Impacts of Native Plants on Local Urban Ecosystems and Human Benefits

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Table of Contents

Abstract

In a time of climate change, lowering biodiversity, and rapidly increasing urbanization the horticulture industry has room to improve its stance and utilization of native plants. As large swaths of land are converted from natural areas to suburban and urban lifestyle many of North native plants are falling by the wayside for industry standard non-native ornamentals. The conversion of these ecosystems is partial due to outdated mindsets on desired plants and lack of institutional knowledge in the largest parts of the horticulture trade. Native plants have a great potential to stich broken ecosystems together when homeowners and horticulturalists hold ecosystem services at a higher value than exotic beauty. As a self-proclaimed green industry there is a vast distance to go to being environmentally sound. When embracing native plants homeowners, land managers and horticulturalist can start addressing environmental issues such as climate change, insect decline and lowering biodiversity while also providing beautiful landscapes that engage everyone while creating room to encourage conservation.

Keywords: Horticulturalists, Landscapers, Landscape Architects/Designers, Landowners/ Managers, Gardeners, Native Plants, Urban Ecosystems, Urban Conservation, Landscaping, Ecosystem Services, Habitats

Impacts of Native Plants on Local Urban Ecosystems and Human Benefits

In the current urban environment horticultural practices of emphasizing non-native ornamentals over native ornamentals perpetuates the growing issue of climate change and lowered biological diversity in the urban landscape. Native plants are defined by the United States Department of Agriculture (USDA) "as a plant that is a part of the balance of nature that has developed over hundreds or thousands of years in a particular region or ecosystem" while non-native plants are defined as "a plant introduced with human help (intentionally or accidentally) to a new place or new type of habitat where it was not previously found" (United States Department of Agriculture, n.d.). It is also important to note that not all non-native plants are invasive. The USDA defines invasive plants as "a plant that is both non-native and able to establish on many sites, grow quickly, and spread to the point of disrupting plant communities or ecosystems" (United States Department of Agriculture, n.d.). Historically the horticulture industry has thrived off new and "exotic" species of plants to garner attention often disregarding or devaluing the ecological role of native plants that are being replaced. Often homeowners and landscape designers rely on popular trends to make planting decisions without accounting for the ecological role and impacts that these plants can take on. As an industry we have unleashed some of the most horrific invasive plants such as kudzu (*Pueraria montana* var. lobata) based on trends and lack of control once planted. Kudzu for example, was introduced by the USDA at the USA's Bicentennial Fair of 1896 as a fodder plant that doubled as erosion control due to its rapid growth and ability to set new roots out at each node in contact with the soil. Due to kudzus prolific ability to spread it has completely engulphed properties in south east North America. Though this introduction was intentional there are often unintentional species that are introduced that can cause widespread damage in relatively quick succession. As we start to take

environmental and ecosystem rolls into consideration and begin to utilize native plants more homeowners, land managers and horticulturalist can start addressing environmental issues such as climate change, insect decline and lowering biodiversity while also providing beautiful landscapes that engage everyone while creating room to encourage conservation.

Background

The horticulture trade is a well-established entity that thrives off new and "exotic" species to garner attention for the client's property. When we look at historical examples like long established botanical gardens, wealthy estates, such as Monticello, or palace gardens, we are often looking at non-native plants which originate in some far-off place and were a symbol of wealth and prosperity. As we have progressed into the 21st century this has been perpetuated by the industry we have become accustomed to many of these non-native species such as *Euonymus alata, Ligustrum japonicum, Lonicera japonica* and many more have become staples of the industry. These plants have become invasive in many regions of the United States but some of the other popular non-native plants remain harmless. Dr. Tallamy states that "over 5000 alien ornamentals have been introduced and have invaded our natural area" (2009), despite the watchful eye of some horticulturalists many of these plants are replacing our native flora reducing the productivity of our local ecosystems and contributing to the larger issues that afflict our urban and rural environments. As stated in both of Dr. Tallamy's books many of the lower trophic species such as insects rely on many of the native plants that we are absentmindedly removing from the landscape as we develop our cities. When we reduce the native flora, we are greatly reducing food for all trophic levels. "Worldwide, 37 percent of animal species are herbaceous insects" (Tallamy D. W., 2009) with a large portion of insects being specialists they rely on the plants we are removing from the landscape. As a field we need more research on the

effect of modified environments and how they impact the ability of native plants and native cultivars, also known as nativars, to remain successful. Another issue to be researched it the affect that nativars have on the coevolved interactions between the modified straight species and the historical specialist insects.

