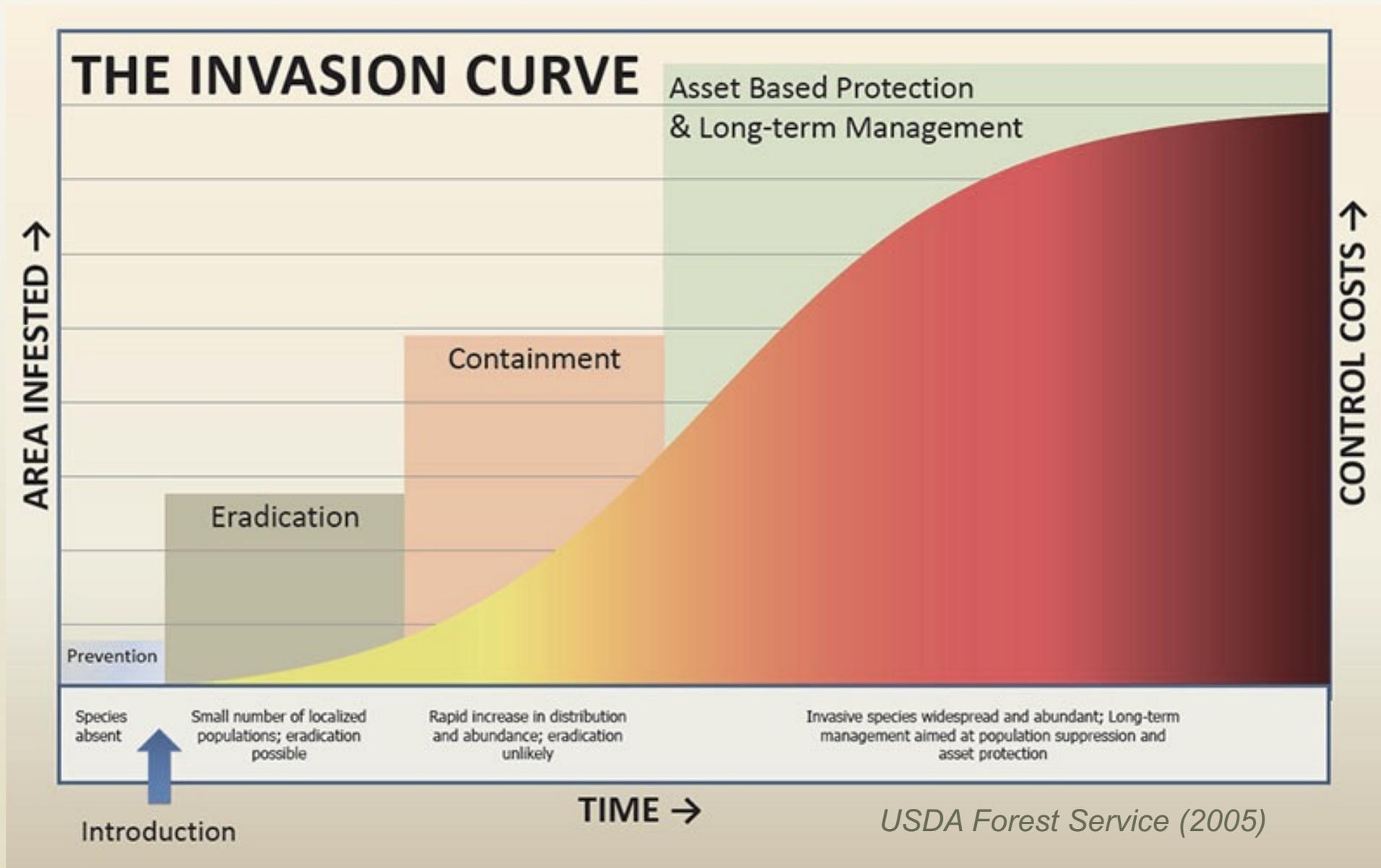




The Role of Public Gardens as Sentinels of Plant Invasion

Theresa Culley, Kurt Dreisilker, Clair Ryan, Hans Landel, Nadia Cavallin, Jessica Arcate Schuler, Brittany Shultz, Roger Gettig, and Kayri Havens





Only a very small number of introduced plants become invasive!

Many traits associated with invasiveness are also desired for horticulture

- Wide ecological tolerance / hardiness
- Rapid growth
- Prolific flowering
- High fruit production (for wildlife)
- Multiple introductions



Many traits associated with invasiveness are also desired for horticulture

- Wide ecological tolerance / hardiness
- Rapid growth
- Prolific flowering
- High fruit production (for wildlife)
- Multiple introductions



Distribution through
ornamental pathway



Horticulture can be a pathway of invasive plant introductions

82% of 235 woody plant species escaping cultivation in US were used in landscaping (Reichard 1994)



Update of Reichard's (1994) Review



Tziporah Serota

- Woody, herbaceous, and vine taxa (not only woody)
- Focused on the Midwestern US (not entire US)
- 295 species listed as invasive by the Midwest Invasive Plant Network
(IN, IL, IA, MI, MN, MO, OH, WI)

Update of Reichard's (1994) Review



Tziporah Serota

- Woody, herbaceous, and vine taxa (not only woody)
- Focused on the Midwestern US (not entire US)
- 295 species listed as invasive by the Midwest Invasive Plant Network
(IN, IL, IA, MI, MN, MO, OH, WI)
- Determined origin as:

