



Report #4

Minimizing the Impacts of Invasive Plants in Horticulture





Executive Summary

In response to the increasing rate of establishment of new invasive plants through horticultural pathways, numerous invasive plant organizations around the world have undertaken initiatives to address this threat. This report provides an overview of these initiatives to minimize the potential for invasive plants to establish and spread through horticulture.

One of the purposes of the Invasive Plant Council of BC is to educate the public and professionals about invasive plants and their risk to ecosystems. Addressing this concern includes collaborating with the horticulture industry about the sale of invasive plants and helping gardeners understand the consequences of propagating invasive species. Horticulture is an important industry in British Columbia and is expanding significantly, and so a key part of invasive plant management is through the horticulture industry and helping to curb the establishment of invasive plants.

One of the better-known examples of collaborative invasive plant management and the horticulture industry is the St. Louis Declaration on Invasive Plants. The outcome of international horticultural delegate meetings held in Missouri (2001) and Chicago (2002), the St. Louis Declaration is a key initiative introduced to curb plant invasions through horticultural pathways. Voluntary Codes of Conduct, developed in collaboration with government representatives, horticulture groups, nursery professionals, landscape architects, botanical gardens, arboreta, and the gardening public, provide guidelines to minimize the establishment and spread of invasive plants.

This report is a summary of the many efforts underway or completed to minimize the introduction and spread of non-native invasive plants that have originated through horticulture. It is presented as a summary overview as well as a useful reference of initiatives at different levels, with many websites provided for the reader's use.

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Introduction

The horticulture industry produces and sells plants and other vegetation for commercial and private use. Gardeners, landscape professionals, and businesses purchase a variety of seeds, cuttings, herbaceous plants, shrubs, and trees for food production and ornamental purposes. Nursery crops include a diverse range of ornamental plants, ranging from herbaceous garden flowers, vines, and grasses to deciduous and coniferous shrubs and trees.

In some cases, plants introduced to a new region that lack natural pests are able to easily spread their fruits, seeds, or roots and are considered invasive. Once established, invasive plants have the potential to pose undesirable or detrimental impacts on humans, animals, or ecosystems (Invasive Plant Council of BC 2006).

The invasiveness of a specific horticulture plant species is not normally considered for the region to which is introduced. However, a small percentage of introduced plant species are already known to be, or prove later to be, invasive. For example, up to 85 percent of 235 woody plant species introduced to the United States and used in landscaping have been identified as invasive to some extent (Reichard 1997), and a small proportion of these species were used in soil erosion control (Reichard and White 2001). This alarming statistic, along with the commercial availability of many known invasive plant species, has urged many invasive plant groups across Canada and around the world to address horticultural pathways of invasive plant introduction. This report summarizes the outcomes of those initiatives.

Horticulture in British Columbia

Horticulture is both an important industry and a widely practised hobby and pastime for many British Columbians. The province's excellent growing climate, one of the best in Canada on the south coast and in the southern Interior, has attracted many amateur and expert gardeners who enjoy the fulfillment of different gardening opportunities, from growing their own seasonal vegetables to testing the suitability of interesting plants in new environments.

British Columbia has approximately 520 commercial nursery businesses that are at least two hectares in area, totalling 3,845 hectares of nursery production area across the province in 2002. Horticulture is an increasing sector of the provincial economy, expanding significantly in BC from 1994 to 2004 by 127 percent, with annual sales of \$178 million and an annual payroll of about \$45 million. The main purchasers of BC nursery products are garden centres (21 percent), followed by other growers, landscape contractors, mass merchandisers, and retail sales to the public (Statistics Canada 2002).

A vast array of plants are purchased from nurseries, prescribed and planted by landscape professionals, and sold by garden centres. This often leads to the discovery that some species can be invasive in different ecosystems throughout the province. The desirability of some plant species (whose invasive characteristics are not widely known) can enable

The purposes of the Invasive Plant Council of British Columbia are to educate the public and professionals about invasive plants and their risk to the world's ecosystems, conduct research relating to invasive plants and make the results of this research available, and carry out other activities that support education and research.

their quick spread from gardens and public areas to other areas through propagation, cultivation, seed production, and transport by birds, wind, and people.

The impacts of invasive plants on natural areas and the economy has led the BC horticulture industry to work cooperatively with invasive plant specialists towards increasing awareness by growers and the gardening public of invasive plants. This includes eliminating the commercial sale of known invasive species and recommending alternative species more suited to the landscapes and sites on which they are planted. The BC Landscape and Nursery Association and the Invasive Plant Council of BC are addressing the topic of 'responsible gardening' through workshops and other ways of collaboration to minimize the impact of horticulture on the establishment and spread of invasive plants.

Initiatives to Address the Impacts of Invasive Plants in Horticulture

Many invasive plant organizations around the world have undertaken initiatives to address the threat of invasive plant introductions through horticultural pathways. The following section provides an overview of some general initiatives, and then detailed overviews of the St. Louis Declaration on Invasive Plants and the resulting Codes of Conduct for the horticulture industry.

