

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 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 most impactful invasive species 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 behave very aggressively. For the purposes of this document, developed for use in the Chicago region, 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** (introduced) – a species that was brought to North America by humans, either deliberately or accidentally.
- **Established outside cultivation** – a non-native species, or native species from another region of the country, that is present in self-sustaining populations 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 non-native species that is able to establish itself within existing native plant communities and threaten ecosystem resilience. .
- **Aggressive** – a native species that is able to establish itself within existing native plant communities and is posing a threat to the integrity of the community.

We have deliberately avoided several terms common in the invasive species literature since they can be misconstrued or have negative connotations. These include “exotic”, “alien”, and “naturalized”.

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. Some non-native species came to the United States with immigrants 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 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 Research 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. Over half of the Chicago Botanic Garden's 385 acres are managed as natural 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 Collections 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) are two lists: the first “Invasive Plant List” is a current list of known invasive species in the Chicago region. The second “Watch List” is for 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 if suitable landscape/display alternatives are available, but exemptions may be made with Committee approval.
3. For our purposes, all cultivars of the listed species are presumed to have the same invasive status (R, P, E or Watch) as its parental taxon until/unless exempted by the Garden's Invasive Plant Committee. In order to exempt a cultivar, it must be proven to be sterile for species that reproduce by seed. Male cultivars of dioecious species may also be exempted. For species that reproduce vegetatively, additional evaluation may be necessary. All species on the invasive list (and their cultivars) have been assigned one of three courses of action: (1) Remove: for known invasive species/cultivars – remove as soon as possible, including all cultivars, and 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; (3a) Evaluate (for taxa already in collection): taxa where invasiveness of the parental taxon (wild type species) is demonstrated, but the risk posed by the cultivars is not known – evaluate cultivars in relation to the wild type species and then remove invasive taxa; taxa under evaluation will not be added to the Garden’s collection except for research purposes (assessment of invasiveness within the Plant Evaluation Program or other research projects that have been brought to the attention of the Invasive Plant Committee), or (3b) Evaluate (for taxa new to collection): follow decision tree in Appendix 2, which could ultimately lead to an evaluation trial.
4. The same level of documentation will be required both to list a species, as well as to exempt (delist) species (and/or cultivars). The definitions of documentation types are listed in Appendix 3. Anecdotal information alone will not be sufficient to list or delist a taxon; rather, observational, other published material, and/or reviewed scientific publications will be required. The Committee member proposing a taxon status change shall provide relevant documentation to the Invasive Plant Committee co-chairs at least one week before a Committee meeting where a vote may be taken.

* 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 in Michigan.

5. Interpretation about many of the species under evaluation will be provided. The list will be reviewed annually by the Garden's Invasive Plant Committee 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.
6. 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 its 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.
7. The Chicago Botanic Garden will not distribute or promote plants, seeds, or cuttings or other propagules of any germplasm within its collections (research or permanent) that is on the Invasive Plant List (R or P) or under evaluation for invasiveness (E on list, as well as taxa from plant collection trips). Plants that are, or would likely become, invasive in the Chicago region or the upper Midwest (R, P, and E), will not be distributed via the Garden plant sales or the Chicagoland Grows plant introduction program. Watch List plants will not be distributed or sold without a written warning of their potential invasiveness. 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.
8. The Garden will work to control invasive species in the Native Habitat areas, 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.
9. 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.
10. The Ornamental Plant Research Department will evaluate the invasive potential of untested plants, and when appropriate, strive to develop noninvasive forms of known-to-be invasive landscape plants.
11. 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. Garden staff and School instructors may not recommend plants that the Garden is removing or has removed from the collections, or are under evaluation, based on the issue of invasiveness (i.e. on the Garden's Invasive Plant List).

12. 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 and Watch Plant Lists

A. Invasive Plant List

Plan: R = Remove as soon as possible if present on grounds either deliberately or spontaneously, 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/or 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, and add them to invasive plant list as R species. The “removal complete” column indicates the year when all accessioned individuals were removed from collection (removal of spontaneous weedy individuals may still be ongoing). An asterisk indicates the species was not accessioned here when this policy was adopted in 2001 and is removed whenever found on grounds.

Taxon	Plan	Removal complete?
<i>Acer ginnala</i>	P	underway
<i>Acer platanoides</i>	R	2015
<i>Aegopodium podagraria</i>	R	2005
<i>Agropyron repens</i>	R	*
<i>Ailanthus altissima</i>	R	
<i>Alliaria petiolata</i>	R	*
<i>Alnus glutinosa</i>	P	2023
<i>Alternanthera philoxeroides</i>	R	
<i>Ampelopsis brevipedunculata</i>	R	2003
<i>Anthriscus sylvestris</i>	R	
<i>Arctium minus</i>	R	*
<i>Artemisia absinthium</i>	R	
<i>Artemisia vulgaris</i>	R	
<i>Azolla</i> spp.	R	
<i>Berberis koreana</i>	R	2019
<i>Berberis koreana</i> x <i>Berberis thunbergii</i> (incl. ‘Tara’ cv.)	R	2019
<i>Berberis thunbergii</i>	R	2017
<i>Berberis vulgaris</i>	R	
<i>Bromus inermis</i>	R	
<i>Butomus umbellatus</i>	R	
<i>Cabomba caroliniana</i>	R	*
<i>Calamagrostis brachytricha</i>	R	underway
<i>Carduus nutans</i>	R	*
<i>Carex divulsa</i>	R	
<i>Celastrus orbiculatus</i>	R	2003
<i>Centaurea cyanus</i>	R	