Accidental

Intentional

Ornamental
Agricultural
Culinary/medicinal
Aquarium
Soil erosion control

* Some species had
multiple origins

Update of Reichard's (1994) Review

■ Ornamental

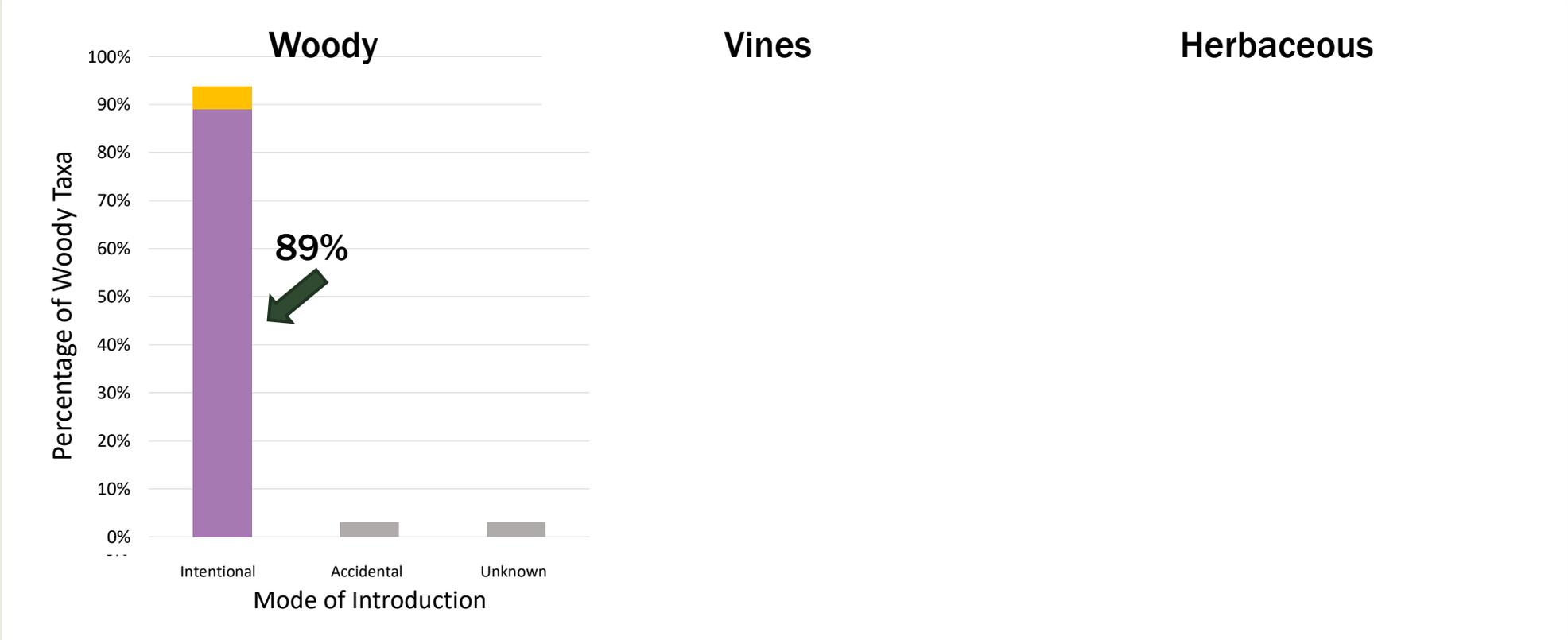
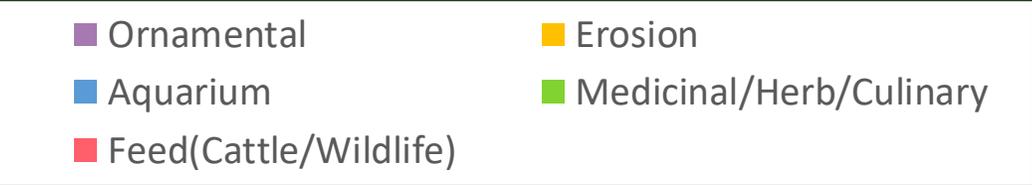
■ Erosion

■ Aquarium

■ Medicinal/Herb/Culinary

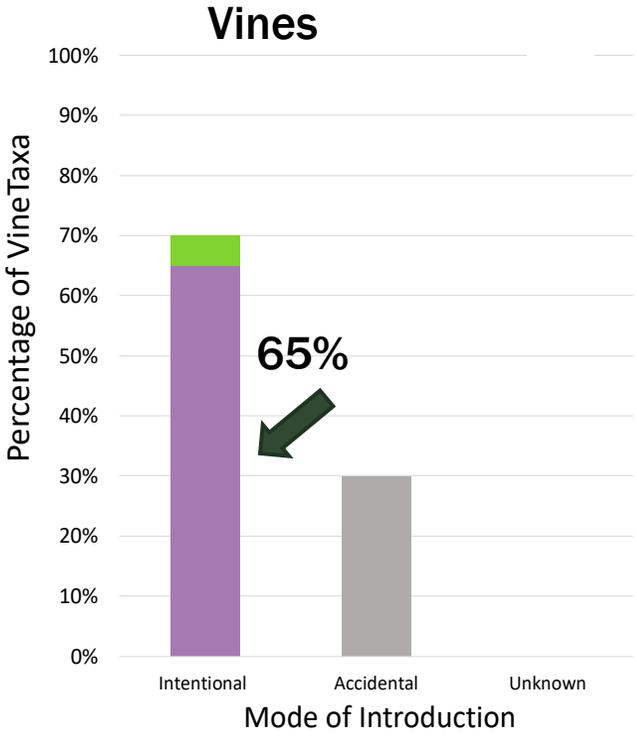
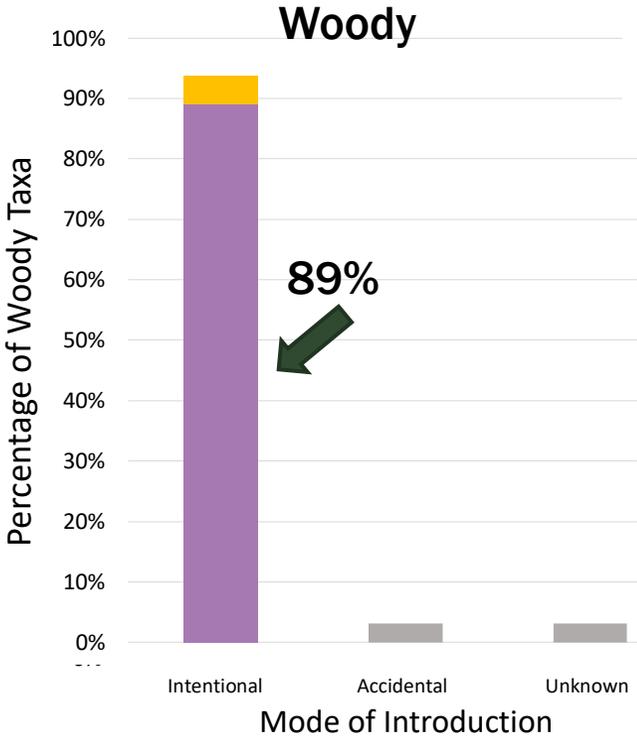
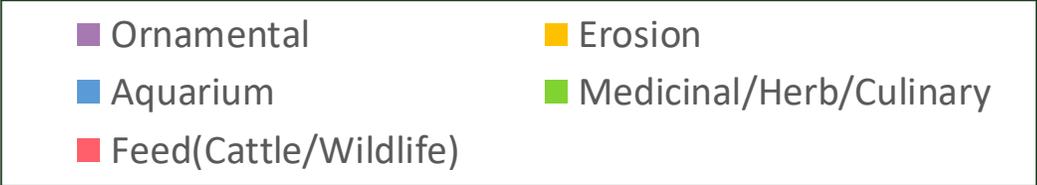
■ Feed(Cattle/Wildlife)