Important roles of native plants in urban conservation

By adapting our home gardens, public parks, and other green spaces in our urban landscape to native plant centric designs, urban conservationists can start to build interest in large scale conservation efforts in areas that are a patch work of ownership. Areas that are closer to home rather that a far of track of land like the traditional model of conservation that is currently used allow the opportunity for more people to engage with the environment. In the expansion of our cities, we are decimating patches of natural areas, to install turf and nonnative plants alongside our developments. Which concurrently reduces the true wildlife corridors that once existed. It is becoming more difficult to fit corridors into the geographic constraints of an urban landscape (Dearborn & Kark, 2010). Though the existing contiguous corridors are being apportioned out to developers, there is still hope by focusing our policies to encourage or even benefit property owners when they plant environmentally sound species. According to Dearborn and Kark, “Urban areas provide an opportunity to teach environmental processes and conservation to large numbers of people, including those who lack the means or motivation to travel to nonurban areas, where exposure-based wildlife education has been located traditionally” (2010). Through outreach and education as proposed by Dearborn and Kark municipalities and NGOs can help homeowners and land managers build a “Homegrown National Park” (Tallamy D. W., 2019). Horticulturalist can begin to build the buy in required to make large scale efforts in restoring the landscape and bringing life into our cities.

Native plants not only offer intrinsic value in their unique and varied looks they support all our native pollinators and other key species they also provide fresh and intriguing local food sources like Pawpaw (*Asimina triloba*) or Common Persimmon (*Diospyros virginiana*). Though some of our native edible plants do not fall high on Tallamy's list of supportive plants for Lepidoptera species, refer to table 1, they offer a way to reduce the distance traveled by our food sources and provide food to non-insect species. When native edible plants are incorporated into to a native plant themed garden, they offer humans a food source while also aiding the ecosystem surrounding them. In Helena, Montana their community garden system incorporates native plants both edible and inedible plants alongside standard fruit and vegetable crops. In this setting they use volunteers and members to maintain the landscape while making excess crops available to the local community and food bank where fresh produce is usually lacking. They also take the time to offer classes into gardening and other horticultural topics to youths, young families and anyone interested in learning. When giving these demographics the tools they need to get started along with teaching them the benefits of native plants to their property and the ecosystem we are coming back to the idea of exposure-based learning that Dearborn and Kark laid out in their paper.

When determining what native plants to use in a landscape design, Tallamy argues that we should focus on species of plants that are required to support specialized insects, whereas a generalist insect will utilize any of the plants that are planted to suit the more selective insects. Through his research Tallamy found that native trees such as oaks (*Quercus* spp.) provide habitat and food for 534 native Lepidoptera species (2009) many of which only use oaks for part of their life cycles and require other species to complete other aspects of their life cycle. Not only do they support 534 Lepidoptera species their acorns are also a vital source of mast for mammalian

species. In some of Tallamy's public talks about his books, he mentions that there are a multitude of oak species that are native to North America, with many having smaller sizes allowing for them to be a better choice for smaller urban properties. One tree that was specifically mentions was *Q. prinoides*, commonly known as dwarf chinquapin oak, which can offer the benefits of native oaks in the environment, while also being mindful of the mature tree size in limited areas. Many butterfly species and other key pollinators rely on different plants for different parts of their life cycle. The Aster family of plants plays a vital role as the main source of food for Monarch Butterflies and is often promoted by groups like the Xerces Society as a great alternative for pollinator gardens. Subjectively many of the Aster plants are aesthetically pleasing and have fun and unique flower shapes while also covering the whole spectrum of color, size and forms offering designers plenty of options for their clients.

