ENVIRONMENTAL MANAGEMENT
Part I: Environmental Stewardship

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Ecological Plant and Habitat Diversity

It is important to select plants that fit the soil and climatic conditions in which they will be planted. It is a wise to look at native plants and their associated communities that have evolved in similar conditions. Plants that are ecologically appropriate will be easier to establish, require less weeding and maintenance and perhaps, be able to regenerate themselves if the conditions are favorable. Using well-adapted non-invasive exotic plants is also a good option where space or soil conditions make it difficult to work with native plants.

Another benefit of creating landscapes with indigenous materials is that they provide habitat for many other species. Insects, birds, and small mammals all require a framework of plants to provide cover, food, and nesting. To provide good habitat for butterflies and many songbirds, it is essential to have large areas of native ecosystems for them to live in and reproduce. Connecting backyard natural areas within neighborhoods, and within parks and nature preserves, helps ensure the survival of species that have large area requirements for their survival. Migrating birds also use these areas of forest and wetlands in the spring and fall as they move through the landscape to their summer nesting grounds in the North.

Diversity is a sign of ecological health. Plant communities that are composed of a few dozen species are much more resilient to environmental stress and change than monocultures or landscapes with just a few species. The more plant diversity present, the more habitats available to support diverse populations of wildlife.

Native Plant Conservation

The conservation of existing native species is a key issue in ecological landscaping. The genetic diversity found in existing natural areas, from plants and animals to microorganisms, forms the backbone of our natural world. Even tiny parcels of prairie or hillsides of mature woods with a surviving component of their natural character are an irreplaceable source for species migration and cross-pollination.

If native plants are found on a project, it is generally beneficial to leave this area alone. These plants may be good choices to restore to similar microclimates nearby. If the area has been already disturbed, it may be possible to move some of the native plants on that site to an appropriate location.

Landscape professionals need to be especially careful selecting their sources for native plant materials. Growers selling plants propagated from seed collected responsibly with local genotypes are generally considered the best source. Plants may also be purchased from companies with permits to salvage native plants, which would otherwise be destroyed. Salvaged plants are typically shallow-rooted woodland ferns and flowers.

If native vegetation is conserved on a project or a new restoration is created adjacent to another natural area, the benefits are multiplied. Habitat fragmentation may occur in isolated, small pieces of land and some species may be able to move from patch to patch. The size of the natural areas is often directly linked to species diversity. The larger areas of land are also easier to manage because there is less edge area to protect, relative to the inner protective space, from migration of invasive species.

Landscape designers can be instrumental by working within a neighborhood to link native plants and new restoration projects with existing natural areas. State and local public funding may be available to offset costs. Restoration or creation of a quality prairie, woodland or wetland may best be completed with a team approach. Ecologists and restoration specialists can collaborate with the landscape designer in site analysis, plant selection and sources, management strategies for the restoration, and future monitoring to keep track of progress. Knowledgeable consultants may make it possible for native species to be conserved in difficult situations. Ecologically, the results may be well worth the expense.

Restoration of native plant communities, as important as it is for wildlife, human enjoyment and all aspects of healthy ecosystems, does not come close to duplicating the complexity of natural systems which

evolve through thousands of years. In The Tall grass Restoration Handbook, Packard and Ross note that remnants of original prairie may have over four times more species of plants in a given area than many restorations. In a restoration project, diversity may migrate into the project from an adjacent remnant. Of course, it is important that exotics or aggressive native plants do not invade land which has been carefully preserved or restored.

As John Tester discusses in his book, Minnesota's Natural Heritage, native species may be valued for practical reasons such as sources of medicines, food crops, or insecticides. However, there may be greater value in the species role in the ecosystem. He notes,

> "All species have evolved over time as part of the natural world. The world is extremely complex and the ecology of most species is not well understood. Therefore, we cannot predict the impact of the loss of a particular species on the ecosystem because we do not know its role. Do we not have a responsibility and obligation to help preserve the diversity of life that makes up our natural world?"

As professionals in the landscape industry, excellent opportunities exist to conserve native heritages.

Native Plant Propagation

Propagation of native plants in a nursery often involves some important considerations regarding the propagules. Propagules such as seeds, stem cuttings and rhizomes from native species, are not readily available in the nursery trade. Many native wildflowers, grasses and woody species are not as numerous as they were 100 years ago. Therefore, many propagators continue to find it necessary to collect these materials from public or private lands. In such circumstances, a permit is required for propagules collection on public lands and permission is necessary from landowners on private lands. Propagules should not be over collected so that existing stands of plants can remain for the future.