Update of Reichard's (1994) Review



Update of Reichard's (1994) Review

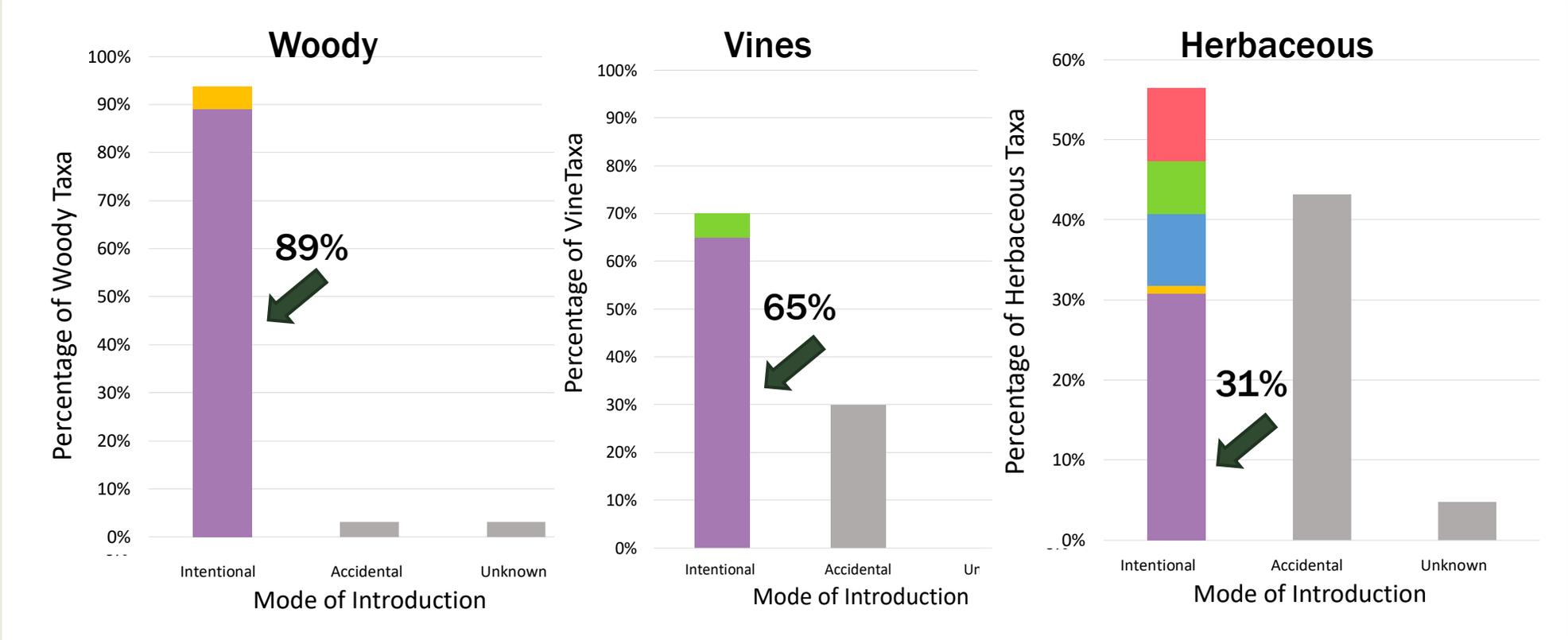
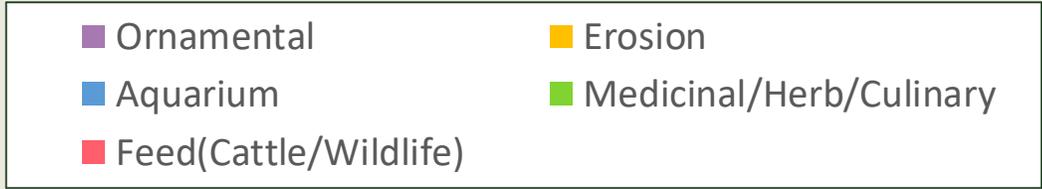
**Reichard
(1994): 82%**



Herbaceous

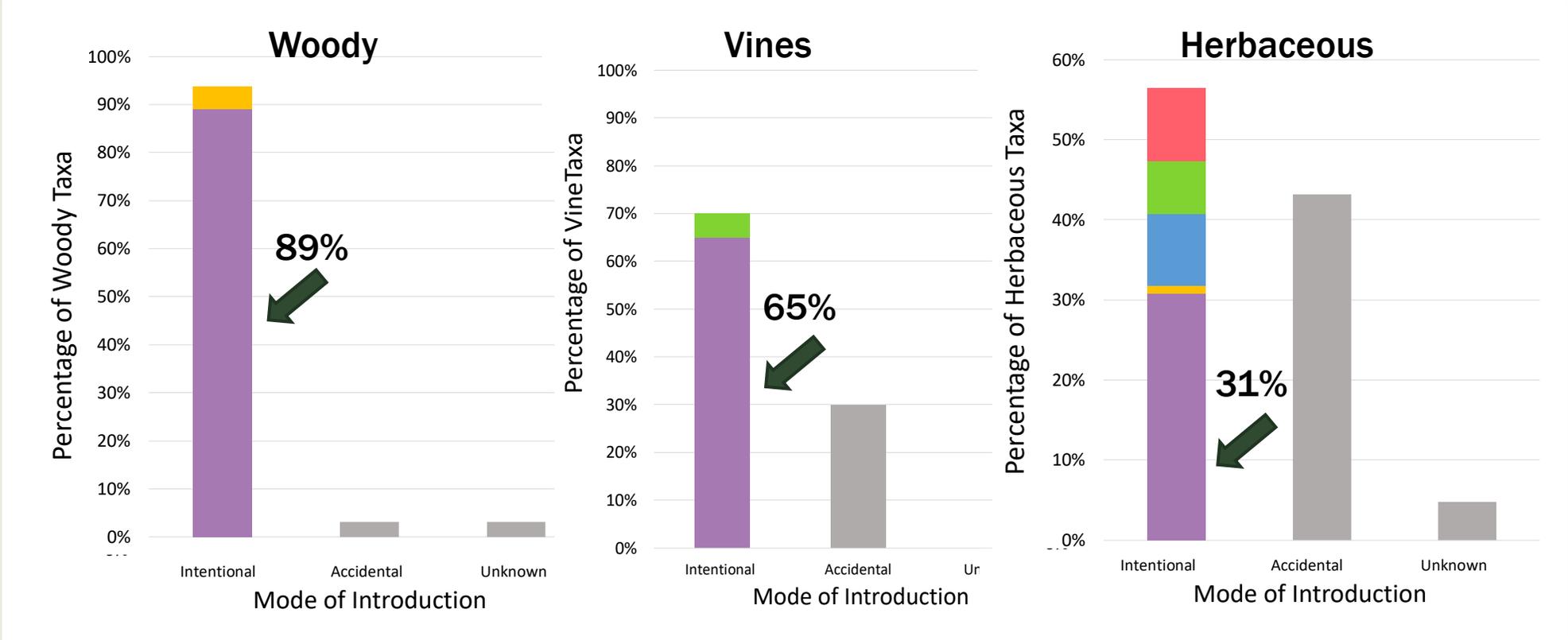
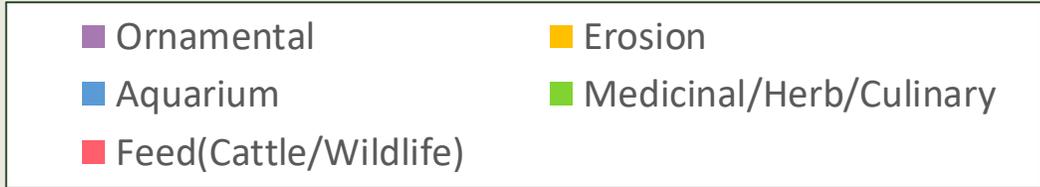
Update of Reichard's (1994) Review