Tallamy uses the interaction between insects and plants to show that native plants are a foundation in the biodiversity of their region. This interaction is largely driven by the coevolution of plants and insects. Stressing the importance of coevolution between plants and insects, Tallamy implies that the development of adaptations to overcome plant defenses play a vital role in plant choices. Many of the Lepidoptera species that Tallamy and his team have observed in their research are specialist which have coevolved with specific plants. This coevolution has allowed insects to develop mechanisms to overcome toxins that are found in plant parts designed to protect them from predation. For example, if you look at table 1 attached below (Tallamy D. W., 2009), the top three native trees families, oak, cherry, and willow can roughly support a combined 1500 species of lepidoptera not to mention the numerous generalist species of insects and other animal species uncounted for. Conversely in table 2 (2009) Tallamy uses *Phragmites australis* as an example of a long-established nonnative species that has become

prevalent across North America but has not become supportive in the ecosystem it is now found in. *Phragmites australis* has been in North America for over 300 years brought over by colonists. In its homeland of Europe, it supports 170 species of herbivores while it only supporting five species of herbivores in North America. Likewise, Tallamy also mentions that *Melaleuca quinquenervia* is highly beneficial in its native range supporting 409 species of herbivores, while in North America it only supports a paltry eight species since its introduction 120 years ago (Tallamy D. W., 2009). The examples of *Melaleuca quinquenervia* and *Phragmites australis* show that the process of coevolution takes place over a much longer time scale than that of human recorded history and that many species cannot adapt as fast as we introduce new plants to the North American landscape.

As the first trophic level, herbivorous insects and their biomass provide the required nutrients to a plethora of insectivorous species. In their observations Tallamy and his team noticed that nearly all bird species only feed their offspring soft body insects like that of Lepidoptera caterpillars and could not support their young with seeds often provided by homeowners (Tallamy D. W., 2019). When we strip plants that serve as insect specific host from the landscape, we are effectively reduce the ability for other animals, like birds, to survive on the landscape. Despite the negative effects of removing native plants from the landscape, there is still hope to add life to the landscape. As an example, a couple in Norfolk, Virginia wanted to add more plants to their yard. After native plants were advocated for, they decided to add several natives to their property. After a short time from the addition of those native plants, the couple noticed a substantial increase in the number of pollinator species they observed on their property. Not only did they become more fascinated by the new visitors on their property, but they also started spending more time in their backyard observing the new pollinators. As their interest in

their new ‘neighbors’ and their prospect of being a helpful property in their neighborhood has begun to build, their interest is leading them to seek out more ways to add native plants to their landscape. This newfound interest and willingness to work with native plants is rooted in the exposure-based learning that Dearborn and Kark are stressing.

Patchworks of smaller properties can make an impact.

Western culture typically views conservation areas as large tracts of minimally broken up land. For example, national parks and state parks which use “conservation strategies and policies [that] place a premium on large, high quality, well connected patches of remnant vegetation with a low prevalence of threats” (Soanes, et al., 2019) are the standard. Despite having a large impact on conservation national parks and state parks are rare in the urban realm (Soanes, et al., 2019) and are often fighting their own invasion of nonnative plants. These parks are not the pinnacle of conservation solutions that are going to be needed to overcome climate and biodiversity issues that are coming to light in the global perspective. The vast amount of land that we cannot manage in a traditional conservation plan is astonishing.