Scientists such as ecologists and plant biologists suggest that landscape practitioners and landowners utilize plants that are locally native. Local native plants are those plants that have not undergone a selection process and still hold a wide genetic variety within them. These plants are derived from a population of species, which originated from a local area.

Once the propagules are collected, seeds must be cleaned and processed. Many seeds are easy to process, while others may require scarification and/or stratification to promote germination. Rhizomes of plants need to be cleaned, divided and transplanted into a growing medium. Softwood and hardwood cuttings of plant species must be made at the appropriate time of year, processed, and planted into a growing medium. The propagator must be familiar with the plants' growing requirements so that each plant will receive the proper moisture, soil drainage, and nutrients for germination and growth into a viable seedling. As a small seedling or cutting grows and develops root structure, the plant will need to be transplanted into larger growing containers. In recent years, many well-established native plant propagators have crops and/or scion blocks of native plants in the nursery site so seeds and cuttings can be harvested more efficiently for production.

Integrated Pest Management (IPM)

Although pesticides can be very valuable in the landscape, they can also cause problems such as ground and surface water contamination, worker exposure, long-term adverse health effects, pest resistance and drift effects on non-targeted plants. Responsible applicators use good judgment and Integrated Pest Management, and they follow label instructions in handling, applying and storing pesticides to minimize any adverse effects. Pesticides may become less available due to increased development costs, to more restricted uses of individual products, and as a result of some products being banned or not reregistered by various agencies. This has occurred from an increased understanding of the short and long-term environmental effects of pesticide use and a public request for organic and less toxic alternatives to traditional pesticides. Also, application regulations and worker protection laws, including re-entry requirements, are mandatory in all states. In addition, certain types and quantities of pesticides require specific storage requirements. Spill prevention measures and accidental spill reporting are now required. In some cases, users are required to obtain permits issued by the state to use certain types and/or quantities of pesticides.

The issues described above can be ameliorated by reducing the amount of pesticides used, or by using less toxic pesticides. However, because customers demand perfect products, it's difficult to make these changes with confidence, but within the last few years, major progress has occurred in the areas of Integrated Pest Management and the development of alternative, less toxic pest control.

Integrated Pest Management (IPM) proposes to apply only what is needed and only when it is needed. IPM can greatly reduce the amount of pesticides required. But, the description of pests must be very well shown in order to control them with IPM techniques. Their life cycle must be understood to determine the most effective application times. Additionally, the applicator needs to know what type or combination

of controls works best and at what rates. It may be cost effective to hire a plant health specialist or scouting service as part of an IPM program to develop safe and effective operations.

Incorporating IPM into pest management includes, but is not limited to the following techniques:

1. Use less toxic pesticides. Less toxic alternatives to traditional pesticides range from biological methods to less toxic chemicals. When changing from a known, proven pesticide for pest control to an alternative less toxic product, understand the new product's ability to control the targeted pests, determine potential phyto-toxicity problems on certain plants, and use only recommended application rates. The best resource for this information is the pesticide manufacture's product labels.

2. Grow and use pest-resistant plants.

3. Understand the effect of microclimates on pest problems and adjust plantings accordingly.

4. Promote plant breeding efforts that focus on developing pest resistant or tolerant plants.

5. Educate and work with individual customers; advise them on alternative pest and disease controls.

Refer to the Chapters on Pesticide Management, Insect Management, Disease Management, and Weed Management for additional information on these topics.

Water Conservation

Water quality and conservation are becoming increasingly important environmental issues in the landscape industry. Growers, retailers, designers and contractors use water in almost all aspects of the business. In each of these positions, it is possible to make a significant contribution to saving and maintaining clean water for future generations if it is used wisely. The irrigation industry has made good progress, using rain sensors and drip irrigation to minimize water use. By minimizing areas of water-dependant turf grass and using drought tolerant plants, healthy landscapes can be designed that are not dependant upon irrigation. Recent trends towards saving and infiltrating rain water also goes hand in hand with minimizing irrigation and replenishing groundwater. Storm ponds, rain gardens, infiltration trenches and basins are all helpful in channeling water into the soil and minimizing runoff during rain events.