<i>Centaurea maculosa</i>	R	
<i>Cirsium arvense</i>	R	*
<i>Cirsium palustre</i>	R	*
<i>Cirsium vulgare</i>	R	*
<i>Clematis terniflora</i>	R	
<i>Conium maculatum</i>	R	*
<i>Coronilla varia</i>	R	2005
<i>Cotoneaster multiflorus</i>	P	
<i>Daucus carota</i>	R	*
<i>Dioscorea batatas</i>	R	2005
<i>Dipsacus laciniatus</i>	R	*
<i>Dipsacus sylvestris</i>	R	*
<i>Duchesnia indica</i>	R	2004
<i>Echinops sphaerocephalus</i>	R	
<i>Egeria densa</i>	R	
<i>Eichornia crassipes</i>	R	
<i>Elaeagnus umbellatus</i>	R	
<i>Epilobium hirsutum</i>	R	
<i>Euonymus alatus</i>	R	
<i>Euonymus europeus</i>	R	2005
<i>Euonymus fortunei</i>	R	underway
<i>Euphorbia cyparissias</i>	R	
<i>Euphorbia esula</i>	R	
<i>Festuca elatior</i> (=F. <i>arundinacea</i>)	R	*
<i>Festuca pratense</i>	R	
<i>Glechoma hederacea</i>	R	*
<i>Hemerocallis fulva</i> (locally invasive)	R (wild type only)	
<i>Heracleum mantegazzianum</i>	R	
<i>Hesperis matronalis</i>	R	2005
<i>Hippophae rhamnoides</i>	R	*
<i>Hydrilla verticillata</i>	R	*
<i>Hydrocharis morsus-ranae</i>	R	
<i>Hypericum perforatum</i>	R	2004
<i>Inula helenium</i>	R	underway
<i>Ipomoea aquatica</i>	R	
<i>Iris pseudacorus</i>	R	2005
<i>Kalopanax septemlobus</i>	R	
<i>Lapsana communis</i>	R	
<i>Lespedeza cuneata</i>	R	

<i>Leymus arenarius</i>	R	
<i>Ligustrum obtusifolium</i>	P	
<i>Ligustrum vulgare</i>	P	
<i>Linaria vulgaris</i>	R	2005
<i>Lonicera japonica</i>	R	2003
<i>Lonicera maackii</i>	R	
<i>Lonicera morrowii</i>	R	
<i>Lonicera tatarica</i>	R	*
<i>Lonicera x bella</i>	R	
<i>Lotus corniculatus</i>	R	*
<i>Lysimachia nummularia</i>	R	2003
<i>Lysimachia punctata</i>	R	
<i>Lysimachia verticillaris</i> = <i>L. verticillata</i>	R	
<i>Lysimachia vulgaris</i>	R	
<i>Lythrum salicaria</i>	R	*
<i>Malus</i> spp. (crabapples)	E, I	
<i>Melilotus alba</i>	R	
<i>Melilotus officinalis</i>	R	
<i>Microstegium vimineum</i>	R	
<i>Miscanthus sacchariflorus</i>	R	
<i>Miscanthus sinensis</i>	R	2016
<i>Morus alba</i>	P	
<i>Myriophyllum aquaticum</i>	R	*
<i>Myriophyllum spicatum</i>	R	*
<i>Najus minor</i>	R	*
<i>Nasturtium officinale</i>	R	
<i>Nymphoides peltata</i>	R	
<i>Pastinaca sativa</i>	R	
<i>Pennisetum alopecuroides</i>	R	underway
<i>Perilla frutescens</i>	R	
<i>Phalaris arundinacea</i>	R	2004
<i>Phellodendron amurense</i> (excluding male cultivars)	R	
<i>Phellodendron japonica</i> (excluding male cultivars)	R	
<i>Phragmites australis</i>	R	
<i>Pinellia pedatisecta</i>	R	
<i>Pinellia triparitita</i>	R	
<i>Pistia stratiotes</i>	R	
<i>Poa compressa</i>	I	
<i>Poa pratensis</i>	I	