Citing the 1991 U.S. Census, Tallamy states that “the vast majority of land in the lower forty-eight states is privately owned, including 85.6 percent of the land east of the Mississippi River, 95 percent of Texas, 94 percent of Maine, and 83 percent of conterminous United States” (2019). In the United States turf grass occupies “over 40 million acres and is growing at a rate of 500 square miles each year” (Tallamy D. W., 2019) vastly reducing the capacity for North America to provide enough nutrition to specialist insects. Although turf covered areas play a vital role, such as providing ground cover in areas that receive large amounts of traffic, like sports fields and public greens, they are not the best option for covering our landscape at large. Many of the common and sought-after species of turfgrasses do not originate in North America and

consequently do not provide nutrition for nearly any species. Turfgrasses typically require large amounts of maintenance in the form of mowing, fertilization, and pesticides. Despite the increasing reduction in land that supports indigenous species we can improve our prospects by reducing each homes turf and providing more natives. Thus, building back some of the key ecosystem services such as, water management, carbon sequestration, crop pollination, pest regulation and many more is important, "because ecosystem services are, by definition, for humans it makes sense to ensure they are provided in areas where human population density is high" (Dearborn & Kark, 2010). Dearborn and Kark suggest that "in an urban context, even a small green space can provide high impact ecosystem services, if they are well planned" (2010). Most large population centers are near rivers or are built on top of wetland areas reducing the natural ability of the wetland species to soak up excess water, minimizing the effects of flooding.

Converting parks and river side areas in our cities to native wetland species and allowing them to grow more naturally than some of our more traditional parks, cities can begin to build an infrastructure that helps minimize the effects of floods while also improving "the urban hydrology and absorbing contaminants" (Dearborn & Kark, 2010). Dearborn and Kark state "true corridors are difficult to fit but steppingstones- probably in a chain of rather than a complete grid- can be a cost-effective way to enhance biodiversity in cities" (2010). By adding steppingstones alongside and in between protected areas we can start to create corridors that support the migratory species of birds, insects, and other fauna. The patch work of native plant dominated properties will help tie together the current bastions of wildlife, helping animals of all species to return to their natural migratory patterns, reducing the space constraints we are placing on them. Anecdotally in Montana, wildlife biologists are seeing grizzly bears and other species of large mammals start to follow corridors that we have left while transiting from Glacier

National Park south to Yellowstone and out of the mountains where they have been forced. This shows that corridors can play a vital role in species movement. By incorporating ecologically sound corridors and encouraging landowners to play a part in conservation we can begin rebuilding the landscape in a way that allows us to truly coexist with other animals rather than pushing them into smaller segments of land. Wildlife corridors can take many forms in the landscape, one incredibly interesting method is building animal centric under and over passes that incorporate a vegetated path. These corridors prevent wildlife from entering highways while also connecting divided natural areas together.

A major benefit of encouraging land managers and homeowners to convert their land is that it takes most of the conservation cost away from the government and puts it on the landowner. Although this may sound shocking many landowners regularly budget for landscaping. Landowners can take the same budget for their nonnative plants and apply it to natives effectively improving their role in the environment, while effectively not increasing their incurred landscaping costs. There are even incentives offered by some nonprofits and government programs to remove nonnatives and invasive plants from your property. This adds a monetary benefit to people looking to convert their land. In the Norfolk area there is a church that recently transitioned to a new property with five acres of land that lies alongside King Creek, an estuary into the Elizabeth River and Chesapeake Bay. With much of their property wooded and partially in a wetland environment, it was required by the Chesapeake Bay Protection Area (CBPA) to remove as much of the invasive plants on their property as possible, along with replanting plants native to the region. The property is heavily infested with invasive plants like Japanese honeysuckle (*Lonicera japonica*), Japanese privet (*Ligustrum japonicum*) and Chinese privet (*Ligustrum sinense*) along with some aggressive native plants like greenbrier

