provide the public with guidelines to evaluate the plants they have in their own gardens and for proper disposal of invasives (*e.g.* microwave, autoclave).
- c.** Work with local nursery and seed industries to assist the public in environmentally safe gardening and sales.
- d.** Include Horticulture education programs (*e.g.* Master Gardeners, and local universities) in outreach programs.
- e.** Sensitize all societies and clubs that use Garden facilities to the invasives issue.
- f.** Partner with other organizations in the management of harmful invasive species.

X. Participate in or support development and implementation of national, regional, or local early warning systems.

a. Develop identification protocols.

b. Map occurrences of invasives and share maps with other agencies.

XI. Identify plants in our collections and native flora that are invasive in other biogeographic regions.

XII. Educate all staff on laws pertaining to importation, exportation, quarantine, and distribution of plant materials across political boundaries, including foreign countries.

a. Increase staff awareness of conventions and treaties that deal with plant distribution issues.

b. Encourage affiliated organizations (*e.g.* plant societies, garden clubs) to do the same.

The MBG Invasive Plant Policy Committee also identified the following additional *principles* to help guide use of their draft *Code of Conduct*:

- Develop and implement a management response for all invasive species in the MBG plant collections.
- Establish an invasive plant assessment procedure.
- Develop and implement a comprehensive awareness and training program for all staff and volunteers.

According to MBG representatives, the succinctness and relevance of the codes to the organization or institution is a key factor necessary for making *Codes of Conduct* work effectively. Also, it is important to ensure that all whose activities could be affected by an invasive species policy are brought to the table to provide input and support to whatever policy or plan is developed. Another consideration is that approaches to using the codes should differ, depending on where they are being applied (*e.g.* a garden or nature preserve).

As the MBG Invasive Species Policy Committee continues its work, it is finding that there is a significant need for education about the extent and nature of the invasive species problem (even among staff). Without an aggressive effort to explain this issue, motivation to participate in solutions likely will remain insufficient. Currently, MBG is focusing efforts on establishing an invasive species list. Collaboratively defining the scope and criteria for this list will be its highest priority. The current scope under consideration is an area within a 50-mile radius of St. Louis to ensure that regional concerns are addressed. MBG is closely watching CBG as it develops this list to learn from Chicago's recent experiences. The MBG commitment to this effort is a long-term one and will be taken up by its Board of Trustees during 2003.

Using Codes of Conduct: Further Considerations & Challenges

The Chicago Meeting included two concurrent, facilitated break-out group sessions on topics that had been identified as key to promoting implementation of the *Codes of Conduct* and effectively addressing the invasive plant species problem. They are:

1. “**Non-Invasive Alternative Plants**”
2. “**Regionality Considerations**”

Appendix A identifies what Break-out Group Session each participant attended.

During the day, other implementation considerations and challenges were also raised, although they were not explored in as much depth. Future meetings may explore them in greater detail. They included additional work on “**invasive species listing criteria**” (which is discussed to some degree in these proceedings) and “**standards for measuring the effectiveness of *Codes of Conduct***”.

BREAKOUT GROUP 1: Non-Invasive Alternative Plants:

When horticultural plants are recognized as invasive one positive way to address the situation is to offer producers and users alternative (or “replacement”) plants that meet their requirements but which are not invasive. One breakout group discussed how lists of and information about non-invasive alternatives could most profitably be constructed and distributed to appropriate audiences. “Alternatives lists” are most effective when they are tailored to individual audiences. Specifically, home gardeners will benefit most from a list that meets their particular interests and needs. This will also be the case for a variety of other audiences, including landscape installation firms, municipalities, nurseries and business park owners.

There are a number of good reasons why “alternatives lists” are appropriate and desirable. First, they offer positive solutions to a problem, rather than simply urging that certain species should be avoided and eliminated where already planted (*i.e.*, telling people NOT to plant certain species). Also, once it has been pointed out that certain species are invasive or that they have negative impacts on conservation, there is an obligation to offer people alternatives that meet their needs

³ Please see **Appendix A** for list of who participated in this break-out session.

but which are not invasive. Finally, promoting the use alternatives in the first place prevents or slows the spread of a problem in the long run.

This breakout group drew a number of general conclusions about the importance of developing “alternatives lists” and about how they should be created:

1. Lists of non-invasive alternatives are useful and worth developing.
2. Gardeners have already begun asking for lists of non-invasive plants to use – the demand is already there.
3. The proliferation of invasive species lists is a problem because it can lead to confusion about which species are troublesome or not.
4. Standard criteria for building alternatives lists should be developed.
5. Lists of alternative species must be regional. As a practical matter due to the organization of trade groups and state regulations, “alternatives lists” should be built for each state (or possibly for regions within states or groups of states where states are smaller, such as in the Northeast).
6. All stakeholders (*e.g.* nursery industry, landscape architects and designers, conservation/biodiversity groups) must be involved in developing the lists.
7. Lists should be built to address different audiences, including: homeowners/gardeners, retail nurseries/growers, landscape design and installation community, government agencies (*e.g.*, Departments of Transportation), and researchers who could study and produce better behaved cultivars.
8. “Alternatives lists” are NOT intended to be “white lists” (*i.e.* lists of the only plants permitted). Beware of and prepare for the potential that people will use these lists for purposes other than those for which they were developed. The best way to prevent misuse is to make the intended use of your list clear.

9. Multiple alternative species for each species to be replaced should be suggested.

The group also discussed plant characteristics that should be considered in determining whether a plant is invasive and therefore worthy of seeking alternatives for and what plant characteristics should be considered when selecting suitable alternatives (replacements) for an invasive plant.