General Initiatives to Address the Introduction of Invasive Plants

A literature review of work to date found that specialists in different countries and specific organizations have pursued initiatives and made significant progress towards minimizing the impacts of non-native invasive plants through the horticulture industry. The following list provides brief overviews of initiatives underway in Canada, the United States, and other countries to address the threat of invasive plants in horticulture. Many groups regard the development of criteria, protocols, and risk assessment models to assess the invasiveness or potential invasiveness of introduced plants as a high priority.



Canada

- The Canadian Biodiversity Information Network's **Proposed Action Plan for Invasive Alien Terrestrial Plants and Plant Pests – Phase I** recommended the development of public education programs for a variety of audiences and, in collaboration with the horticulture industry, the promotion of native species and the development of best practices guidelines for the importation, transportation, and sale of plants and plant products.
- Recognizing that nurseries, retail garden outlets, and residential gardens are important sources of problem plants, the Evergreen Foundation's **Stop the Spread** initiative seeks to increase awareness among the horticulture trades and the gardening public.
- Researchers at **Simon Fraser University's** School of Resource and Environmental Management distributed an invasive plant survey to garden clubs to survey the gardening public on their knowledge of invasive ornamental plants and attitudes to management.
- The **Invasive Plant Council of BC** is working with representatives from the **BC Landscape and Nursery Association** regarding 'responsible gardening.' The two organizations co-hosted a workshop in late 2006 that brought together industry representatives to determine how to limit the spread of invasive plants through horticulture. The two organizations are working cooperatively to both prevent the sale by horticulture businesses of known invasive species and provide information about invasive plants to gardeners and customers.

United States

- Professional societies, such as the **American Society of Landscape Architecture**, encourage education and training institutions to identify and address invasive species in plant material courses associated with their degree programs.
- The **California Horticultural Invasive Prevention Partnership** of nursery and landscaping industries surveyed retail nurseries in 2003 and growers in 2004. The survey was used to develop a list of ornamental plants that have become invasive in California but still commercially available. Appropriate strategies for preventing their continued introduction and spread are being addressed. Future research will focus on invasive cultivars and vulnerable habitat types and regions.
- The **Washington Invasive Species Coalition** conducted a pilot project to study the impact of implementing Codes of Conduct on horticultural business practices. Using a scientific assessment process, five plants available to gardeners in western Washington were identified as invasive. Several nurseries volunteered to avoid selling these plants, replace them with safe alternatives, and determine how these actions impacted sales and customer satisfaction. An outcome of the pilot project was the publication *Garden Wise—Non-Invasive Plants for*

your Garden, which has been well received by nurseries, growers, and the gardening public. A nursery outreach program is ongoing.

- The **Massachusetts Invasive Plant Advisory Group** developed a list of scientifically valid evaluation criteria to judge the known or potential invasiveness of plants already growing in the state, and then determine how to classify these species. The American Nursery Landscape Association proposed that the evaluation criteria serve as a national model. Strategic recommendations for managing invasive plants in Massachusetts were also developed.
- The **University of Florida** developed an assessment protocol to screen ornamental plants for potential invasiveness. The protocol factors included the ecological impacts, potential for expansion, complexity of management, and commercial value of the plant. The Institute of Food and Agricultural Sciences uses the protocol to categorize non-native plants listed in planting recommendations and extension publications.
- The United States Department of Agriculture's **Animal and Plant Health Inspection Service (APHIS)** is working to develop and implement a risk assessment process for nursery stock. APHIS recently hosted an electronic public discussion on methods used to evaluate the potential invasiveness of plants introduced to the United States.
- Hall (2000) and Peters et al. (2006) conducted surveys assessing the knowledge and attitudes of the horticulture industry of invasive ornamental species.

Other Countries

- The United Kingdom's **Department of Environment, Food and Rural Affairs** has developed risk assessment modules to summarize the level of risk and uncertainty, invasive attributes, and economic impact posed by any non-native organism to a species, habitat, or ecosystem in the UK.
- Australia, at the forefront in addressing introduced plants that have become invasive, has developed an array of risk assessment tools and best management practices for the horticulture industry. Examples include the **Weeds CRC** (Cooperative Research Centre) which manages programs in research, education, and information delivery to reduce the risks posed by invasive species.



St. Louis Declaration on Invasive Plant Species

In December, 2001, the Missouri Botanical Garden and the Royal Botanic Gardens, Kew convened a landmark gathering of horticultural and invasive plant experts from around the world to "explore and develop workable, voluntary approaches for reducing the introduction and spread of non-native invasive plants" (Missouri Botanical Garden 2001).

"People are major dispersers of plants. The magnitude of this dispersal is unprecedented and has allowed dispersal of species that manifest aggressive traits in new areas. Plant introduction and improvement are the foundation of modern agriculture and horticulture, yielding diversity to our supply of plants used for food, forestry, landscape and gardens, and medicinal and other purposes. A small proportion of introduced plant species become invasive and cause unwanted impacts to natural systems and biological diversity as well as economies, recreation, and health. Plant species can be invasive in some regions, but not in others. The impacts of invasive plant species can occur at times and places far removed from the site of invasion."