**Reichard
(1994): 82%**



Update of Reichard's (1994) Review

Reichard
(1994): 82%



Most woody (93.8%), vines (70.0%), and herbaceous (52.1%) were introduced intentionally

Gardens Feature Plants from All Around the World



Chicago Botanic Garden



Arnold Arboretum



Morton Arboretum

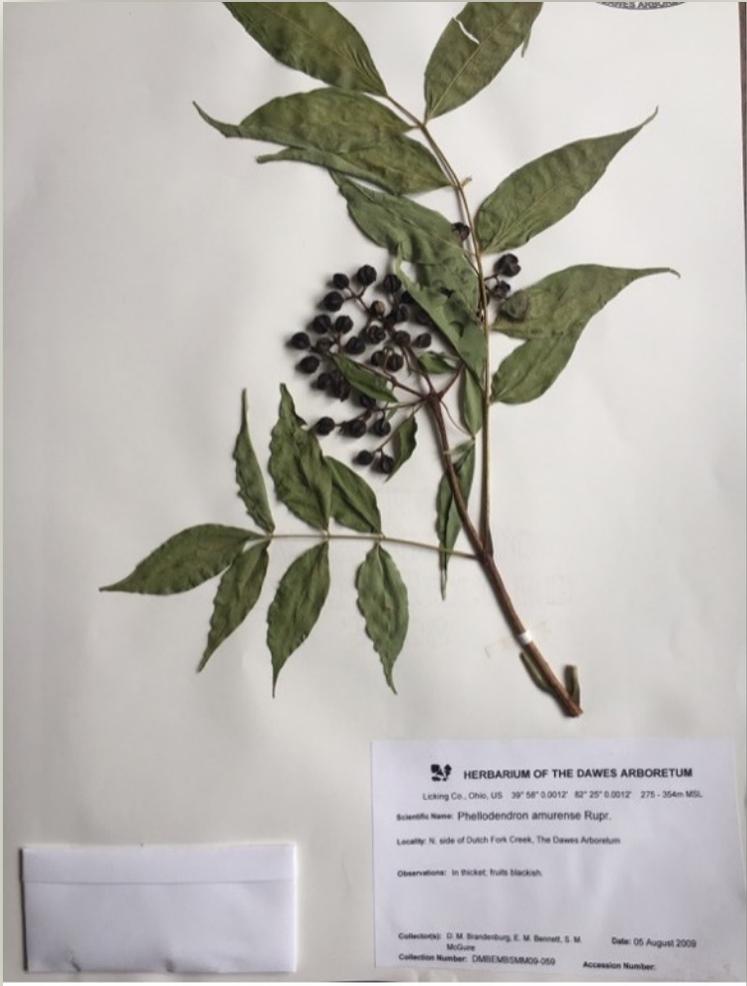
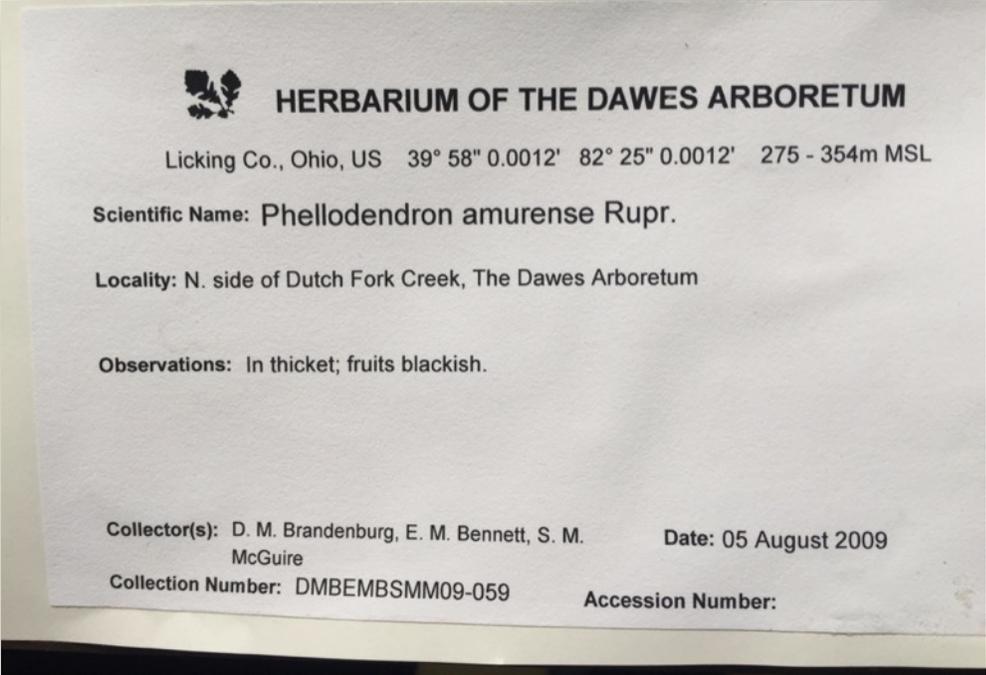
Botanical Gardens & Arboreta are Ideal for Tracking Invasives