The following table presents their suggestions:

<p>Characteristics of Plants to be Replaced</p>	<p>Characteristics to consider for Replacements</p>
<ol style="list-style-type: none"> 1. Plant is in the trade or otherwise in common use. 2. Plant has negative impacts on the environment/native biological diversity. 3. Plant should be determined regionally. As a practical matter this should be decided separately for each state (or portion of a state for some of the larger ones or groups of states for some of the smaller ones in the northeast). 4. Full stakeholder participation is necessary from the start (<i>i.e.</i> all stakeholders should be represented in decisions about which species to include). 5. Consider plant sales value BUT do not exclude a species here just because it has high value. Experience has shown that even high value species can be replaced in the trade over time, driven by changing consumer preferences. 6. Consider a time-frame-of-production. For species that require long periods to produce, it may be best to give producers long notice 	<ol style="list-style-type: none"> 1. Plant must be non-invasive in region. 2. Focus on why the plant to-be replaced is selected for use (<i>i.e.</i> what are its desirable characteristics). Most species have many traits that make them desirable for certain uses. Be sure to address each of them. No other single species may have this same precise combination of characteristics but any given consumer is probably focused on just one or a few of these traits anyway. List the desirable characteristics separately and then find one or more alternatives for each characteristic. Find alternatives for ALL common uses, for example including wreath-making, cut flowers, etc. 3. Major categories of characteristics: <ul style="list-style-type: none"> • Life Form <ul style="list-style-type: none"> ➤ Size ➤ Shape ➤ Branching pattern ➤ Flower size, color and season ➤ Fruit size and color and season ➤ Fall color? ➤ Evergreen? ➤ Foliage color and shape • Environmental Tolerance <ul style="list-style-type: none"> ➤ Life-zones (temperature, seasonality)

<p>of plans to urge use of alternatives.</p>	<ul style="list-style-type: none"> ➤ Water requirements ➤ Shade/sun requirements ➤ Disease & pest resistance ➤ Vigor ➤ Adaptability ➤ Soil preferences/tolerances ➤ Resistance to deer browse • Landscape Use <ul style="list-style-type: none"> ➤ Focal/specimen planting ➤ Groundcover ➤ Erosion control ➤ “Does it spread?” (as a positive trait) • Production Regime <ul style="list-style-type: none"> ➤ Easy to grow? ➤ Time required to produce ➤ Cost of production
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This breakout group concluded its discussion by identifying several **guiding principles for the further development of ways to use alternative plant species** in place of harmful invasive plant species. Among the foremost principle is that a general set of criteria for developing such lists should be created – this is of great importance for ensuring the equitability and reliability of alternatives lists. On the other hand the lists themselves should be for single states, groups of small states or regions. These lists must reflect behavior of the plants in that region. ALL stakeholders should be involved from the outset in their creation and should first agree upon criteria for listing plants (both alternative and invasive species). Furthermore, the listing criteria should identify which plant a particular alternative species is replacing. If there are several alternative species available to replace an invasive plant, then they should all be identified. This entire effort should be aimed at an audience that includes consumers, growers, landscape contractors, researchers (to help them find “better behaved” cultivars) and government agencies. Finally, tangible **next steps** need to be taken:

1. Fully define and fund this project by gathering and officially constituting a group of all interested parties to collaboratively develop an overall project description and basis for it;

2. Use this approach to create national guidelines that can be adopted and tailored for use in particular states and regions;
3. Develop case studies on how the process of selecting alternatives works and the lists that result to help guide others who desire to take similar steps in other states and regions.

BREAKOUT GROUP 2: Regionality Considerations

It is commonly agreed that the potential for a particular plant to behave “invasively” depends on the region in which it exists. For instance, English Ivy has high invasive potential in the Pacific Northwest and Middle Atlantic States, but cold winters appear to limit invasions in the Midwest and New England. This situation occurs with many plants species. This means that any effort to address the invasive species problem must include consideration of what is called “regionality”.

This breakout group deliberated about several key areas that drive the “regionality” factor:

1. How best to define a “Region”;
2. A process and appropriate participants for developing invasive plant species lists that reflect regional considerations;
3. Criteria for creating regional invasive species lists;
4. Other influencing factors; and,
5. Next steps for addressing “regionality” considerations.

The deliberation results are presented below:

Defining “Region”

- Use pre-existing approaches for defining a region, such as The Nature Conservancy’s “eco-regions” or USDA’s hardiness zones;
- Consider soil and temperature when defining the eco-regions;
- Evaluate and possibly modify (as needed) the goals of previous definitions of regions, as they may diverge too much from those adopted for developing invasive species lists;

- In some cases it may be appropriate to use distance from a central point - such as a 100-mile radius around a botanical garden or nursery- when defining a region.

Process for Developing Invasive Plant Species List

- Establish a clear purpose and scope for the list;
- Identify and convene all key stakeholders in the region and consider what their motivation and desired outcome/use for the list will likely be. Key stakeholders should include all those who could be affected by the list⁴;
- Create an on-going review process for the list to add or drop species;
- Develop clear and objective criteria for listing a species;
- Provide for public review and comment on the list before it becomes final.

Suggested Listing Criteria

- Historical documentation such as herbarium specimens, field note documentation (consider asking participants sign an affidavit that says that they were sure they saw the species in a particular place);
- Whether the species is actually reproducing out of cultivation, or is just persistent;
- The suspected impact of the species and basis for this reasoning (acknowledging that detailed studies may not be feasible if there is reason to suspect it does have a strong negative effect);
- How many individual plants and plant populations are in the region;
- Availability and consideration of peer-reviewed papers or other public data;

⁴ For example, botanic gardens may wish to use the list for internal purposes to identify which plants it will not display due to their invasive qualities and convey this to all stakeholders so that others can act to ensure that a consistent message is sent across the region.

- Plant dispersal ability;
- Affected habitats of a particular invasive plant and their value;
- General knowledge about our ability to control the plant;
- Economic burdens are a separate issue - this is just concerning possible ecological harm that would land a species on a list of invasive species. Economic Impact may be considered in the selection of response measures.

Other Influencing Factors (*i.e.* economic or political)

- The cost and viability of control/quarantine;
- The cost of not controlling/quarantining;
- The ramifications of crossing political boundaries, assuming regional boundaries are drawn using political ones;
- Who the stakeholders and other relevant issues associated with a particular region.

Next Steps For Regional Considerations

- Determine how to perform and conduct simple economic risk/benefits analyses for a few representative species;
- Establish what research has been conducted to support whether a plant should be listed as invasive;
- Create and adapt a uniform criteria model adaptable to multiple regions;
- Actively encourage and facilitate communication among all stakeholders (*e.g.* follow the Florida and Massachusetts examples to develop listing criteria and report progress to others, such as industry, Exotic Pest Plant Councils, and state Heritage Programs;

- Continue to facilitate communication about the *Codes of Conduct*, particularly to garden writers and other media by releasing timely press releases. Also, strategically consider who should endorse the codes and make such endorsement requests be adapted to regions.