From the participants at St. Louis, Missouri in December 2001 (Fay 2001).

Recognizing the need for a more collaborative response to the growing problem of invasive plants, the workshop brought together, for the first time, representatives from botanical gardens, arboreta, and the nursery industry; landscape professionals; members of garden clubs and conservation organizations; scientists; and policy-makers. Participants produced the *St. Louis Declaration on Invasive Plant Species*, which includes *Findings and Principles* (Appendix 1) that present both the problem of invasive species and ways to address it, and *Draft Voluntary Codes of Conduct* (Appendix 2). The St. Louis Declaration on Invasive Plants is considered the most progressive and renowned international collective action to address invasive plants in horticulture. It is comprised of six overarching principles with voluntary Codes of Conduct produced by government specialists, nursery professionals, landscape architects, representatives of botanic gardens and arboreta, and the gardening public. Designed to promote voluntary governance and self-regulation, the goal was that major professional horticultural societies and organizations, such as the nursery and landscape trades, would endorse the codes of conduct and then test and revise them to increase their utility and effectiveness.

In October, 2002, a second, follow-up meeting was convened at the Chicago Botanic Garden in Chicago, Illinois (Fay 2002). The purpose of the Chicago meeting was to review the status of endorsement of the Codes of Conduct and their implementation, explore the role of "regionality" in developing invasive plant lists, and develop guidelines for selecting alternative plant species. The Codes of Conduct were formally assessed for their success in publicizing and promoting voluntary adoption and implementation by various institutions and businesses. The major national societies and professional associations for the participating sectors endorsed the appropriate Codes of Conduct and then took steps to encourage their members to adopt and implement them. Summaries of

their experiences in endorsing, communicating, and applying the Codes of Conduct, and how to best advance them equitably and effectively among their constituencies, were presented. Meeting participants identified education as one of the most important motivating factors for the public, businesses, and institutions, and set a goal to develop educational materials targeted to different audiences, including the media.

Meeting participants also determined that risk assessment for introductions of invasive plants is critical because not all exotic species are invasive, and only a subset of cultivated species pose a threat to native plants and ecosystems (White 1998). A useful tool for the prediction and risk assessment of invasive plants is the decision tree presented at the Missouri workshop (Reichard 2004). Such a simple but useful tool should be a key element of voluntary codes of conduct related to plant introductions, as well as for educators and regulators. A host of tools and methods has also been developed for Australia and other areas.

Additional topics discussed at the meeting were non-invasive alternative plants and regionality considerations. Conclusions and suggestions were compiled on the importance of developing a list of alternative species for known invasive plant species, and the criteria for the creation of lists of both invasive and alternative species. Guiding principles for the use of alternative plant species were also identified. Action items included the creation of national guidelines that can be adopted and tailored for use in particular states and regions, and the development of case studies to show the process of selecting alternatives and compiling lists as guides to help others.

Regionality considerations addressed the definition of region and the process for developing an invasive plant species list, and suggested listing criteria, and other influencing factors (i.e., economic or political). The next steps for regional considerations were to determine how to perform and conduct simple economic risk-benefit analyses for representative species, determine what research has been conducted to support whether a plant should be listed as invasive, create a uniform criteria model adaptable to multiple regions, actively encourage and facilitate communication among all stakeholders, facilitate communication about the Codes of Conduct, and strategically consider who should endorse the Codes to allow for regional adaptation.

Codes of Conduct

One way to encourage responsible gardening is through voluntary Codes of Conduct. The St. Louis Declaration on Invasive Plants now stands as the key initiative introduced to curb plant invasions in the United States. Its voluntary Codes of Conduct provide guidelines for those whose actions could affect the spread of invasive plants through horticultural pathways.

For the horticulture industry—including nursery and landscape professionals and the gardening public—achieving endorsement of their respective Codes of Conduct has involved promoting education and awareness among their constituents and customers, scientifically developing regional criteria to



identify and list non-native invasive plants and alternative non-invasive species, and developing risk assessment models for potential invasive species with early detection rapid response tools.

The endorsement and subsequent implementation of the Codes of Conduct required that organizations inform their constituencies, focusing on one or more of them. Some organizations identified research goals to meet their specific needs, to be pursued before implementing Codes of Conduct. Many associations formed collaborative working groups with scientists to assess the implementation of the codes of conduct among their membership, develop and evaluate criteria and protocols for judging the invasiveness of certain species (taking into account regionality issues), and develop the plant lists.

Participant experiences in endorsing, communicating, and applying the Codes of Conduct led to the identification of education and awareness as important long-term components for using the Codes of Conduct. Also critical to successful implementation were the challenges of continuing to develop criteria for invasive plant lists and alternative regional non-invasive species listings, based on scientific research and the development of risk assessment models.