- Curated living collections
- Staff with unique expertise
- Natural areas
- Staff on the ground constantly monitoring collection
- Accessions labeled, monitored over time
- Historical repository



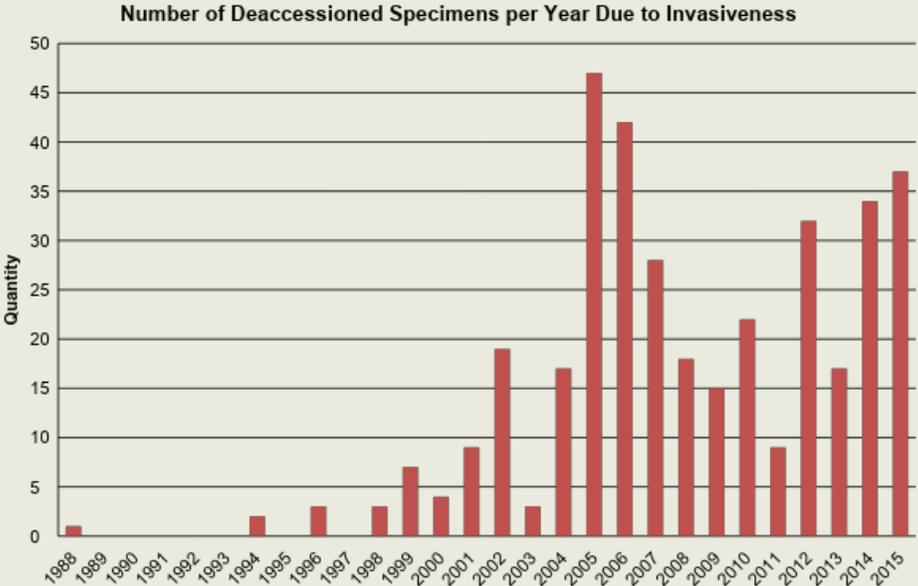
Botanical Gardens & Arboreta are Ideal for Tracking Invasives

Amur Corktree



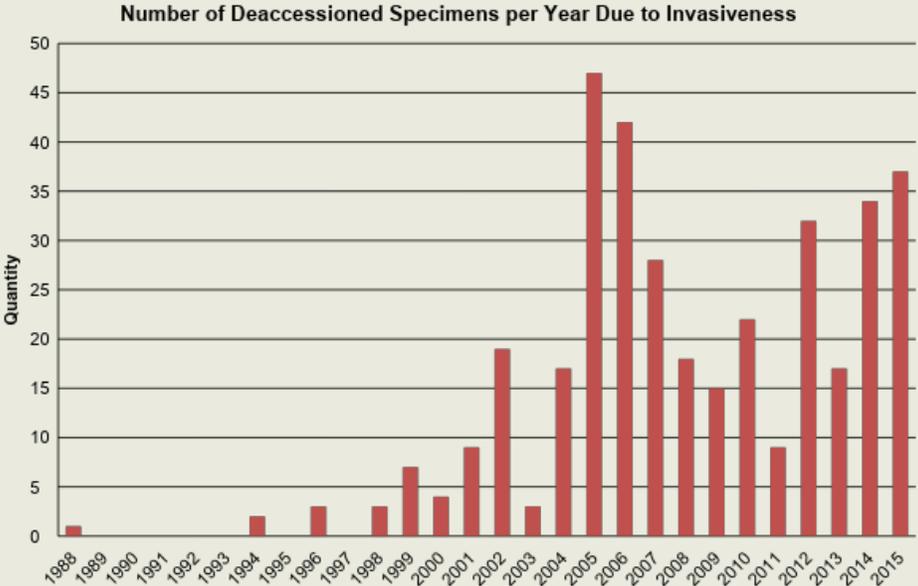
Many Gardens are Listing, Deaccessioning Problematic Taxa

2016 Survey:
65% of gardens actively remove non-native plant taxa that spread from their site of planting



Many Gardens are Listing, Deaccessioning Problematic Taxa

2016 Survey:
 65% of gardens actively remove non-native plant taxa that spread from their site of planting



The screenshot shows the homepage of The Columbus Dispatch. At the top, there are navigation links for 'Obituaries', 'E-Edition', 'DMG Rewards', 'Jobs', 'Cars', 'Homes', and 'Classifieds'. The main headline is 'The Columbus Dispatch' with a '\$5000 HOUZZ SHOPPING SPREE IN THE ULTIMATE HOME DECOR CONTEST' promotion. Below this, there are several news snippets, including 'Congress votes to reopen government, passes budget deal' and 'Michael Arace | Supporting cast is reset for LeBron James' stretch run'. A banner for 'OLYMPICS' is visible, along with a promotion for 'FAMILY VALUE' tickets. The main article is titled 'Dawes Arboretum snuffing out burning bush' and features a photo of a man using a chainsaw on a tree. A 'MOST POPULAR' sidebar lists several other articles.

An Early Invasive Detection Program for Botanical Gardens & Arboreta

Public Gardens as Sentinels against Invasive Plants



Creating:

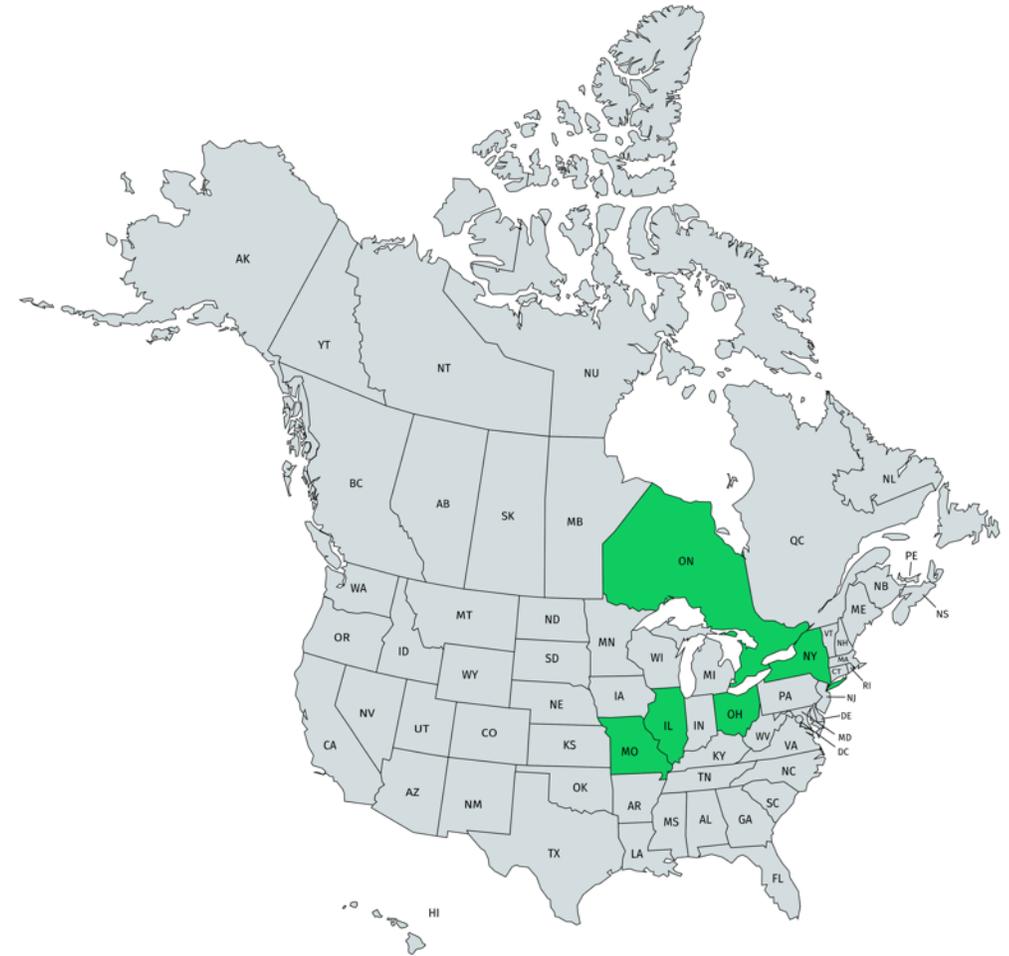
- 1) **Online platform** for gardens to share their information
- 2) **Set of guidelines** to help gardens develop their own standardized lists



Garden Survey – Proof of Concept

7 gardens participated by sharing their data:

- Provided lists of invasive, watch, and/or removed species or cultivars
- Based on historical & current collections
- Compared info to state listed taxa
(IL, IN, IA, WI, MN, MI, OH, MO, NY)



Garden Survey – Proof of Concept

- **736 species or cultivars reported within the 7 gardens as being problematic or escaping cultivation**

Ex. Garden A: 17,469 total taxa, of which 230 are problematic (1.3%)



Garden Survey – Proof of Concept

- **736 species or cultivars reported within the 7 gardens as being problematic or escaping cultivation**

Ex. Garden A: 17,469 total taxa, of which 230 are problematic (1.3%)

- **Some list only ornamentals, others include recognized invasives**
 - Often found in natural areas or spreading within the garden
 - Not always clear if species/cultivar originated in the collection
 - Gardens collect different data

Clearly need standardization!



All 7 Gardens: 7 problematic species

#

of 9 states listing



Euonymus alatus
(Burning Bush)

© C. Barton



Celastrus orbiculatus
(Oriental bittersweet)



Rhamnus cathartica
(Common buckthorn)



Acer platanoides
(Norway maple)



Frangula alnus
(Glossy buckthorn)



Lonicera maackii
(Amur honeysuckle)



Lonicera japonica
(Jap. honeysuckle)

None of
these on:



All 7 Gardens: 7 problematic species

of 9 states listing



Rhamnus cathartica
(Common buckthorn)



None of these on:



Frangula alnus
(Glossy buckthorn)

6 Gardens: 11 problematic species



Lonicera tatarica
(Tatarian honeysuckle)



Clematis terniflora
(Sweet autumn clematis)



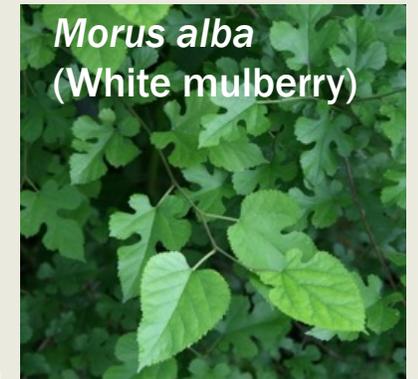
Ailanthus altissima
(Tree of heaven)



Acer ginnala
(Amur maple)



Berberis thunbergii
(Jap. barberry)



Morus alba
(White mulberry)



Hedera helix (English Ivy)



Rosa multiflora
(Multiflora rose)



Phellodendron amurense
(Amur cork tree)



Pyrus calleryana
(Callery pear)



Alnus glutinosa
(Black alder)

6 Gardens: 11 problematic species



Lonicera tatarica
(Tatarian honeysuckle)



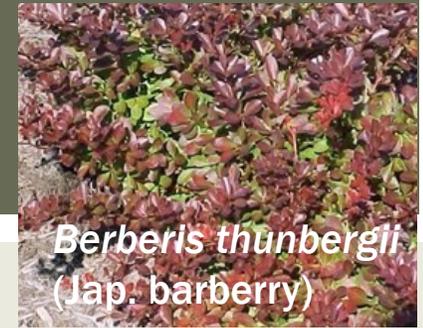
Clematis terniflora
(Sweet autumn clematis)



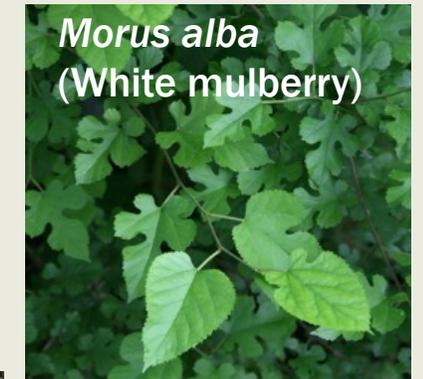
Ailanthus altissima
(Tree of heaven)



Acer ginnala
(Amur maple)



Berberis thunbergii
(Jap. barberry)



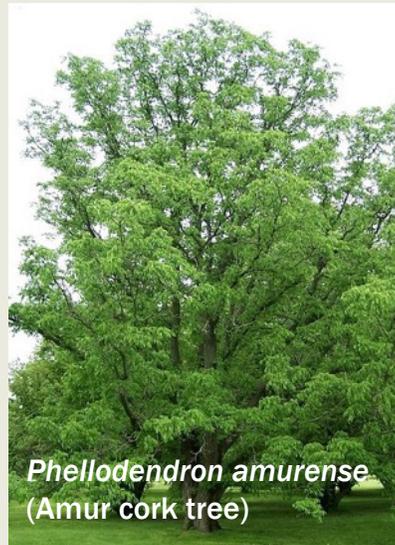
Morus alba
(White mulberry)