(*Smilax* spp.). Though not thought of as invasive the property is also struggling with English ivy long side the rear of the building making it hard for the project manager to restart the native plant population. This project requires large amounts of mechanical controls to reduce the overall concentration of invasive plants while also utilizing limited amounts of chemical controls for plants that sucker after being cut. Due to the nature of the property ownership, they have a built-in volunteer network from the congregation lowering labor cost to nearly zero. While also receiving grants from Lynnhaven River Now and other local nonprofits whose goals are to improve the Chesapeake Bay watershed the grants permit a larger scale restoration project on the property with most of the funds going towards buying plants or hiring specialists to accomplish tasks, such as herbicide application or arborists. The property already has a wealth of older native trees, such as various species of oaks, a mixture of native shrubs, tree saplings and herbaceous perennials. All these native plants are trying to work their way into the spaces currently overtaken by the more successful invasive plants. This model does not have to be the only way to accomplish conversion of properties from nonnatives to native plants. Homeowners or other landowners can slowly convert their land as their nonnative plants decline or add a few larger plants each year to replace the use of nonnative annuals. Though this method would be slower, it can help avoid the monetary shock of a complete overhaul of their property all at once. John Magee, a native plant landscape designer, alongside Tallamy, suggest we do not have to hit 100 percent native plants on our properties, but we should aim to have well over 70 percent native plants in the landscape. This mindset allows for some wiggle room for people to hold onto their favorite nonnative and noninvasive plants, while also building capacity on their land albeit at a much slower pace. When determining what nonnative plants, you can keep, Tallamy suggests that you should research to see if it easily spreads or if it will become readily invasive. By aiding

clients in their design goals, we can help encourage and provide the knowledge needed to make more informed decisions. Utilizing this methodology, we can start to reduce the number on invasive plants the industry is planting each year adding to the increasingly harder task of managing escaped plants. By creating a demand for native plants, we can cause a shift in the nursery industry improving and adding to the capacity to produce native plants on a level that can sustain the supply with increased demand.

Changing perceptions of native plants

Some horticulture textbooks, such as Professional Landscape Management 3rd ed., often state that native plants can be used though they may not adapt to the altered landscape that we find in the urban environment. For example, in the Professional Landscape Management text book talks about how native species can be beneficial in reducing costs such as labor and fertilization along with other traditional inputs then promptly states that “native plants are not a panacea” and that due to the altered ecosystem they are no longer in native soils (Hensley, 2010), or even the Professional Turfgrass Management textbook utilized by TCC stating that turfgrass is an eco-conscious choice of ground cover. While turfgrass is easier to maintain than other plants it often takes more inputs and is over utilized in the landscape reducing its benefits as it becomes a large monoculture. In many horticulture textbooks the benefits and ecological reasoning for native plants is often overlooked if mentioned at all. While in some plant identification courses that are offered in the area many do not speak to which plants are native, nonnative or have aggressive/ invasive habits. This lack of knowledge hinders the industry in its ability to become a truly ‘green industry’ focusing on environmentally conscious designs. In the Journal of Conservation Biology an essay looking at misconceptions in conservation states:

> It seems there remains a pervasive narrative in policy, practice, and the public psyche that urban environments, while useful for engaging people with nature or providing ecosystem services, are of little conservation value. We argue that this tendency to undervalue urban environments stems from misconceptions about the ability of native species to persist within cities and towns (Soanes, et al., 2019).

The way we teach horticulture and landscape design often follows suit with the misconception that urban areas are not valuable for conservation. Though many of our soils are drastically altered in developed areas, the urban environment should not be dissuaded from planting natives (Hensley, 2010). In most horticulture classes we talk about the importance of right plant in the right place and considering the other environmental factors that can affect a plants success once put into the ground. Rather than not planting natives as they might not be 'adapted' to the altered soils we should strive to rebuild healthy and productive soils in our urban environment. This ultimately improves the health of the ecosystem. Another topic that is often overlooked is that of 'weeds'. In many instances we add the term weed into a plants common name, such as Joe Pye weed (*Eutrochium purpureum*), leaving the uninitiated consumer to believe the plant is a weed when it is a native plant that hosts local pollinators. Gardeners and horticulturalist know weeds are subjective to who is managing the landscape. Rather than using the term 'weed' we should strive to classify plants as native, nonnative, or invasive, as it will give more meaningful information than simply stating the plant is out of place. Thus, beginning to allow consumers to understand the role of the plants that they are planting. For example, in the reference book Weeds of the Northeast all the plants found within are identified as weeds. Most of the weeds in the book are not supplied with a native region or given details to what they host for food and habitat.