These ideas and suggestions regarding “regionality” should be considered by anyone responding to the invasive plant species problem, including those implementing the *Codes of Conduct*. Future efforts to formulate “next steps”, as well as explore other suggestions will be considered shortly by the Organizing Committee of “Linking Ecology and Horticulture to Prevent Plant Invasions”. In the meantime, these considerations and challenges offer a useful perspective to anyone working to address this important problem.

Future Directions

A number of ideas have emerged to ensure that the initiative taken by The Missouri Botanical Garden, The Chicago Botanic Garden and all the participants of the two workshops entitled “**Linking Ecology and Horticulture to Prevent Plant Invasions**” remains influential. These ideas reflect the general consensus that this effort IS making a difference.

A first step involved is to continue encouraging major national societies and professional associations for botanic gardens and arboreta, the nursery industry, garden clubs and landscape architecture, as well as government agencies, to endorse and implement the “*Codes of Conduct*”. They should also take steps to encourage their members to adopt and implement them. This can be accomplished by following, evaluating, and then communicating, the progress underway by leading institutions and businesses. As part of this, high quality materials targeted to different audiences by appropriate leaders are necessary. Also, the media needs be encouraged to play a more active role.

A second necessary step is to convene a group of leaders representing all stakeholder groups to develop alternative and invasive plant species lists, building from current good examples of collaborative efforts. These lists need to reflect clear and accepted criteria for listing invasive plants and alternatives for them; the specific horticultural needs of different audiences and appropriate regional approaches. Lists need to be developed for states or regions.

A third step is to enhance the tools required for accomplishing the second step. Scientific research and risk assessment (economic and environmental) models need to be further developed (also by a group of qualified representatives of all stakeholder groups) to provide a stronger foundation for identifying (and listing) plant species as invasive or as non-invasive alternatives.

In the coming weeks, the Organizing Committee (see cover for list of committee members) will discuss the merits, emphasis and financial feasibility of taking these future steps. They will be considering whether to formalize the existence of this project and acknowledge the need for continued communications and efforts among the groups represented. Steps to formalize the group could include giving it a name, defining a mandate and plan of action for the next 1-5 years and evaluating funding opportunities to support future meetings.

As outlined in **Appendix E**, the project website (www.mobot.org/invasives) is also being upgraded so that it can become an even more useful tool for communicating the results and progress of “**Linking Ecology and Horticulture to Prevent Plant Invasions**”.

APPENDIX A

LIST OF PARTICIPANTS

Linking Ecology and Horticulture to Prevent Plant Invasions: A Workshop

Hosted by the Chicago Botanic Garden

October 31, 2002

WORKSHOP PARTICIPANTS

Note: + Regionality Considerations Break-Out

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APPENDIX B

CODES OF CONDUCT

Voluntary Codes of Conduct for Government

1. Require risk assessment for government-led or financed plant introductions to ensure that no new harmful plant species are introduced, intentionally or unintentionally.
2. Do not distribute existing holdings of invasive plant species to areas where they can potentially do harm. Eliminate these holdings or maintain new or existing holdings using appropriate safeguards.
3. Coordinate and facilitate collaboration in databases, early warning systems, monitoring, and other means of preventing invasive plant species problems.
4. Lead and fund (subject to budgetary considerations) the development of environmentally sound methods to control harmful invasive plant species, seek control of such species on public lands and promote their control on adjacent private lands.
5. Develop and promote the use of non-invasive plant species within all government units and to the public.
6. Facilitate, lead, coordinate and evaluate public outreach and education on harmful invasive plant species.
7. Encourage Federal employees and management to participate in ongoing training programs on invasive plant species.
8. Foster international cooperation to minimize the risk of the import and export of potentially invasive plant species.
9. Develop partnerships and incentive programs to lessen the impact of invasive plant species and provide non-invasive restoration materials.
10. Provide a forum for regular evaluation of the effectiveness of these voluntary codes of conduct towards preventing the invasive plant species problem.

11. Enforce invasive plant species legislation at all levels.

Voluntary Codes of Conduct for Nursery Professionals

1. Ensure that invasive potential is assessed prior to introducing and marketing plant species new to North America. Invasive potential should be assessed by the introducer or qualified experts using emerging risk assessment methods that consider plant characteristics and prior observations or experience with the plant elsewhere in the world. Additional insights may be gained through extensive monitoring on the nursery site prior to further distribution.
2. Work with regional experts and stakeholders to determine which species in your region are either currently invasive or will become invasive. Identify plants that could be suitable alternatives in your region.
3. Develop and promote alternative plant material through plant selection and breeding.
4. Where agreement has been reached among nursery associations, government, academia, and ecology and conservation organizations, phase-out existing stocks of those specific invasive species in regions where they are considered to be a threat.
5. Follow all laws on importation and quarantine of plant materials across political boundaries.
6. Encourage customers to use, and garden writers to promote, non-invasive plants.

Voluntary Codes of Conduct For The Gardening Public

1. Ask for only non-invasive species when you acquire plants. Plant only environmentally safe species in your gardens. Work towards and promote new landscape design that is friendly to regional ecosystems.
2. Seek information on which species are invasive in your area. Sources could include botanical gardens, horticulturists, conservationists, and government agencies. Remove invasive species from your land and replace them with non-invasive species suited to your site and needs.
3. Do not trade plants with other gardeners if you know they are species with invasive characteristics.
4. Request that botanical gardens and nurseries promote, display and sell only non-invasive species.
5. Help educate your community and other gardeners in your area through personal contact, and in such settings as garden clubs and other civic groups.
6. Ask garden writers and other media to emphasize the problem of invasive species and provide information. Request that garden writers promote only non-invasive species.
7. Invite speakers knowledgeable on the invasive species issue to speak to garden clubs, master gardeners, schools and other community groups.
8. Seek the best information on control of invasive plant species and organize neighborhood work groups to remove invasive plant species under the guidance of knowledgeable professionals.
9. Volunteer at botanical gardens and natural areas to assist ongoing efforts to diminish the threat of invasive plants.