Hedera helix (English Ivy)



Rosa multiflora
(Multiflora rose)



Phellodendron amurense
(Amur cork tree)



Pyrus calleryana
(Callery pear)



Alnus glutinosa
(Black alder)

6 Gardens: 11 problematic species



Lonicera tatarica
(Tatarian honeysuckle)



Clematis terniflora
(Sweet autumn clematis)



Ailanthus altissima
(Tree of heaven)



Acer ginnala
(Amur maple)



Berberis thunbergii
(Jap. barberry)



Morus alba
(White mulberry)



Hedera helix (English Ivy)



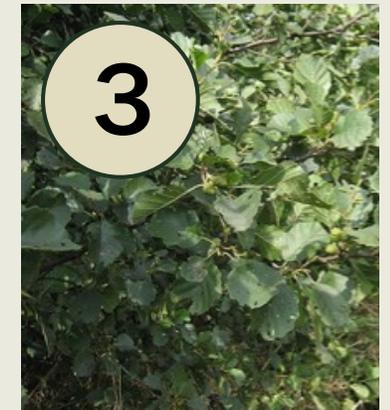
Rosa multiflora
(Multiflora rose)



Phellodendron amurense
(Amur cork tree)



Pyrus calleryana
(Callery pear)



Alnus glutinosa
(Black alder)

5 Gardens: 18 problematic species



Euonymus fortunei
(Wintercreeper)



Lythrum salicaria
(Purple loosestrife)



Iris pseudacorus
(Yellow flag)



Fallopia japonica
(Japanese knotweed)



Ligustrum vulgare
(Common privet)



Viburnum opulus
(Guelder-rose)



Wisteria sinensis
(Chinese wisteria)



Robinia pseudoacacia
(Black locust)

5 Gardens: 18 problematic species



Euonymus fortunei
(Wintercreeper)



Lythrum salicaria
(Purple loosestrife)



Iris pseudacorus
(Yellow flag)



Fallopia japonica
(Japanese knotweed)



Ligustrum vulgare
(Common privet)



Viburnum opulus
(Guelder-rose)



Wisteria sinensis
(Chinese wisteria)



Robinia pseudoacacia
(Black locust)

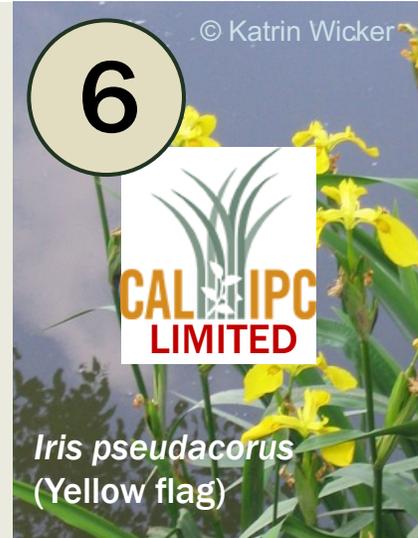
5 Gardens: 18 problematic species



Euonymus fortunei
(Wintercreeper)



Lythrum salicaria
(Purple loosestrife)



Iris pseudacorus
(Yellow flag)



Fallopia japonica
(Japanese knotweed)



Ligustrum vulgare
(Common privet)



Viburnum opulus
(Guelder-rose)



Wisteria sinensis
(Chinese wisteria)



Robinia pseudoacacia
(Black locust)

4 Gardens: 29 problematic species



Paulownia tomentosa
(Princess tree)



Miscanthus sinensis
(Maiden Grass)



Spiraea japonica
(Japanese spiraea)



Cirsium arvense, *C. vulgare*
(Canada & bull thistle)



Vinca minor
(Lesser periwinkle)

4 Gardens: 29 problematic species



Paulownia tomentosa
(Princess tree)



Miscanthus sinensis
(Maiden Grass)



Spiraea japonica
(Japanese spiraea)



Cirsium arvense, *C. vulgare*
(Canada & bull thistle)



Vinca minor
(Lesser periwinkle)

4 Gardens: 29 problematic species



Paulownia tomentosa
(Princess tree)

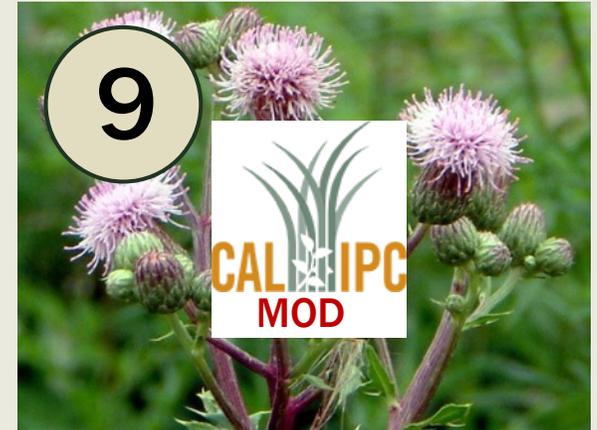


Miscanthus sinensis
(Maiden Grass)



Spiraea japonica
(Japanese spiraea)

Vinca minor
(Lesser periwinkle)



Cirsium arvense, C. vulgare
(Canada & bull thistle)



3 Gardens: 57 problematic species



Buddleja davidii
(Butterfly bush)



Heracleum mantegazzianum
(Giant hogweed)



Koelreuteria paniculata
(Goldenrain tree)



Myriophyllum spicatum
(Spike watermilfoil)



Cytisus scoparius
(Scotch broom)



Berberis vulgaris
(Common barberry)

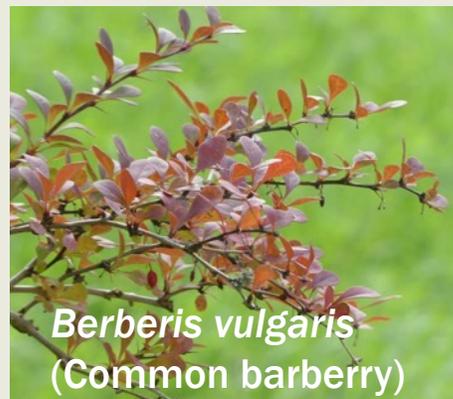


Elaeagnus angustifolia
(Russian olive)



Viburnum plicatum, *V. dilalatum*, *V. sieboldii*
(Snowball)

3 Gardens: 57 problematic species



3 Gardens: 57 problematic species



2 Gardens: 148 problematic species



Magnolia kobus
(Japanese magnolia)



Zelkova serrata
(Japanese zelkova)