The guide is intended to be used as a reference to the turfgrass industry which views any species other than the planted and desired grasses as a weed.

Going forward we could require that plants sold everywhere are to be supplied with more amplifying information, such as the plant's benefits to the ecosystem or ability to become invasive on the tags that are already used to convey light and moisture requirements. There are great resources available on the market, like the Brooklyn Botanical Garden's Native Alternative to Invasive Plants book that shows perspective plant buyers native alternatives to the nonnative or invasive plants. These resources give the buyer a few options that fill similar roles as the nonnative plants, such as form, color, or size, while also providing an ecological service. There are also other texts like the Southeast Native Plant Primer and other regional guides that give gardeners a wealth of knowledge on plants that can work in various garden situations. By promoting resources that aid improved knowledge of the plants we are utilizing, we can give consumers more incentive to increase demand of native plants from the nursery industry. Increasing demand in native plants can lead to major changes in the horticulture industry and the plants that are commonly produced.

Another change we need to make as an industry is rethinking the promotion of the term "pest resistant" plants. The main reason that plants are considered pest resistant is because they are not acting as a food source for insects. This is due to the lack of coevolution between insect species endemic to North America and the non-native plant species. The nonnative plants we plant often hold no nutritional value to insects, while also being deathly to non-adapted species. If we transition to more native plants in the landscape, we will have to reframe how people view insects and how they interact with 'our' plants. As we begin to provide for more insect species, we can also reap the benefit of the natural predator-prey interactions that will help control some

of our common pest species, like aphids or mites (Walliser, 2014). In her book, Walliser uses a tree on her property to show how the natural predator-prey interactions can be useful when managing for aphids. She had a large tree on her property that was infested with aphids causing sooty mildew to afflict most of her plants underneath the tree. Rather than use chemicals to control the aphids, Walliser waited and watched to see if natural predators would control her pests. Between providing native host plants and hosting prey insects Walliser's tree attracted natural predators to help control the pest problem within a few weeks. Though this method is slower than spraying with an insecticide it shows that by providing habitat to more insects we can help ourselves reduce the number of intensive controls needed to manage pests in our garden.

Tallamy states, "restoring habitat where we live and work, and to a lesser extent where we farm and graze, will go a long way toward building biological corridors that connect preserved habitat fragments with one another" (Tallamy D. W., 2019). In his book he likens the patch work of home gardens and other small tracks of land as a "Homegrown National Park". For example, in a webinar series offered by the Lewis Ginter Botanical Garden, Janet Davis of Hill House Nursery talked about a client that was looking to redo his landscaping in front of his small local business. Initially he went with a standard smattering of plants recommend by a local landscape designer that primarily used nonnative plants until he was approached by a local group that advocated for native plants. Being intrigued by this he agreed and worked with Janet to develop a captivating landscape design that played heavily on the regions native plants drawing interest to his store front and becoming another piece of the patchwork required to reconnect our ecosystem (Davis, 2021). Though in this case the whole project was going to happen with or without native plants it is important to glean that advocacy and changing the narrative on what

we plant can make a positive impact on how we view what we are planting. In most cases customers do not take a plants origin in consideration when approaching landscape designs but through advocacy and gentle nudging many people are willing to take a new approach to their gardens.