10. Participate in early warning systems by reporting invasive species you observe in your area. Determine which group or agency should be responsible for reports emanating from your area. If no 800 number exists for such reporting, request that one be established, citing the need for a clearinghouse with an 800 number and website links to information about invasive plant species.

11. Assist garden clubs to create policies regarding the use of invasive species not only in horticulture, but also in activities such as flower shows. Urge florists and others to eliminate the use of invasive plant material.

Voluntary Codes of Conduct For Landscape Architects

1. Seek out education and information on invasive species issues:
 - a) Work with local plant ecologists, horticulturists, nurseries, botanic gardens, conservation organizations and others to determine what species in your region either are currently highly invasive or show aggressive potential. Investigate species under consideration that may present a threat.
 - b) Increase interaction with other professionals and non-professionals to identify alternative plant material and other solutions to problems caused by harmful invasive plants.
 - c) Take advantage of continuing education opportunities to learn more about invasive species issues.
2. Identify and specify non-invasive species that are aesthetically and horticulturally suitable alternatives to invasive species in your region.
3. Eliminate specification of species that are invasive in your region.
4. Be aware of potential environmental impacts beyond the designed and managed area of the landscape plan (*e.g.* plants may spread to adjacent natural area or cropland).
5. Encourage nurseries and other suppliers to provide landscape contractors and the public with non-invasive plants.
6. Collaborate with other local experts and agencies in the development and revision of local landscape ordinances. Promote inclusion of invasive species issues in these ordinances.

Voluntary Codes of Conduct For Botanic Gardens and Arboreta

1. Conduct an institution-wide review examining all departments and activities that provide opportunities to stem the proliferation of invasive species and inform visitors. For example, review or write a collections policy that addresses this issue; examine such activities as seed sales, plant sales, bookstore offerings, wreath-making workshops, etc.
2. Avoid introducing invasive plants by establishing an invasive plant assessment procedure. Predictive risk assessments are desirable, and should also include responsible monitoring on the garden site or through partnerships with other institutions. Institutions should be aware of both direct and indirect effects of plant introduction, such as biological interference in gene flow, disruption of pollinator relationships, etc.
3. Consider removing invasive species from plant collections. If a decision is made to retain an invasive plant, ensure its control and provide strong interpretation to the public explaining the risk and its function in the garden.
4. Seek to control harmful invasive species in natural areas managed by the garden and assist others in controlling them on their property, when possible.
5. Promote non-invasive alternative plants or, when possible, help develop non-invasive alternatives through plant selection or breeding.
6. If your institution participates in seed or plant distribution, including through Index Seminum, do not distribute known invasive plants except for bona-fide research purposes, and consider the consequences of distribution outside your biogeographic region. Consider a statement of caution attached to species that appear to be potentially invasive but have not been fully evaluated.
7. Increase public awareness about invasive plants. Inform why they are a problem, including the origin, mechanisms of harm, and need for prevention and control. Work with the local nursery and seed industries to assist the public in environmentally safe gardening and sales. Horticulture education programs, such as those at universities,

should also be included in education and outreach efforts. Encourage the public to evaluate what they do in their own practices and gardens.

8. Participate in developing, implementing, or supporting national, regional, or local early warning systems for immediate reporting and control. Participate also in the creation of regional lists of concern.
9. Botanical gardens should try to become informed about invasiveness of their species in other biogeographic regions, and this information should be compiled and shared in a manner accessible to all.
10. Become partners with other organizations in the management of harmful invasive species.
11. Follow all laws on importation, exportation, quarantine, and distribution of plant materials across political boundaries, including foreign countries. Be sensitive to conventions and treaties that deal with this issue, and encourage affiliated organizations (plant societies, garden clubs, etc.) to do the same.

APPENDIX C

ENDORSEMENTS AND ARTICLES

List of Endorsements of the Invasive Plant Species

Codes of Conduct

(As of February 2003)

1. American Nursery and Landscape Association
2. American Society of Landscape Architects
3. American Association of Botanic Gardens and Arboreta
4. The Garden Club of America
5. The Federation Garden Clubs of Missouri
6. Southeastern Exotic Pest Plant Council
7. Mid-Atlantic Exotic Pest Plant Council
8. Chicago Botanic Garden (also implementing the Codes)
9. Missouri Botanical Garden (also implementing the Codes)
10. North Carolina Botanical Garden (also implementing the Codes)
11. University of Washington (also implementing the Codes)
12. Florida Nurserymen and Growers Association

13. Tampa Bay Wholesale Growers Association

14. Perennial Plant Association

15. Texas Nursery and Landscape Association

16. Michigan Invasive Plant Council

List of Articles:

Linking Ecology & Horticulture To Prevent Plant Invasions

(As of February 2003)

1. Allen, William. "*Invasive Plants Get Attention At Botanical Workshop*". St. Louis Post Dispatch, December 3, 2001.
2. Baskin, Yvonne. "*The Greening of Horticulture: New Codes of Conduct Aim to Curb Plant Invasions*". Vol. 52 No 6. Bioscience, June 2002
3. Dowdell, Jennifer. "*An Unlikely Alliance: Professionals Counter Alien Plant Invasions with a United Front*". Landscape Architecture, March 2002.
4. Fay, Kate (Editor). "*Linking Ecology & Horticulture To Prevent Plant Invasions: Proceedings of the Workshop at the Missouri Botanical Garden, St. Louis, Missouri, 1-4 December 200*". Missouri Botanical Garden
5. White, Peter. "*Linking Ecology and Horticulture to Prevent Plant Invasions: An Introduction to the St. Louis Declaration and the Codes of Conduct*". Wildland Weeds, Winter 2002.