Resources

A literature review and Internet search were conducted for this report to identify groups, academic institutions, organizations, and agencies working on horticulture (industry sector and the gardening community) and voluntary codes of conduct with respect to non-native ornamental plants with potential impacts on natural areas. The following information resource was compiled, with resources grouped by jurisdiction or source: global, North America-wide, national (Canada, United States, Australia, and the United Kingdom), provincial, and gardening clubs and organizations.

Organizations and agencies with significant information or initiatives and useful links are listed alphabetically. Some website listings—such as for nursery and landscape associations requiring membership to access information on the group’s professional activities—are for groups working collaboratively with other agencies. Most of the organization and agency descriptions are extracted from the website and are intended to give readers of this report a general idea of the website’s usefulness for their purposes.

Global

International Weed Science Society

<http://iws.ucdavis.edu>

A worldwide scientific organization whose purpose is to supplement and complement the role of six regional weed science societies. Membership is open to all who are interested in weeds and their control.

World Conservation Union, Invasive Species Specialist Group

www.issg.org

Advises about threats from invasive species and methods to

control or eradicate them. Activities focus primarily on invasive species that threaten biodiversity, particularly for oceanic islands.

North America

NatureServe Explorer

www.natureserve.org/explorer

Provides information on more than 65,000 plants, animals, and ecosystems of the United States and Canada. Includes an Invasive Species Assessment Protocol to assess non-native plants found in North America according to their impacts on native plants, animals, and natural communities.

North American Plant Protection Organization

www.nappo.org

Coordinates efforts among Canada, the United States, and Mexico to protect plant resources from the entry, establishment, and spread of regulated plant pests, while facilitating intra- and inter-regional trade.

North American Weed Management Association

www.nawma.org

Provides education, regulatory direction, professional improvement, and environmental awareness to preserve and protect natural resources from the degrading impacts of exotic invasive plants.

Canada

Canadian Botanical Conservation Network

www.rbg.ca/cbcn/en

A registered charitable organization aiding botanical gardens, arboreta, and related organizations, individuals, and others to increase their participation in plant conservation and biodiversity programs. Includes a link to invasive plants at www.rbg.ca/cbcn/en/projects/invasives/invade1.html.

Canadian Food Inspection Agency

www.inspection.gc.ca

Works to prevent and manage all invasive species in Canada to strengthen the nation’s long-term competitiveness, protect its natural environment, and contribute to citizens’ well-being.

Canadian Museum of Nature

www.nature.ca/plnt/res/res_iss_e.cfm

The Native Plant Crossroads homepage includes many useful links to invasive plant management.

Canadian Nursery Landscape Association

www.canadanursery.com

Links nine provincial member associations in the landscape, horticulture, and nursery industries across Canada.

An Invasive Alien Species Strategy for Canada

Canada's strategy to respond to the threat of alien invasive species. Available through the Canadian Biodiversity Information Network at www.cbin.ec.gc.ca/issues/ias.cfm?lang=e and the Canada Food Inspection Agency www.inspection.gc.ca/english/plaveg/invenv/strate.shtml Provides links to the **Action Plan for Invasive Alien Terrestrial Plants and Plant Pests** (Phases 1 and 2).



Provincial

Alberta Invasive Plants Council

www.invasiveplants.ab.ca

Works to make Albertans aware of the impacts of invasive plants on the environment, economy, and society; promotes and facilitates partnerships; and acts as a resource organization on invasive plant issues.

BC Landscape & Nursery Association

www.bclna.com

Serves as a voice for the BC landscape horticulture industry. Includes a section on native plants commercially grown in BC and a provincial directory of garden and landscape retailers and professionals. *Gardenwise*, the annual publication, is available at www.gardenwise.bc.ca.

Evergreen Foundation

www.evergreen.ca

The Stop the Spread initiative seeks to increase awareness among the horticulture trades and gardening public.

Invasive Aquatic and Wetland Plant Species of Manitoba

www.invasivespeciesmanitoba.com

Provides information specific to invasive plants in Manitoba and links to the Manitoba Purple Loosestrife Project.

Invasive Plant Council of British Columbia

www.invasiveplantcouncilbc.ca

Educates the public and professionals about invasive plants and their risks to the world's ecosystems, conducts research relating to invasive plants and makes the results of this research available, and carries out other activities that support education and research.

Ontario Nature, Natural Invaders

www.ontarionature.org/pdf/natural_invaders.pdf

Alerts gardeners to the dangers of many common flowers and nursery varieties that threaten to replace native vegetation.

Simon Fraser University, School of Resource and Environmental Management

www.rem.sfu.ca/econ/research_invasives

The School's Environment and Development Research Group is conducting research to produce a new ecological-economic method of assessing the sale of exotic species by private nurseries in the US and Canada, and the accompanying risk of accidental introduction. The project also evaluates policy interventions for reducing the risk of accidental introduction by the North American horticultural industry. In November, 2006, an invasive plant survey was disseminated to garden clubs.