Many groups such as the National Wildlife Foundation, Xerces Society, and Botanical Gardens offer certificates that help encourage homeowners to achieve certain benchmarks that will aid in supporting local wildlife. Many of the bodies offering these certifications also utilize a mapping feature showing anyone that looks where other wildlife friendly landscapes are in the region. By utilizing certificates and citizen science work, like Cornell Universities annual bird count, people that are interested in seeing wildlife can strive to reach achievable goals on their property building the interest needed to promote a new way of thinking about our gardens. Likewise, for people that are less interested in plants or their landscaping, the industry should make a concerted effort to set new standards that focuses on how they can improve the environment rather than making beautiful yet barren landscape. Another way environmentalists have proposed building interest in children at a young age is by engaging them in nature play. There are several books, such as Vitamin N and Nature Play at Home, that are geared towards parents with young children that help lay out ideas and tactics to foster nature play in their household. We could also begin to build and incorporate large native gardens that focus both on food production and ecological impact around schools and childcare facilities with fun and interactive educational games that teach kids about the ecological roles' plants play. This would help us build a new and enthusiastic generation of nature loving adults that want to continue to see the beauty of the world around them.

Conclusion

As an industry we need to make a concerted effort to becoming a true “green industry” through embracing native plants and by teaching homeowners, land managers and horticulturalists about the benefits of planting natives. As we build more “Homegrown National Parks” we can build more interest and excitement in restoring the ecosystems that we interact with daily. The increased excitement can help build capacity in the industry to launch it into a phase of growth and renewed views on how they can make a positive change. Though the transition may take some time, it is vital that we become part of the solution to so many of the environmental problems that surround us rather than perpetuating the issues that are feeding into loss of biodiversity and climate change. By being more environmentally conscious and engaging in the local ecosystems rather than current trends of humans versus nature we can build towards a healthier environment in our urban landscapes increasing the health and mental wellbeing of citizen. Going forward we need to engage policy makers, homeowners, homeowner associations and horticulturalists in conversations that will allow us to transform our urban environments from a nearly sterile ‘beautiful’ landscapes which do not provide for the fauna surrounding us into a healthy ecosystem that not only provide beauty but fundamental value to non-human animals. By becoming part of the solution, we can truly be an industry that is leading major environmental causes aiming to protect and restore the environments around us.

Tables and Figures

Table 1:

WOODY PLANTS RANKED BY ABILITY TO SUPPORT LEPIDOPTERA SPECIES			
Common Name	**Family**	**Plant Genus**	**Species Supported**
Oak	Fagaceae	*Quercus*	534
Willow	Salicaceae	*Salix*	456
Cherry, Plum	Rosaceae	*Prunus*	456
Birch	Betulaceae	*Betula*	413
Poplar,Cottonwood	Salicaceae	*Populus*	368
Crabapple	Rosaceae	*Malus*	311
Blueberry, Cranberry	Ericaceae	*Vaccinium*	288
Maple, box elder	Aceraceae	*Acer*	285
Elm	Ulmaceae	*Ulmus*	213
Pine	Pinaceae	*Pinus*	203
Hickory	Juglandaceae	*Carya*	200
Hawthorn	Rosaceae	*Crataegus*	159
Alder	Betulaceae	*Alnus*	156
Spruce	Pinaceae	*Picea*	156
Ash	Oleaceae	*Fraxinus*	150
Basswood, linden	Tiliaceae	*Tillia*	150
Filbert, hazelnut	Betulaceae	*Corylus*	131
Walnut, butternut	Juglandaceae	*Juglans*	130
Beech	Fagaceae	*Fagus*	126
Chestnut	Fagaceae	*Castanea*	125

(Tallamy D. W., 2009, p. 147)

Table 2:

HOSTING CAPACITY OF ALIEN PLANTS INTRODUCED TO NORTH AMERICA

Plant Species	Herbivores Supported in Homeland	Herbivores Supported in North America	Years Since Introduction	Reference
Clematis vitalba	40 Species	1 species	100	Macfarlane& vanden Edne 1995
Eucalyptus stellulata	48 Species	1 species	100	Morrow & La Marche 1978
Melaleuca quinquenervia	409 Species	8species	120	Costello et al. 1995
Opuntia ficus-indica	16 Species	0 species	250	Annecke & Moran 1978
Phragmites australis	170 Species	5 species	300+	Tewksbury et al. 2002

(Tallamy D. W., 2009, p. 285)

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