APPENDIX D

“THE CHICAGO BOTANIC GARDEN INVASIVE PLANT POLICY”

Chicago Botanic Garden Invasive Plant Policy

Introduction:

Invasive plants and animals are threatening our nation's environment and economy. Invasive species pose an enormous threat to our native plants, animals and ecosystems. In fact, their toll on the environment is second only to habitat destruction. Nearly half of the species listed as threatened or endangered under the Endangered Species Act are at risk due to competition with or predation by non-native species. Invasive species can also alter communities by changing the hydrology or soil chemistry. Invasive species are costing the United States nearly \$125 billion per year (www.invasivespecies.gov). Some of the worst weeds in natural areas in Illinois include purple loosestrife (*Lythrum salicaria*), Japanese and bush honeysuckles (*Lonicera japonica*, *L. maackii*, *L. tatarica*, *L. morrowii*), garlic mustard (*Alliaria petiolata*) and buckthorns (*Rhamnus cathartica* and *R. frangula*).

Although invasive plants are almost always not native to a region, it is important to note that most non-native species are not invasive. In addition, some native species can become invasive. For the purposes of this document, the following definitions will be used:

- **Native** (indigenous) – a species that was present in North America prior to European settlement or has arrived since through natural means of dispersal.
- **Non-native** (exotic, alien, introduced) – a species that was brought to North America by humans, either deliberately or accidentally.
- **Naturalized** – a non-native species, or native species from another region of the country, that has become established in disturbed areas and/or native communities.
- **Weedy** – a species that readily spreads, especially in disturbed areas, but generally does not pose a threat to the integrity of native plant communities.
- **Invasive** – a species, usually non-native, that is able to establish itself within existing native plant communities and is posing a threat to the integrity of the community.

When plants are introduced to a new location, either intentionally or accidentally, they can spread prolifically, out-compete native species for resources, and eventually even dominate the landscape. Biologists are studying the mechanisms underlying a taxon's ability to become invasive, but for now it is still difficult to predict whether or not a species will become invasive in a new habitat. Some factors common to many invasive plants include:

- Escape from natural enemies
- Rapid growth and early maturity
- Production of many seeds
- Ability to reproduce vegetatively
- Seeds that are dispersed widely (such as by birds or wind) and seeds that germinate quickly (do not have long dormancies)
- Apomictic seed production (production of seed asexually)

People have introduced the vast majority of invasive species, either accidentally or deliberately. For example, kudzu was introduced to control soil erosion. Many non-native species came to the United States with the colonists who wanted familiar food and garden plants. Some invasive species were, or still are, popular ornamental plants used in landscaping. The rapid expansion of global trade and human mobility has led to many species arriving accidentally. Seeds can hitch rides to new locations in cargo or even stuck to the bottom of hiking boots.

The federal government has responded to the invasive species crisis in several ways. President Clinton issued an Executive Order (13112) on invasive species in February 1999. The order established the National Invasive Species Council to provide national leadership on invasive species; see that Federal efforts are coordinated and effective; promote action at local, state, tribal and ecosystem levels; identify recommendations for international cooperation; facilitate a coordinated network to document and monitor invasive species; develop a Web-based information network; provide guidance on invasive species for Federal agencies to use in implementing the National Environmental Policy Act; and prepare a management plan. The plan, "Meeting the Invasive Species Challenge Management Plan" was completed by the Council and signed by President Clinton on January 18, 2001. Of relevance to botanic gardens, the plan calls for the development of a screening and evaluation process by 2006 for the introduction of non-native plants to the United States. The USDA and Department of the Interior will have oversight for plant importation processes.

Chicago Botanic Garden – History:

The Chicago Botanic Garden is well known for its diverse and beautiful horticultural displays. One of its goals has been to develop the most diverse horticultural plant collection in the Midwest. To build its collection, the Garden has been an active participant in exploration trips to countries in Asia and Europe, as well as other parts of the United States, to bring back new plants with horticultural merit. The Ornamental Plant Development department has programs in plant breeding, plant evaluation, and plant introduction with goals of developing, selecting, recommending, and introducing the best horticultural plants for the Chicago region to the nursery industry.

In recent years the Garden has become more concerned about invasive plants. Nearly one-third of the Chicago Botanic Garden's 385 acres is devoted to Native Habitat areas. There, Garden staff are actively implementing and conducting research on management protocols that remove invasive plants and help prevent their recolonization. The Chicago Botanic Garden is now evaluating many of the plants collected abroad through the Plant Exploration program before they enter the collection. Species that show signs of weediness in the evaluation period (four years for herbaceous plants, seven to ten years for woody plants) are destroyed. The Garden's Collection Policy states that any plant "which has the potential to threaten the genetic diversity of local native populations, has overly aggressive behavior (weedy), or the ability to introduce pests or diseases will be screened and evaluated before being accepted into the Collection."

Today, with an increased awareness about the environmental and economic threats posed by invasive species, the Chicago Botanic Garden is expanding and strengthening its invasive plant policy. The Garden aims to strengthen its role as a conservation leader without compromising its horticultural mission or the beauty of its landscapes.

Chicago Botanic Garden Invasive Plant Policy

1. Species known to be invasive in the Chicago region* will not be added to the collection. When species are determined to present a risk of becoming invasive, they will be removed from the collection and destroyed. Whenever possible, interpretation about invasive species removal will be provided. The Garden will also develop, utilize, and promote a list of acceptable noninvasive plants with similar landscape utilizations as the plants being removed as part of its interpretive efforts.
2. Attached (Appendix 1) is a current list of known invasive species. All species on the list have been assigned one of four courses of action: (1) Remove – for known invasive species/cultivars - remove as soon as possible, including all cultivars, and/or do not add to collection in future; (2) Phase out – for species that pose a lesser invasive risk, form significant structural features in landscape, and will be costly and time-consuming to replace - phase out over a five to ten-year period; (3) Evaluate – for taxa where invasiveness is suspected but the risk posed by each cultivar is not known – evaluate wild type species and all cultivars, then remove invasive taxa, or (4) Watch List – taxa that are potential or suspected invasive species. The Watch List includes taxa that are weedy in the Chicago region but not yet invasive, as well as taxa that are invasive in similar climates but have not become problematic in this area. If taxa on the Watch List are found in the collection, they will be monitored for invasiveness. Addition of Watch List taxa to the collection should be avoided, especially when suitable landscape/display alternatives are available.
3. Interpretation about many of the species under evaluation will be provided. The list will be reviewed annually by the Garden's Invasive Species Working Group and will be revised as needed. Invasive species removal in Garden areas will be the responsibility of the Horticulture Department in consultation with the Collections Department. A reasonable timeframe will be established for the removal of plants that are key components of designed displays such that those landscapes are not unduly impacted.