Weeds BC

www.weedsbc.ca/links/invasive.html

Provides integrated pest management information for known invasive plants in British Columbia.

United States

American Nursery and Landscape Association

www.anla.org

Serves as the national voice of the nursery and landscape industry, and provides education, research, public relations, and representation services to members.

American Seed Trade Association

www.amseed.com

Addresses a wide range of issues associated with the development, marketing, and free movement of seed, associated products, and services globally, and works to promote the development of better seed.

American Society of Landscape Architects

www.asla.org

Serves as the national professional association representing landscape architects in the United States. Its Invasive Plant Species Task Force was requested by education and training institutions to encourage degree programs that uniformly identify and address invasive species in plant materials courses.

Animal and Plant Health Inspection Service, Noxious Weed Program

www.aphis.usda.gov/ppq/weeds

Designed to prevent the introduction of non-indigenous invasive plants into the U.S. and prevent the spread of newly introduced invasive species. The website lists many related publication resources.

California Invasive Plant Council

www.cal-ipc.org/landscaping

Aims to develop voluntary measures to reduce the number of invasive plant species sold in California and prevent further invasions from horticulture, including the Don't Plant a Pest program. A list has been compiled of ornamental plants that have become invasive in California and that are still available through horticulture.

Center for Invasive Plant Management

www.weedcenter.org

Promotes ecologically sound management of invasive plants by facilitating collaboration and partnerships among scientists, educators, and land managers. Hosts a variety of useful publications on the website on gardening, alternative plant species, invasive plant prevention, and resources for Early Detection and Rapid Response.

Center for Plant Conservation

www.centerforplantconservation.org/invasives/welcome.html

The site is hosted by the Missouri Botanical Garden, and it provides documentation on Linking Ecology and Horticulture to Prevent Plant Invasions, including the St. Louis Declaration and the Voluntary Codes of Conduct.



Chicago Botanic Garden

www.chicagobotanic.org/research/conservation/invasive/policy

Describes the invasive plants policy and provides background information about invasive plants in landscaping and gardening.

Connecticut Invasive Plant Working Group

www.hort.uconn.edu/cipwg

A consortium of individuals, organizations, and agencies concerned with invasive species issues.

Federal Interagency Committee for the Management of Noxious and Exotic Weeds

www.fws.gov/ficmnew

Coordinates information on the identification and extent of invasive plants in the U.S. and their management by federal agencies.

Florida Exotic Pest Plant Council

www.fleppc.org

Supports the management of invasive exotic plants in Florida's natural areas by providing a forum for the exchange of scientific, educational, and technical information.

Invasive Plant Atlas of New England

www.ipane.org

Provides a comprehensive web-accessible database of invasive and potentially invasive plants in New England to facilitate education and research to support conservation management. The project also addresses early detection and rapid response to new invasions.

Maryland Native Plant Society

mdflora.org/publications/invasives.htm

A Guide for Gardeners and Homeowners in the Mid-Atlantic Region lists popular landscape plants and weeds that are causing significant changes to natural areas, provides measures for controlling each species, and recommends alternative native plants.

Massachusetts Invasive Plant Advisory Group

www.massnrc.org/mipag

Developed a list of scientifically valid, transparent evaluation criteria to determine which plants already growing in the state are invasive or potentially invasive, and how to classify them. Two significant documents that can be downloaded from the website are:

- The Evaluation of Non-Native Plant Species for Invasiveness in Massachusetts
- Strategic Recommendations for Managing Invasive Plants in Massachusetts

National Association of Exotic Pest Plant Councils

www.naeppc.org

Goals include improving the methods of prevention of new infestations of exotic pest plants from importation into the U.S. and through interstate movement. Member Councils include (and not listed elsewhere in the report):

Alabama Invasive Plant Council

www.se-eppc.org/alabama

California Invasive Pest Plant Council

www.cal-ipc.org

Georgia Exotic Pest Plant Council

www.gaepcc.org

Kentucky Exotic Pest Plant Council

www.se-eppc.org/ky/index.htm

Michigan Exotic Pest Plant Council

<http://forestry.msu.edu/mipc>

Mid-Atlantic Exotic Pest Plant Council

www.ma-eppc.org

Mississippi Exotic Pest Plant Council

www.se-eppc.org/mississippi

Invasive Plant Council of New York State

www.ipcnys.org

North Carolina Exotic Pest Plant Council

www.se-eppc.org/northcarolina

South Carolina Exotic Pest Plant Council

www.se-eppc.org/southcarolina

Southeast Exotic Pest Plant Council

www.se-eppc.org

Tennessee Exotic Pest Plant Council

www.tneppc.org

Invasive Plants Association of Wisconsin

www.ipaw.org

National Invasive Species Council

www.invasivespeciescouncil.gov

An interagency group whose goal is to develop and test a fair, feasible, and risk-based comprehensive screening system. Members include invasive species councils from Washington, Idaho, Hawaii, and Oregon.