Many growers are reusing and conserving irrigation water. As water gets mixed with fertilizers and pest control agents, it becomes increasingly important and cost effective to manage and recirculate the water. As water becomes scarcer, it is essential that the nursery industry is not perceived as a polluter of wetlands or ground water resources. Using water wisely and also creating positive storm water management features in landscapes can maintain an environmentally friendly image.

Soil Improvement with Composting*

Composting is an efficient method of breaking down organic materials into an end product that is beneficial to the soil and growing plants. Adding organic materials directly to the soil without composting may initially have some undesirable effects. For example, if large quantities of non-composted leaves are incorporated into the soil, microbes will compete with plant roots for soil nitrogen during leaf decomposition. This competition for nitrogen can result in nitrogen deficiency and poor plant growth. Adding mature composted material with a carbon-to-nitrogen ratio of less than 20:1 reduces the competition for nitrogen. Another benefit of composted material is that it is much easier to handle and mix with soil than non-composted material. Composted material will have fewer weed problems than non-composted materials.
Decomposition of organic matter is dependent on microbial activity. Efficient decomposition includes the following factors: aeration; moisture; particle size; nutrients; and turning or mixing. Many organic materials are suitable for composting such as yard wastes, leaves, grass clippings, straw, non-woody plant debris, kitchen wastes, vegetable scraps, coffee grounds, egg shells, sawdust in moderate amounts if nitrogen is added, wood ashes in small amounts, blood meal, bone meal, livestock manure and lake plants. Adding human, cat or dog feces cannot be used because of the transmission of diseases. Meat, bones, grease, whole eggs and dairy products should not be added because they may attract rodents to the site.

The compost pile should initially be prepared in layers. This will facilitate decomposition by insuring proper mixing. Organic wastes, such as leaves, grass, and plant trimmings are put down in a layer eight to ten inches deep. Coarser materials will decompose faster if placed in the bottom layer. This layer should be watered until moist, but not soggy. A nitrogen source should be placed on top of this layer. Use one to two inches of livestock manure, or a nitrogen fertilizer such as ammonium nitrate or ammonium sulfate at a rate of one third of a cup for every twenty-five square feet of surface area. Do not use fertilizer that contains herbicides or pesticides.

Organic sources that may contain a limited amount of nitrogen include green grass clippings, lake plants or blood meal. A one-inch layer of soil or completed compost can be applied on top of the fertilized layer. The purpose of adding soil is to ensure that the pile is inoculated with decomposing microbes, however, the use of soil in a compost pile is optional.

To prevent odors and hasten decomposition, the pile must be turned occasionally. Turning also exposes seeds, insect larvae, and pathogens to lethal temperatures inside the pile. Turning may be done by inverting segments of the compost, or by shifting the pile into another bin. The compost pile should be kept moist, but not waterlogged. Odors may arise either from the addition of excessive amounts of wet plant materials like fruits or grass clippings, or from over-watering. A properly mixed and adequately turned compost heap will not have objectionable odors. An actively decomposing pile will reach temperatures of 130-160°F in the middle of the pile. Reasons for the pile not heating up may be due to: too small a pile; not enough nitrogen; lack of oxygen; too much moisture; or not enough moisture. Generally, a well-managed compost pile with shredded materials under warm conditions will be ready in about two to four months.

*The above four paragraphs are excerpted from: Rosen, C.J., N. Schumacher, R. Mugaas, and T.R. Halbach. 2000. Composting and Mulching: A Guide to Managing Organic Yard Wastes. (BU 3296F). University of Minnesota Extensive Service, University of Minnesota. St. Paul, MN.

Sustainable Landscaping

The goal of sustainable landscape design is to combine a group of plants into a community where each species thrives with little outside care. Selecting plants that are best adapted to light, soil and moisture conditions for all sites within a project will reduce the need for management. It is also important to direct any surface flow to rain gardens that have species adapted to survive occasional flooding. However, even the best combination of species will not eliminate the need for management. Prairie meadows will not persist without controlled burns or other techniques to control woody species that would dominate without intervention. Invasive, non-native species must also be removed, such as Buckthorn, Tartarian Honeysuckle, Canada Goldenrod, Canada Thistle, Garlic Mustard and others. While no landscape is maintenance-free, sustainable landscapes benefit our environment by reducing storm water runoff and requiring less fuel, irrigation, pesticides, and fertilizers compared to more traditional landscapes.