* Chicago region as defined by Swink and Wilhelm (1994) in *Plants of the Chicago Region*, the following 22 counties: Walworth, Racine, and Kenosha counties in Wisconsin; Boone, McHenry, Lake, DeKalb, Kane, DuPage, Cook, Kendall, Will Grundy and Kankakee counties in Illinois; Lake, Newton, Porter, Jasper, LaPorte, Starke, and St. Joseph counties in Indiana; and Berrien County, Michigan.

4. The Chicago Botanic Garden will follow all laws on importation and quarantine of plant materials across political boundaries. The Garden will perform risk assessment for all plants introduced to the Garden via the Plant Exploration program, to help ensure that new harmful species do not escape cultivation (as outlined in Appendix 2). Species new to the United States, whether herbaceous or woody, will also be evaluated for at least four years after reaching reproductive maturity. The evaluation will follow the protocols developed by the Plant Evaluation Program and must be completed prior to the species' inclusion in the permanent collections.
5. The Chicago Botanic Garden will not distribute plants, seeds, or cuttings or other propagules of any germplasm within its collections (research or permanent) that is on the Invasive Species List (R or P) or under evaluation for invasiveness (E on list or taxa from plant collection trips). Plants that are, or would likely become, invasive in the Chicago region, or the upper Midwest, will not be distributed via the Garden plant sales or the Chicagoland Grows plant introduction program. The Garden will no longer continue the Index Seminum (seed exchange) program, but will consider individual requests for propagules on a case-by-case basis.
6. The Garden will work to control invasive species in the Native Habitat Areas and lakes and on Garden grounds generally. Staff training in recognition and removal techniques of invasive species will be implemented. The Garden will disseminate information about invasive species control based on our experiences.
7. The Conservation Science Department will conduct research on the biology of invasiveness and assist with the design and implementation of evaluation studies on the invasive potential of untested plant species.
8. The Ornamental Plant Development Department will evaluate the invasive potential of untested plants, and when appropriate, strive to develop noninvasive forms of known-to-be invasive landscape plants.
9. The Chicago Botanic Garden will educate the public and the nursery industry about preventing the introduction and spread of invasive species. Instructors for the School of the Chicago Botanic Garden will be provided with a list of regionally-invasive species and will

be asked to provide information about invasiveness to course takers, and to not recommend plants that the Garden is removing or has removed from the collections based on the issue of invasiveness.

10. The Garden will assess the threat that popular or common horticultural plants may present to related native plants in the wild (conspecifics and congeners). The possibility of hybridization threatening wild plant populations and their genetic integrity will be assessed. If a significant risk is present, alternatives to those horticultural plants will be sought.

* Many of the policy statements are adapted from S. Reichard and P. White, 2000. Guidelines for Botanic Gardens with a Conservation Ethic. World Botanic Gardens Conservation Congress.

Appendix 1: Invasive Plant List

- IL ALA, WI ALA, IN ALA: American Lands Alliance/Faith Campbell, Worst invasive plant species in the conterminous United States (1999), Lists for Illinois, Wisconsin, and Indiana respectively
- MWRPTF: Midwest Rare Plant Task Force Invasive Species Team List (1999)
- IL DNR: Illinois Department of Natural Resources, 25 weeds that pose the greatest threat to Illinois forests (1994)
- INPS: Illinois Native Plant Society, list of 60 worst invasive plant species in Illinois (2000)
- INPAWS: Indiana Native Plant and Wildflower Society, 40 worst weeds in Indiana (2000)
- WI DNR: Wisconsin Department of Natural Resources, 25 introduced species to avoid planting (1998)
- Midewin: Midewin National Tallgrass Prairie list of invasive species, *=existing problem, W=watch list
- USFS: US Forest Service Eastern Region, Category 1 invasive plants (highly invasive non-native plants which invade natural habitats and replace native species) and Category 2 (moderately invasive plants)
- For Sale: Plants available in the nursery trade
- At CBG: Species currently accessioned at the Chicago Botanic Garden; D=deliberate, S=spontaneous
- Plan: R = Remove as soon as possible, including all cultivars, and/or do not add to collection in future; P = Phase out (species that pose a lesser invasive risk, form significant structural features in landscape, and will be costly and time-consuming to replace will be phased out over a five to ten-year period); I = Interpret; E = Evaluate species and cultivars, then remove invasive taxa, W = Watch list (taxa not posing a serious invasive risk in the Chicago area currently, but may do so in the future).

Taxon	IL ALA	WI ALA	IN ALA	MW RPTF	IL DNR	INPS	IN PAWS	WI DNR	Midewin	USFS	For Sale	At CBG	Plan
Herbaceous													
<i>Aegopodium podagraria</i>								*		*2	*	*D	R
<i>Alliaria petiolata</i>	*	*	*	*	*	*	*		*	*I	*	*S	R
<i>Arctium minus</i>	*	*	*	*		*		*	*		*		R
<i>Carduus nutans</i>	*	*	*	*		*		*	*		*		R
<i>Centaurea maculosa</i>	*	*	*	*						*I	*		R
<i>Cirsium arvense</i>	*	*	*			*	*		*	*2	*	*S	R
<i>Cirsium palustre</i>										*2			R
<i>Cirsium vulgare</i>	*	*	*			*			*		*	*S	R