<i>Polygonum cuspidatum</i> = <i>P. japonicum</i>	R	
<i>Polygonum perfoliatum</i>	R	
<i>Polygonum sachalinense</i>	R	
<i>Populus alba</i>	P	
<i>Portulaca oleracea</i>	R	
<i>Potamogeton crispus</i>	R	*
<i>Potentilla argentea</i>	R	
<i>Prunus mahaleb</i>	P	
<i>Pueraria montana</i> = <i>P. lobata</i>	R	*
<i>Pyrus calleryana</i>	R	2019
<i>Ranunculus ficaria</i>	R	
<i>Rhamnus cathartica</i>	R	*
<i>Rhamnus frangula</i>	R	2005
<i>Robinia pseudoacacia</i> (native to N. Am.; aggressive in our region)	R wild type; E cultivars	2004
<i>Rorippa sylvestris</i>	R	
<i>Rosa canina</i>	R	
<i>Rosa multiflora</i>	R (check rootstock)	*
<i>Rumex acetosella</i>	R	*
<i>Salvinia molesta</i> and <i>S. minima</i>	R	*
<i>Saponaria officinalis</i>	R	2005
<i>Setaria faberi</i>	R	
<i>Silene latifolia</i> ssp. <i>alba</i> (<i>Lychnis alba</i>)	R	
<i>Sonchus arvensis</i>	R	*
<i>Sorghum halapense</i>	R	
<i>Stachys balansae</i>	R	
<i>Symphytum asperum</i>	R	
<i>Tanacetum vulgare</i>	R	
<i>Thalictrum buschianum</i>	R	
<i>Trapa natans</i>	R	*
<i>Typha angustifolia</i>	R	
<i>Ulmus pumila</i>	R	
<i>Valeriana officinalis</i>	R	2005
<i>Verbascum thapsus</i>	R	*
<i>Veronica gentianoides</i>	R	
<i>Viburnum opulus</i>	R	
<i>Vinca minor</i>	E, I	
<i>Vincetoxicum nigrum</i>	R	*
<i>Vincetoxicum rossicum</i>	R	*

B. Watch List

These taxa are not currently posing a serious invasive risk in the Chicago area, but may do so in the future, particularly as the climate changes. Plan: W= watch and monitor for signs of invasiveness. Addition of Watch List taxa to the collection should be avoided.

Taxon	Plan
<i>Acer campestre</i>	W
<i>Akebia quinata</i>	W
<i>Buddleja davidii</i>	W
<i>Cercidiphyllum japonicum</i>	W
<i>Elaeagnus angustifolia</i>	W
<i>Gypsophila paniculata</i>	W
<i>Houttuynia cordata</i>	W
<i>Koeleruteria paniculata</i>	W
<i>Quercus acutissima</i>	W
<i>Ranunculus acris</i>	W
<i>Ranunculus lingua</i>	W
<i>Scilla siberica</i>	W
<i>Spiraea japonica</i>	W
<i>Syringa reticulata</i>	W
<i>Tamarix ramosissima</i> and other <i>Tamarix</i> spp.	W
<i>Verbina bonariensis</i>	W and deadhead
<i>Viburnum dilatatum</i>	W
<i>Wisteria sinensis</i>	W

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 3: Types of documentation

(modified from those of the Southwest Exotic Plant Information Clearinghouse)

Anecdotal: The response to a question is supported only by unconfirmed, anecdotal information. Anecdotal includes newspaper articles, third party information, or information from a non-qualified professional.

Observational: The response to a question is supported by little published information, but confirmed, not-yet-published observations are available from a qualified professional (as accepted by the Invasive Plant Committee). This definition is expanded to include inference based on the evaluator's review of the literature (reviewed scientific publication or other published material) or based on the evaluator's personal observation and general scientific principles. Inference is identified as the level of documentation when a particular observation or experimental result is not available for the species under evaluation, but some degree of deductive logic can be used to arrive at a reasonable conclusion that enables the evaluator to respond to the criteria question with something other than "unknown".

Other published material: The response to a question is supported by reports, non-peer-reviewed documents, etc. Includes documents such as agency reports, technical reports, in-house documents, conference proceedings, fact sheets, element stewardship abstracts, theses, and dissertations, and books covering numerous invasive plants that may be edited but whose individual contributions are not peer-reviewed. If the only source of information is an overview or synthesis type of article, then this is stated in the rationale and the level of documentation is "other published material" unless the original citations are actually reviewed by the evaluator him/herself (in which case the documentation level would be "reviewed scientific publication"). Even if it is a book or synthesis article (often both are considered peer-reviewed), it is still "other published material" because the evaluator is relying on the author's understanding and interpretation of the original literature. If authors of other published material indicate they are inferring something based on observation and general scientific principles, then it is stated as such and observational is the correct level of documentation.

Reviewed scientific publication: The response to a question is supported by published, peer-reviewed scientific evidence. If the author(s) includes in the manuscript possible explanations (even though this may not be the particular research question being addressed) or an observation as a result of the covered research and this manuscript is peer-reviewed, the appropriate documentation level is reviewed scientific publication. If authors indicate they are inferring something based on observation and general scientific principles, then it should be stated as such in the rationale and reviewed scientific publication is still the correct level of documentation. The assumption is the peer-reviewers have confidence in the author's conclusions or speculations.