Energy Conserving Landscape Design

It is possible to reduce both summer cooling and winter heating bills by up to 25 percent in the upper Midwest with the proper placement of trees and shrubs. The principles outlined here are based on the following home energy consumption facts. In the summer, most unwanted heat comes in through east- and west-facing windows and less than five percent of the heat comes through insulated roof and walls. Therefore, shading west windows reduces costly peak electric demands. In the winter, northwest winds cause the most heat loss, and direct sun gives significant free solar energy through south windows. Principles for energy-wise landscaping include:

1. Plant large shade trees to the east or west sides of south-facing walls; prune existing mature trees high enough for direct sun to strike south-facing windows. If a large shade tree is planted on the south side, the shade in the summer falls on the ground, but the branches block the heat of winter sun that could warm rooms with south-facing windows.

2. Plant evergreens in the northwest quadrant of property. Windbreaks planted here allow the winter sun to warm rooms, while blocking dominant winter winds and setting summer sun.

3. Design for at least 50 percent tree cover for the entire landscape.

4. Preserve and care for existing trees and forests close to neighborhoods.

5. Keep air conditioners out of direct sun using screens of plants like vines or small trees that are pruned to permit easy air circulation.

6. Plant shade over parking areas using species best adapted to these tough growing conditions, such as hackberry or oaks, but not sugar maples.

Following these principles will reduce energy bills for homeowners, and the problems associated with “urban heat islands”. These islands are areas that collect and store summer heat, such as buildings and pavement, resulting in an increased need for air conditioning.

Responding to Environmental Change

Climate change is occurring in Minnesota. The decade of the 1990’s was the warmest and wettest on record since the late 1800’s. In the past 17,000 years, global temperature increased 8°F to 10°F; in the past 100 years, land temperature increased by 1.5°F. In

the next 100 years or less, temperatures are projected to rise by 2.5°F to 10.4°F degrees worldwide, according to the United Nations Intergovernmental, Panel on Climate Change.

The Minnesota nursery, turf and landscape industry will need to monitor trends in weather changes to ensure that plant materials grown, sold, and used are adaptable to climatic changes. Heat and water stress during the summer, along with increased temperature variations during the winter, may affect the short and long-term performance of many commonly used plant materials.

Climatic changes can also affect plant diseases and insects, causing new problems on plants once considered pest free. Increased monitoring of pests may help growers recognize changes in pest trends and be better prepared to combat and adapt to these changes.

Waste Reduction

All of the industry has a responsibility to the health and vitality of the environment. If by doing "the little things" such as recycling containers and greenhouse poly, and asking for more environmentally friendly products, this goal will be readily achieved.

The nursery and landscape industry's professional services provide the application and the sharing of knowledge of plant materials, hardscapes, landscapes, soils, irrigation, fertilizers, pesticides and other cultural factors to create a beautiful environment. It is the industry's responsibility, and to the industry's advantage, to be environmentally responsible.

ENVIRONMENTAL MANAGEMENT
Part II: Invasive Plant Guidelines

Tim Power

Native Plants

In the United States, native plants are often described as those plants present in a particular ecosystem before the time of European occupation, about 1830, in much of the United States. In reality, native plant communities have developed over the millennia in response to the soils, the terrain features, and the climate surrounding their locations. Catastrophic natural events like fire may change a site temporarily, but the process of ecological succession eventually returns the site to an equilibrium state called climax. Climax is a dynamic equilibrium, changing slowly as the components of the ecosystem, such as plant and animal communities, and the weather, fluctuate. In the context of this long-term equilibrium, each ecosystem has an indigenous population of species, known as natives.

Native plant populations reproduce primarily by seed, a process that maintains genetic diversity within species. This genetic diversity protects species from changes in the ecosystem by allowing them to adapt to those changes. Local ecotypes of native plant species are well adapted to local soils and climate, and they are in equilibrium with native pests and predators. Natural resource managers seek out these local ecotypes when trying to restore native plant communities.

Native plants are often a good option as landscape plants, for the reasons stated above, and because they may require a minimum of chemical and cultural care when they are properly sited and established in the landscape. The genetic variability of local provenance native seedlings provides good ecological characteristics, however, genetic variability provides no guarantee of good landscape plant characteristics (Segal).