Taxon	IL ALA	WI ALA	IN ALA	MW RPTF	IL DNR	INPS	IN PAWS	WI DNR	Midwin	USFS	For Sale	At CBG	Plan
<i>Conium maculatum</i>	*	*									*		R
<i>Coronilla varia</i>	*	*	*	*		*	*	*	*	*1	*		R
<i>Daucus carota</i>	*	*									*	*S	R
<i>Dipsacus laciniatus</i>	*	*		*		*		*	*		*		R
<i>Dipsacus sylvestris</i>	*	*	*	*		*		*	*		*		R
<i>Echinops sphaerocephalus</i>									*				<i>R species</i> <i>E cultivars, I</i>
<i>Epilobium hirsutum</i>										*2	*		R
<i>Euphorbia esula</i>	*	*	*	*		*		*	*	*1	*		R
<i>Euphorbia cyparissias</i>									*		*		R
<i>Glechoma hederacea</i>	*	*	*		*	*	*	*	*		*		R
<i>Hemerocallis fulva</i> (locally invasive)	*		*	*					*		*		R
<i>Hesperis matronalis</i>			*	*		*	*	*	*	*2	*	*D,S	R
<i>Houttynia cordata</i>													W
<i>Hypericum perforatum</i>	*	*						*	*		*		R
<i>Iris pseudacorus</i>	*								W	*2	*	*D,S	<i>R species</i> <i>E cultivars, I</i>
<i>Lespedeza cuneata</i>	*		*	*	*	*	*		W		*	*D	R
<i>Linaria vulgaris</i>	*	*									*	*S	R

Taxon	IL ALA	WI ALA	IN ALA	MW RPTF	IL DNR	INPS	IN PAWS	WI DNR	Midewin	USFS	For Sale	At CBG	Plan
<i>Lotus corniculatus</i>	*		*	*		*			*		*	*S	R
<i>Lysimachia nummularia</i>	*	*	*		*		*	*	*	*2	*	*S,D	R (in 2002)
<i>Lythrum salicaria</i>	*	*	*	*		*	*	*	*	*1	*	*S	R
<i>Melilotus alba</i>	*	*	*	*		*	*		*	*2	*	*S,D	R
<i>Melilotus officinalis</i>	*	*	*	*		*	*		*	*2	*		R
<i>Pastinaca sativa</i>	*	*	*	*		*			*		*	*S	R
<i>Perilla frutescens</i>	*		*		*						*		R
<i>Polygonum cuspidatum</i> = <i>P. japonicum</i>	*	*		*		*	*	*	*	*1	*	*D	E, I
<i>Polygonum sachalinense</i>	*				*						*		R
<i>Portulaca oleracea</i>	*	*									*		R species E cultivars, I
<i>Potentilla argentea</i>	*	*		*							*		R
<i>Rorippa sylvestris</i>	*												R
<i>Rumex acetosella</i>	*	*	*						*		*	*D	R species E cultivars, I
<i>Saponaria officinalis</i>	*												R
<i>Sonchus arvensis</i>	*	*						*	*	*2	*	*D	R
<i>Valeriana officinalis</i>													R
<i>Verbascum thapsus</i>	*	*						*	*		*	*S	R

Taxon	IL ALA	WI ALA	IN ALA	MW RPTF	IL DNR	INPS	IN PAWS	WI DNR	Midewin	USFS	For Sale	At CBG	Plan
<i>Verbina bonariensis</i>													W
Grasses													
<i>Agropyron repens</i>	*	*							*		*	*S	R
<i>Bromus inermis</i>	*	*	*			*	*		*	*2	*		R
<i>Festuca elatior</i> (=F. arundinacea)	*	*	*	*		*	*		*	*2	*	*S	R
<i>Festuca pratense</i>	*	*	*						*	*2	*		R
<i>Microstegium vimineum</i>	*	*	*	*	*		*		W	*1			R
<i>Miscanthus sacchariflorus</i> (locally common)	*	*							W		*		R
<i>Miscanthus sinensis</i> (locally common)	*			*			*				*	*D	E, I R v. purpurescens
<i>Phalaris arundinacea</i>	*	*	*	*		*	*		*		*	*S, D	R
<i>Phragmites australis</i>				*		*	*		*		*		R
<i>Poa compressa</i>	*	*	*						*	*2	*	*D	I
<i>Poa pratensis</i>	*	*				*			*	*2	*	*D	I
<i>Setaria faberi</i>	*								*		*		R
<i>Sorghum halapense</i>	*	*	*			*			*	*2	*		R
Aquatics													
<i>Alternanthera philoxeroides</i>	*										*	*D	R
<i>Butomus umbellatus</i>										*1	*	*D, S	R

Taxon	IL ALA	WI ALA	IN ALA	MW RPTF	IL DNR	INPS	IN PAWS	WI DNR	Midewin	USFS	For Sale	At CBG	Plan
<i>Egeria densa</i>										*2	*		R
<i>Hydrilla verticillata</i>										*2			R
<i>Myriophyllum spicatum</i>	*	*							W	*1	*		R
<i>Najas minor</i>										*2		*S	R
<i>Nasturtium officinale</i>										*2	*		R
<i>Nymphoides peltata</i>										*2	*		R
<i>Potamogeton crispus</i>		*								*1		*S	R
<i>Trapa natans</i>										*1	*		R
Vines													
<i>Ampelopsis brevipedunculata</i>										*1	*	*D	R
<i>Celastrus orbiculatus</i>	*	*	*	*	*	*	*	*	W	*1	*	*D,S	R
<i>Dioscorea batatas</i>	*		*	*		*					*		R
<i>Euonymus fortunei</i>	*	*	*	*	*	*	*	*	W	*2	*	*D	E, I
<i>Lonicera japonica</i>	*	*	*	*	*	*	*	*	W	*1	*	*D	R
<i>Polygonum perfoliatum</i>									W	*1	*		R
<i>Pueraria montana =P. lobata</i>	*		*	*	*	*	*			*1	*		R
<i>Vinca minor</i>	*	*	*	*	*	*	*	*	*	*2	*	*D	E, I
<i>Vincetoxicum nigrum</i>										*2			R