Alternanthera philoxeroides
(Aligatorweed)



Eleutherococcus sieboldianus
(Five-leaved aralia)



Dipsacus laciniatus
(Cutleaf teasel)



Pennisetum alopecuroides
(Foxtail fountaingrass)

2 Gardens: 148 problematic species



Magnolia kobus
(Japanese magnolia)



Zelkova serrata
(Japanese zelkova)



Alternanthera philoxeroides
(Aligatorweed)



Dipsacus laciniatus
(Cutleaf teasel)



Eleutherococcus sieboldianus
(Five-leaved aralia)



Pennisetum alopecuroides
(Foxtail fountaingrass)

2 Gardens: 148 problematic species



Magnolia kobus
(Japanese magnolia)



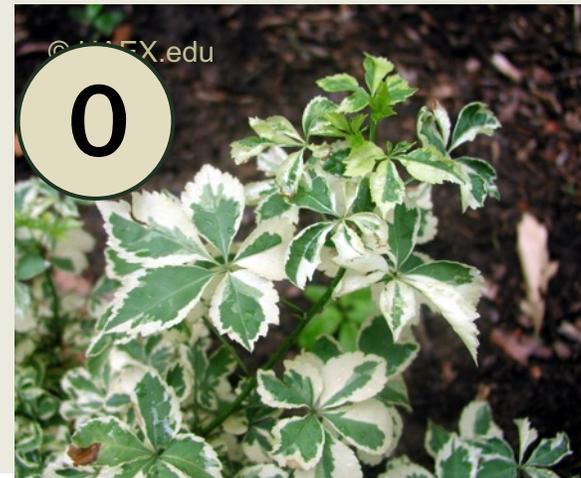
Zelkova serrata
(Japanese zelkova)



Alternanthera philoxeroides
(Aligatorweed)



Dipsacus laciniatus
(Cutleaf teasel)



Eleutherococcus sieboldianus
(Five-leaved aralia)



Pennisetum alopecuroides
(Foxtail fountaingrass)

Only 1 Garden: 504 problematic species



Malus floribunda
(Jap. Flowering crabapple)



Hibiscus syriacus
(Rose of Sharon)



Triadica sebiferum
(Chinese tallow tree)



Vinca major
(Large-leaved periwinkle)



Schinus terebinthifolius
(Brazilian peppertree)

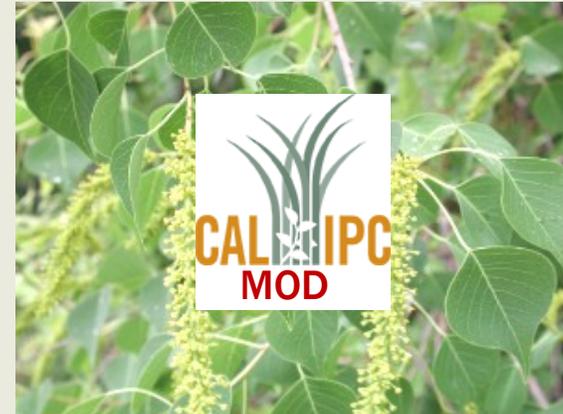
Only 1 Garden: 504 problematic species



Malus floribunda
(Jap. Flowering crabapple)



Hibiscus syriacus
(Rose of Sharon)



Triadica sebiferum
(Chinese tallow tree)

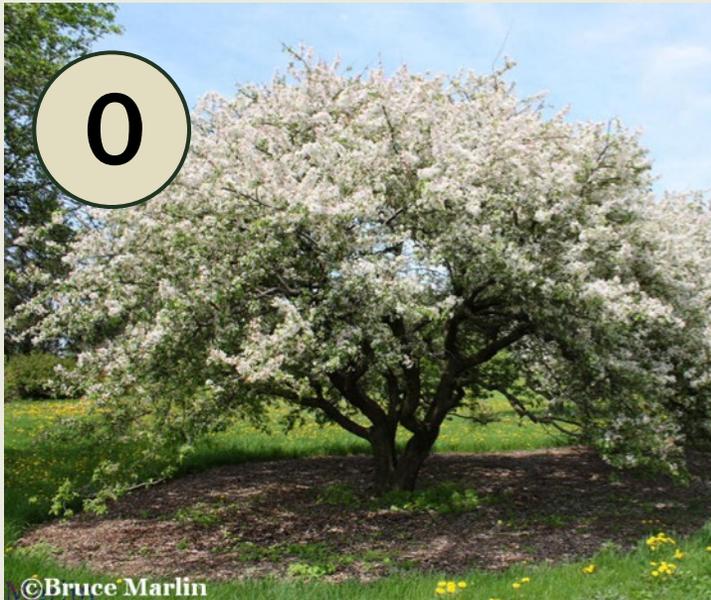


Vinca major
(Large-leaved periwinkle)



Schinus terebinthifolius
(Brazilian peppertree)

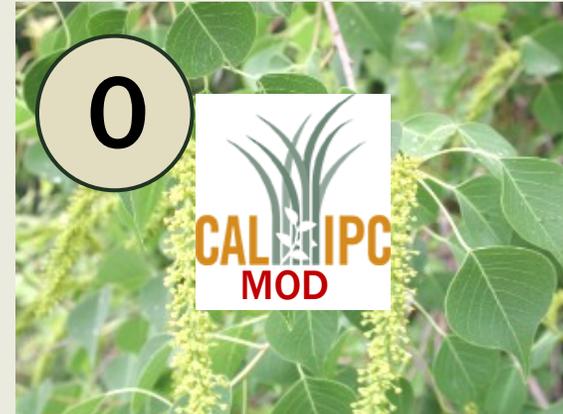
Only 1 Garden: 504 problematic species



Malus floribunda
(Jap. Flowering crabapple)



Hibiscus syriacus
(Rose of Sharon)



Triadica sebiferum
(Chinese tallow tree)



Vinca major
(Large-leaved periwinkle)



Schinus terebinthifolius
(Brazilian peppertree)

CONCLUSIONS

- **Most non-native, invasive species introduced intentionally, and most of those for ornamental purposes**

Woody - 89%

Herbaceous - 31%

Vines - 65%



Reichard: Woody - 82%



CONCLUSIONS

- **Most non-native, invasive species introduced intentionally, and most of those for ornamental purposes**

Woody - 89%

Herbaceous - 31%

Vines - 65%



Reichard: Woody - 82%

- **Public gardens can act as sentinels of plant invasion**

- Regionality is important
- Some taxa are already listed as invasive or noxious on state lists
- Other taxa have escaped detection until now
- Need to standardize data collection
- Information could be shared more widely