Plant Selection and Plant Breeding

Throughout recorded history, horticulturists, agronomists and other plant breeders have made selections of superior plant materials. Selection and plant breeding have resulted in a huge variety of plants available for agronomic and horticultural use. There have been spectacular successes in adapting or breeding plants for new regions and new uses, including many of the horticultural and agronomic crops grown today.

In the horticultural environment, plant selection and breeding have produced a large percentage of the plant palette now available in the nursery and landscape industry. This industry has introduced a multitude of selections of native, hybrid, and non-native plants, chosen for their aesthetic characteristics, for their durability in the landscape, and for their environmental enhancement capabilities. Most horticultural plant varieties are vegetatively reproduced, preserving the morphological and physiological traits that made the variety successful. Plants produced vegetatively are highly predictable in growth rate, flower color, fall foliage color, uniformity, disease resistance, and many other characteristics. Vegetative propagation eliminates genetic diversity by replicating a single genotype, rather than retaining the diversity provided by seed-grown plants. However, multiple clonal cultivars may add limited diversity.

Non-native horticultural plants can play many roles in the landscape. They broaden the range of colors, textures, sizes, and shapes available to the landscape designer. People who move to new areas often want to see the plants they grew up with, even if those plants are not native to their new area. In some cases, non-natives can be used where natives would languish or fail in a managed landscape. The soils and microclimates of many landscape sites have been radically altered from their natural states. Some non-native plants are successful in landscapes specifically because they surpass local natives in characteristics like heat-tolerance, shade-tolerance, wind-tolerance, disease resistance, root systems that are more tolerant of transplanting, or the ability to withstand a wide range of soil types and soil conditions like wetness or compaction.

Aggressiveness

Some of the horticultural characteristics that make plants successful in an ecosystem may also make them aggressive. Plants that set seed at a young age, produce large numbers of seeds, produce a high percentage of viable seeds, and/or produce seeds that remain viable for a long time, are more likely to become aggressive. Plants that readily reproduce by vegetative means such as shoots from roots or rhizomes are also more likely to become aggressive.

In fact, vegetative spreading is more predominant than copious seed production in aggressiveness. Some aggressive plants also exhibit allelopathy. Allelopathy is a process within one plant that causes chemicals to be produced and released which then retard or inhibit the growth of plants in the surrounding area.

The characteristics of aggressiveness described above apply to both native and non-native plants. Plants that have aggressive characteristics have the potential to escape the landscape and move into surrounding natural areas. However, aggressive native plants are often the fast-growing "pioneer" species that establish easily on disturbed sites. Native pioneer species will eventually be displaced through the process of ecological succession, so they are of minimal concern to natural resource managers.

However, aggressive capabilities can be a major concern in a landscape setting. For example, box elder seedlings or sumac root suckers can be nasty weeds in a managed northern landscape. When viewed only in the short-term context of landscape management, it is not important if aggressive horticultural plants are native or non-native. The planned landscape community can be degraded to the presence of either one. Aggressive landscape plants can often function beautifully as mass or screening plants, but they should be managed carefully in the landscape through proper site selection and cultural practices, or they should be container by physical barriers.

Invasiveness

In the longer-term context of ecological succession, it is very important whether aggressive landscape plants are native or non-native. Natural resource managers are very concerned about invasive plants and their potential effects on native ecosystems. An invasive plant can be defined as a plant species whose introduction causes or is likely to cause economic or environmental harm, or harm to human health, and is non-native to the ecosystem under consideration. Aggressive non-native plants have the potential to become invasive, damaging an ecosystem by changing its composition, structure, or function (Cronk and Fuller). An aggressive non-native plant may perform its horticultural function admirably and still become invasive if it is poorly sited or improperly maintained in the landscape.

Invasiveness is not an absolute characteristic, but rather a continuum from the totally innocuous to the extreme of plants so problematic that they must be regulated. Invasiveness relates to a particular ecosystem, so plants that are invasive in a forested setting, for example, may display no invasiveness in prairie ecosystems. The vast majority of non-native horticultural plants are nearer to the innocuous end of the invasiveness continuum. However, plants like purple loosestrife (Lythrum salicaria*)* and European buckthorn (Rhamnus cathartica*)* are now being added to noxious weed lists because of their highly invasive characteristics in certain ecosystems. Unfortunately, once invasive plants are established in an ecosystem, they are very difficult to eradicate.