National Invasive Species Information Center

www.invasivespeciesinfo.gov

Provides a gateway to information on invasive species, from federal, state, local, and international sources.

National Parks Service Plant Conservation Alliance

www.nps.gov/plants

Areas of focus of the Alien Plant Working Group include policy and guidelines, research, information management, on-the-ground management, outreach and education, resources and training, communication, networking and partnerships, and funding, with horticulture being a major component. Includes the Weeds Gone Wild initiative, which provides information for a wide audience on the threats and impacts of invasive plants to the United States' native flora, fauna, and natural ecosystems.

North Carolina Botanical Garden

<http://ncbg.unc.edu>

Works to inspire understanding, appreciation, and conservation of plants in gardens and natural areas, and advance a sustainable relationship between people and nature. Became the first botanical garden in North America to stop distributing seeds outside its region.

The Nature Conservancy

<http://tncweeds.ucdavis.edu>

Includes the Global Invasive Species Team, which is addressing the impacts of harmful invasive species on biodiversity. The website provides many resources to help conservationists manage invasive species.



University of California Cooperative Extension

<http://cesandiego.ucdavis.edu>

On this website, the San Diego County addresses invasive plants and horticulture.

University of California Environmental Horticulture Research and Information Center

<http://groups.ucanr.org/ohric/index.cfm>

Provides a venue for research-based information on important issues facing the California horticulture industry. Includes invasive plants under the Statewide Integrated Pest Management Program.

University of Florida

irrecenvhort.ifas.ufl.edu/invasiveplants

Under the Screening Ornamentals for Potential Invasiveness program, an assessment protocol was developed for use by the Institute of Food and Agricultural Sciences to categorize non-native plants listed in planting recommendations and extension publications. The Invasive Plants Working Group is at <http://plants.ifas.ufl.edu/committee.html>.

University of Minnesota, Department of Horticultural Science

<http://horticulture.coafes.umn.edu>

A horticultural industry survey on invasive plants (Peters et al. 2006) is useful research to document knowledge gap of industry perspectives and knowledge of invasive ornamental crops by surveying industry professionals in the Minnesota Nursery and Landscape Association.

University of Washington, Center for Urban Horticulture

<http://depts.washington.edu/urbhort>

Scientists are members of Washington State Nursery and Landscape Association's collaborative task force studying the impact of implementing the St. Louis Declaration Codes of Conduct on horticulture.

Washington Invasive Species Coalition

<http://invasivespeciescoalition.org/GardenPlants>

Comprised of conservation and education groups in Washington working together to stop the spread of invasive species and to protect native habitats and the state economy. The website reports on the results of a study by the Washington State Nursery and Landscape Association on the impact of implementing the Codes on horticultural business practices. The study used an assessment process for identifying invasive and potentially invasive plants, from which five plants available to gardeners in western Washington were identified as regionally invasive. Several nurseries volunteered to avoid selling these plants, replace them with safe alternatives, and determine how these actions impact sales and customer satisfaction.

Washington State Noxious Weed Control Board

www.nwcb.wa.gov

Works to protect and preserve Washington lands and resources from the damaging effects of noxious weeds by advising the Washington State Department of Agriculture about noxious weed control, coordinating the state's noxious weed program, and coordinating and supporting the county noxious weed control boards and weed districts of Washington.

Weed Science Society of America

www.wssa.net

Promotes research, education, and extension outreach activities related to weeds, provides science-based information to the public and policy makers, and fosters awareness of weeds and their impacts on managed and natural ecosystems.

Wild Ones

www.for-wild.org/download/invasive.html

A comprehensive listing of websites on invasive plants.

Other State Programs Addressing Invasive Ornamentals

Connecticut Invasive Plant Working Group

www.hort.uconn.edu/cipwg

Florida Exotic Pest Plant Council

www.fleppc.org

Hawaiian Ecosystems at Risk Project

www.hear.org

Massachusetts Nursery and Landscape Association

www.mnla.com

Washington Invasive Species Coalition

www.invasivespeciescoalition.org

Australia

National Garden Industry Association

www.ngia.com.au/home_gardeners/invasive_plants.asp

Supports the nursery industry's role in minimizing the distribution and planting of invasive species, including response garden waste disposal and processing green waste.

Royal Botanic Gardens, Melbourne

www.rbg.vic.gov.au/_data/page/1081/WEEDS-DRAFT-LATESTforweb.pdf

The Weed Working Group has developed this useful resource and information pack (report).

WWF-Australia

www.wwf.org.au

The World Wildlife Fund's website link to Weeds, Pests and Diseases provides an overview of invasive plant information for Australia. Groves et al. (2005) covers the naturalization stage of plant invasions and recommendations for the availability by nurseries of invasive garden plants. The Garden Escapees program is at www.wwf.org.au/ourwork/invasives/gardenescapees.