Taxon	IL ALA	WI ALA	IN ALA	MW RPTF	IL DNR	INPS	IN PAWS	WI DNR	Midewin	USFS	For Sale	At CBG	Plan
<i>Vincetoxicum rossicum</i>										*2			R
<i>Wisteria sinensis</i>	*					*					*		W
<i>Shrubs</i>													
<i>Berberis thunbergii</i>	*	*	*	*	*	*		*	*	*1	*	*S,D	R species E cultivars, I
<i>Berberis vulgaris</i>	*	*	*	*				*	*	*2	*		R
<i>Cotoneaster multiflorus</i>	*								*		*	*D	P
<i>Elaeagnus angustifolia</i>	*	*			*			*		*1	*	*D	W
<i>Elaeagnus umbellatus</i>	*	*	*	*	*	*	*	*	*	*1	*	*D	R
<i>Euonymus alatus</i>	*	*	*	*	*	*	*		*	*2	*	*D	R species E cultivars, I
<i>Euonymus europeus</i>	*								W		*	*D	R
<i>Hippophae rhamnoides</i>											*	*D	R
<i>Ligustrum obtusifolium</i>	*			*	*						*	*S,D	P
<i>Ligustrum vulgare</i>	*	*		*		*	*	*	*	*2	*	*S,D	P
<i>Lonicera x bella</i>	*	*				*		*	*	*1	*		R
<i>Lonicera maackii</i>	*	*	*	*	*	*	*	*	*	*1	*		R
<i>Lonicera morrowii</i>	*	*	*	*		*	*			*1	*		R
<i>Lonicera tatarica</i>	*	*	*	*	*	*	*	*	*	*1	*	*S	R
<i>Rhamnus cathartica</i>	*	*	*	*	*	*	*	*	*	*1	*	*S	R

Taxon	IL ALA	WI ALA	IN ALA	MW RPTF	IL DNR	INPS	IN PAWS	WI DNR	Midewin	USFS	For Sale	At CBG	Plan
<i>Rhamnus frangula</i>	*	*	*	*	*	*	*	*	*	*1	*	*S,D	R
<i>Rosa multiflora</i>	*	*	*	*	*	*	*	*	*	*2	*	*S	R (check rootstock)
<i>Spiraea japonica</i>				*							*	*D	W
<i>Syringa reticulata</i>													W
<i>Viburnum opulus</i>	*	*	*	*		*	*	*	*		*	*D,S	R species E cultivars, I
Trees													
<i>Acer ginnala</i>				*	*			*	W		*	*D	P
<i>Acer platanoides</i>	*	*		*		*	*	*	*	*1	*	*D	R species E cultivars, I
<i>Ailanthus altissima</i>	*	*	*		*	*	*		*	*1	*	*D	R
<i>Alnus glutinosa</i>	*	*					*		W		*	*D	P species E cultivars
<i>Malus spp. (crabapples)</i>	*	*	*								*	*D	E, I
<i>Morus alba</i>	*	*		*	*	*	*		*		*	*D	P
<i>Populus alba</i>	*	*	*	*		*	*		*		*	*D	P
<i>Prunus mahaleb</i>	*	*	*								*	*D	P
<i>Robinia pseudoacacia</i>				*		*	*	*	*		*	*D	R species E cultivars, I
<i>Ulmus pumila</i>	*	*	*	*		*	*	*	*	*2	*		R

Appendix 2: Risk Assessment and Evaluation Protocols

Decision tree for adding non-native plant taxa to the Chicago Botanic Garden collections:

1. If taxon is on the Chicago Botanic Garden Invasive Plant List as “R” or “P”—do not add to collection.

1. If taxon is not on list, go to 2.

2. Taxon is already in U.S. and commercially available in the Chicago area -- no risk assessment needed, can add to collection.

2. Taxon is in U.S. but not commercially available in the Chicago area – perform risk assessment and go to 3.

2. Taxon has never been introduced to U.S. – perform risk assessment and evaluation and go to 3, then 4.

3. Taxon passes risk assessment – can add to collection.

3. Taxon fails risk assessment – do not add to collection **OR** go to 4.

4. Taxon passes evaluation trial – can add to collection.

4. Taxon fails evaluation trial – do not add to collection and destroy germplasm.

Appropriate risk assessments include, but are not limited to, Reichard and Hamilton (1997), Randall, et al., (1998), and Western Australia’s Weed Risk Assessment Model. A national risk assessment system is under development and could be used once it is available.

For international plant exploration trips:

Prior to a plant exploration trip, a target list of taxa for collection will be developed. Any species, or cultivars of species, known to be invasive in the Chicago region (those listed as “R” or “P” in Appendix 1) will not be collected for use at the Chicago Botanic Garden on plant exploration trips. Recognizing the collaborative nature of international plant exploration trips, the Garden will make its policy on invasive species known to its collecting partners. All target taxa will be subjected to an established risk assessment procedure. The plant collector(s), in consultation with the Collections Department, will be responsible for developing the target list and performing risk assessment. The final list will be reviewed by the Invasive Species Working Group.

For purchased plants, seed orders, and U.S. collecting trips:

Any species, or cultivars of species, known to be invasive in the Chicago region (those listed in Appendix 1 as “R” or “P”) will not be purchased, or otherwise obtained, for collections, display, or resale. These taxa may be purchased only for the purpose of research into their invasiveness and if so they will be grown under controlled conditions and carefully monitored to prevent escape. All orders will be checked against the Garden’s Invasive Plant List.

APPENDIX E

WEBSITE INFORMATION AND SUMMARY OF CONTENTS

WEBSITE INFORMATION AND CONTENTS

The website for “Linking Ecology and Horticulture to Prevent Plant Invasions: A Workshop Hosted by the Chicago Botanic Garden is: www.mobot.org/invasives.

This website, which is currently being updated contains the most comprehensive and up to date information on this project. Its contents are organized as follows:

1. **Press Releases**, currently including the press release issued in 2002 for the St. Louis Workshop.
2. **Statement of Purpose**, which presents why this project was initiated; including key topics and activities
3. **St. Louis Declaration**, which offers the *Findings and Principles and Codes of Conduct* developed at the St. Louis Meeting.
4. **The Codes of Conduct**, designed for use by landscape architects, the gardening public, botanical gardens and arboreta, government and the nursery industry.
5. **Workshop Participants Lists**, to demonstrate the broad participation base for this project.
6. **Comprehensive Workshop Proceedings** published for the St. Louis and Chicago workshops.
7. **A Current List of Codes of Conduct Endorsements** to demonstrate the significant and broad support for this project.
8. **A Current List of Related Published Articles**, for website visitors to reference.

Future website enhancements will include: 1) links to other invasive species related websites; and, 2) a new website address to make it easier for those searching the Internet for “invasive species” to locate project activity.