Noxious Weeds

Noxious weeds are regulated on a federal, state, or county basis. Traditionally, state noxious weed lists have included invasive plants or weeds of agronomic crops. Canadian thistle is an example of a regulated weed in agronomic crops. Agronomic crops are generally grown in a mechanically or chemically controlled monoculture such as row-crop agriculture. Agronomic weeds are often present across wide ranges of soil types, hardiness zones and different cropping systems, and are present because of the common element of disturbance that is characteristic of agriculture. Agronomic noxious weeds are regulated and controlled at the county or state level, because they may be specific to that agricultural region of a county or state.

Horticultural noxious weeds provide a different perspective because they could have been the "crops" that the landscaper or homeowner planted many years ago and have escaped from their original sites. These aggressive horticultural weeds only invade certain ecosystems, but they can do significant damage to those ecosystems, without the element of disturbance common to agriculture. When that damage becomes significant enough to alarm natural resource managers and state agencies, action may be taken to regulate the invasive plants causing the damage.

Non-Regulated Plants with Aggressive Tendencies

Not all aggressive plants need to be regulated. Many plants with aggressive tendencies can be managed to minimize the risk of damage to surrounding natural areas. For example, trees and shrubs whose seeds are distributed by gravity and wind can be planted far enough away from the natural "edges" of the landscape that the resulting seedlings can be controlled by mowing. Plants that spread by root or rhizome can be planted in beds, contained by edging, or other mechanical means of preventing spread.

The real key, however, is to avoid placing aggressive non-native landscape plants in or near the ecosystems where their aggressive traits can turn into invasiveness.

The Minnesota Department of Agriculture (MDA) and the Minnesota Department of Natural Resources (DNR) are working on the invasive species issue for

plants, insects, and animals. The MDA is starting a new initiative to assess invasiveness on a site specific basis, particularly for pests that have the potential of entering the state. Also, a multi-agency group called the Minnesota Invasive Species Advisory Council (MISAC) monitors, assesses and evaluates potential invasive species. In addition, the Noxious Weed Potential Evaluation Committee within MDA reviews petitions for noxious weeds and designates them as Non-regulated Weeds, Managed Noxious Weeds, or Prohibited Noxious Weeds. These groups are in the process of developing a Plant Risk Assessment and Management Protocol to assess plant invasiveness in Minnesota.

Voluntary Code of Conduct for Nursery Professionals

In December of 2001, the American Nursery and Landscape Association (ANLA) took part in a landmark conference in St. Louis, Missouri, entitled, "The Workshop on Linking Ecology and Horticulture to Prevent Plant Invasions." Voluntary codes of conduct were developed and agreed to by representatives of government, academia, arboreta, ecology, and conservation organizations and the nursery and landscape industry. The text of the code for nursery professionals, since endorsed by ANLA, the Minnesota Nursery and Landscape Association (MNLA), and many other state nursery and landscape associations, is as follows:

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 each region are either currently invasive or will become invasive. Identify plants that could be suitable alternatives in each 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 species.

The concept of invasiveness is relatively new for the nursery and landscape industry. This industry has expended much time and effort developing and promoting the broad array of plant materials that succeed in landscapes. The horticultural perspective is very different from the ecological perspective of the natural resources community, which sees the use of non-natives in the landscape as potentially troublesome. Wise management of horticultural plants that have aggressive tendencies will avoid problems of invasiveness in the future. Education of the industry and the public about this issue is a key element in resolving this conflict of goals. However, highly invasive horticultural plants should be acknowledged and phased out where agreement has been reached in accordance with the voluntary code of conduct cited above.

Conclusion

The conflicting "world views" of the nursery and landscape industry versus the natural resources community concerning invasive plants, need not be mutually exclusive. Nursery and landscape professionals need to recognize the aggressive nature of some horticultural species and utilize best management practices to ensure their proper use and placement. The nursery and landscape industry and the natural resources community must cooperate as partners in reducing the impact of invasive non-native plants.

At the same time, the natural resources community should recognize that a "natives only" world will not satisfy the wider gardening public. Non-native horticultural plants are an integral part of many successful landscapes. Most non-native plants pose minimal threat to natural environments and often, non-native plants that are aggressive can be managed successfully in the landscape. Research is being conducted at many institutions to develop plant varieties that are sterile, or to find other strategies that reduce invasive potential. The nursery and landscape industry can be an ally in educating the public on invasiveness and in promoting the plant materials, site selections, and maintenance practices that minimize the problem.