United Kingdom

Department of Environment, Food and Rural Affairs

www.defra.gov.uk/wildlife-countryside/non-native/index.htm

The Wildlife and Countryside section provides a scheme for assessing the risks posed by any non-native organism to species, habitats, or ecosystems in all or part of the UK. In addition to risk assessment modules, spreadsheets were created for summarizing the level of risk and uncertainty, invasive attributes, and economic impact.



PlantLife International

www.plantlife.org.uk/uk/plantlife-campaigning-change-invasive-plants.html

Lists and classifies plants by their invasiveness in the U.K.

Royal Horticultural Society

www.rhs.org.uk/conservation/Conservation_and_environment_nonnative.asp

The Working Group on the Horticultural Codes of Practice was established and a report reviewing non-native species policy was published in March 2003 (www.defra.gov.uk/wildlife-countryside/resprog/findings/non-native/index.htm).

The Scottish Government – Environment

<http://www.scotland.gov.uk/Topics/Environment/Wildlife-Habitats/InvasiveSpecies/HCOP>

Provides advice and guidance on the safe use, control, and disposal of invasive non-native plants for everyone engaged in horticulture and related activities involving plants.

Horticultural Trades Association of the United Kingdom

<http://www.the-hta.org.uk>

Covers all aspects of the horticulture industry and includes businesses representing retailers, growers, landscapers, manufacturers, and distributors of garden materials and service providers.

Garden Clubs and Organizations

Gardening BC

<http://www.gardeningbc.com/clubs.html>

This webpage for the British Columbia Council of Garden Clubs provides links to provincial garden centres and supplies, nurseries (retail and wholesale), and landscape services.

GardenWise

<http://www.gardenwise.bc.ca>

An annual publication by the BC Landscape & Nursery Association and the Province of British Columbia. Includes a section on native plants commercially grown in BC and a provincial directory of garden and landscape retailers and professionals.

Master Gardeners of British Columbia

<http://www.bcmastergardeners.org>

Operates a year-round plant information line and provides links to public gardens, botanical references, gardening and horticulture, seeds, gardening clubs and societies, Master Gardeners groups, specialty nurseries and suppliers, international botanical and horticultural sites, educational opportunities, other interesting sites. Information on the **Master Gardener Course** through the Horticulture Centre of the Pacific (Victoria, BC) is available at http://www.hcp.bc.ca/mg_MasterGardenerCourse.htm

References

- Fay, K. (ed.) 2001. Linking ecology and horticulture to prevent plant invasions: proceedings of the workshop at the Missouri Botanical Garden, St. Louis, Miss., Dec. 1-4. Miss. Bot. Garden.
- Fay, K. (ed.). 2002. Linking ecology and horticulture to prevent plant invasions II: proceedings of the meeting at the Chicago Botanic Garden, Chicago, Ill., Oct. 31.
- Groves, R.H., R. Boden, and W. M. Lonsdale. 2005. Jumping the garden fence: invasive garden plants in Australia and their environmental and agricultural impacts. Royal Botanic Gardens, Melbourne, Weed Working Group. CSIRO report for WWF-Australia. WWF-Australia, Sydney. Feb. Available at www.wwf.org.au
- Hall, M. 2000. IPlants: Invasive Plants and the nursery industry. How should we prevent exotic plants from becoming invasive pests? Brown Univ. Undergrad. Senior Thesis in Environmental Studies. (Spring). Available at www.brown.edu/Research/EnvStudies_Theses/full9900/mhall/IPlants/
- Missouri Botanical Garden. 2001. (Linking Ecology and Horticulture to Prevent Plant Invasions, Proceedings of the Workshop at the Missouri Botanical Garden, St. Louis, Missouri, December 1-4. Available at www.centerforplantconservation.org/invasives/home.html.
- Invasive Plant Council of BC. 2006. Beautiful in your garden, but be aware. Brochure.
- Peters, W.L., M. M. Hockenberry, and N.O. Anderson. 2006. Minnesota horticultural industry survey on invasive plants. *Euphytica* 148:75-86.
- Reichard, S.H. 1997. Prevention of invasive plant introductions on national and local levels. *In*: Luken J.A. and A.J. Theiret, eds. *Assessment and Management of Plant Invasions*. New York. Springer. pp. 215-227.
- Reichard, S.H. 2004. Conflicting values and common goals: codes of conduct to reduce the threat of invasive species. *Symposium. Weed Tech.* 18:1503-1507.
- Reichard, S.H. and P. White. 2001. Horticulture as a pathway of invasive plant introductions in the United States. *Bioscience* 51(2):103-113.
- Statistics Canada. 2002. Greenhouse, sod and nursery industry. Catalog #22-202-X1B.
- White, P.S. 1998. Biodiversity and the exotic species threat. *In*: *Exotic pests of eastern forests* (Britton, K., ed.), pp. 1-7. Atlanta: Tennessee Exotic Plant Council and USDA Forest Service.



Other Information

- Baskin, Y. 2002. The greening of horticulture: new codes of conduct aim to curb plant invasions. *BioScience* 52(6):464-470.
- BC Ministry of Agriculture and Lands. 2007. Ornamentals. BC nursery industry overview. Available at www.agf.gov.bc.ca/ornamentals/overview_nursery.htm.
- D'Antonio, C.M.D., N.E. Jackson, C.C. Horvitz, and R. Hedberg. 2004. Invasive plants in wildland ecosystems: merging the study of invasion processes with management needs. *Front Ecol. Environ.* 2(10):513-521.
- Dehnen-Schmutz, K., J. Touza, C. Perrings, and M. Williamson. 2006. The horticultural trade and ornamental plant invasions in Britain. *Conserv. Biol.* (In press).
- Dowdell, J. 2002. An unlikely alliance: professionals counter alien plant invasions with a united front. *Landscape Arch.*, March.
- Fox, A.M., D. Gordon, J. Dusky, L. Tyson, and R. Stocker. 2001. IFAS assessment of non-native plants in Florida's natural areas. Institute of Food and Ag. Sciences, Univ. of Florida. Available at <http://agronomy.ifas.ufl.edu/IFASassessmt.html>
- Harrington, R.A., R. Kujawski, and H.D.P. Ryan. 2003. Invasive plants and the green industry. *J. of Arboriculture* 29(1): 42-48.
- Knowler, D. and E. Barbier. 2005. Importing exotic plants and the risk of invasion: are market-based instruments adequate? *Ecol. Econ.* 52:341-354.
- Maki, K. and S.M. Galatowitsche. 2004. Movement of invasive aquatic plants into Minnesota (USA) through horticultural trade. *Biol. Conserv.* 118:389-396.
- Manchester, S.J. and J.M. Bullock. 2000. The impacts of non-native species on UK biodiversity and the effectiveness of control. *J. of Applied Ecology* 37:845-864.
- Olsen, R.T. and T.G. Ranney. 2005. Breeding for non-invasive landscape plants. Mountain Horticultural Crops Res. and Ext. Center, Dept. of Horticultural Science. Available at www.ces.nesu.edu/depts/hort/nursery/short/2005
- Panetta, F.D. 1993. A system of assessing proposed plant introductions for weed potential. *Plant Prot. Quarterly* 8:10-14.
- Peters, W.L., M. M. Hockenberry, and N.O. Anderson. 2006. Minnesota horticultural industry survey on invasive plants. *Euphytica* 148:75-86.
- Pheloung, P.C., P.A. Williams, and S.R. Halloy. 1999. A weed risk assessment model for use as a biosecurity tool evaluating plant introductions. *J. Env. Mgmt.* 57:239-251.
- Reichard, S.H. and C.W. Hamilton. 1997. Predicting invasions of woody plants introduced into North America. *Cons. Biol.* 11(1):193-203.
- Shogren, J.F. and J. Tschirhart. 2005. Integrating ecology and economics to address bioinvasions. *Ecol. Econ.* 52:267-271.
- Simberloff, D. 2005. Non-native species do threaten the natural environment! *J. Agr. and Env. Ethics* 18:595-607.
- Spencer, R. 2005. Environmental weeds, agricultural weeds, and garden plants. Resource and information pack with emphasis on Victoria. Royal Botanic Gardens Melbourne, Weed Working Group. Nov. Available at www.rbg.vic.gov.au/__data/page/1081/WEEDS-DRAFT-LATESTforweb.pdf
- Timmins, S.M. 2004. How weed lists help protect biodiversity in New Zealand. *Weed Tech.* 18:1292-1295.
- White, P.S. 2002. Linking ecology and horticulture to prevent plant invasions: an introduction to the St. Louis Declaration and the Codes of Conduct. *Wildland Weeds, Winter.*

APPENDIX 1. Findings and Principles of The St. Louis Declaration on Invasive Plant Species

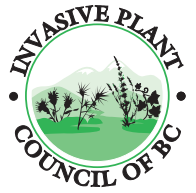
The statement on the 'Findings and Principles' about invasive plant problems was a result of the meeting *Linking Ecology and Horticulture to Prevent Plant Invasions* held at the Missouri Botanical Garden, St. Louis, Missouri on December 1-4, 2001. A set of five draft codes of conduct were also included in the St. Louis Declaration on Invasive Plant Species (Appendix 2).

Findings

- People are major dispersers of plants. The magnitude of this dispersal is unprecedented and has allowed dispersal of species that manifest aggressive traits in new areas.
- Plant introduction and improvement are the foundation of modern agriculture and horticulture, yielding diversity to our supply of plants used for food, forestry, landscape and gardens, medicinal and other purposes.
- A small proportion of introduced plant species become invasive and cause unwanted impacts to natural systems and biological diversity as well as economies, recreation, and health.
- Plant species can be invasive in some regions, but not in others. The impacts of invasive plant species can occur at times and places far removed from the site of invasion.

Principles

1. Plant introduction should be pursued in a way that both acknowledges and minimizes unintended harm.



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.