Invasive Species and the Managed Landscape

January 20, 2017
Grow Green

Hans Landel, Ph.D.
Invasive Species Program Coordinator
Lady Bird Johnson Wildflower Center
TODAY

- General Concepts and Background
  - What Is an Invasive Species?
  - How Do Invasive Species Spread?
- Invasives and Horticulture
- Tools for Assessing Invasiveness of a Landscape Plant
- LBJ Wildflower Center Invasives Program
  - The Invaders of Texas Citizen Scientist Program
  - The Sentinel Pest Network
  - TIPPC
What Is an Invasive Species?

The Federal Definition

*a species that is non-native (or alien) to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.*

(Executive Order 13112, 1999)
What Is an Invasive Species?
Are All Non-native Species Invasive?

Not All Exotics Are Invasive
  – 98% U.S. agricultural crops are non-native
  – **Remember:** *Must Cause Harm*

How Exotics Become Invasive
  – Become *naturalized*
  – Spread (more on this later)
  
  “How” Example: Ornamental Plants

---


What Is an Invasive Species?

Other terms:

- Non-native
- Exotic
- Introduced
- ALIEN
- "Weed"
Why Do We Battle Invasive Species?

Recall

Invasive species → HARM

Environment
Recreation/Social
Human Health
Animal Health
Economy
Invasive Species: Harm
Environmental

- **Genetic & Individual Impacts:**
  - Hybridize with native species
  - Changes in morphology
  - Changes in behavior

- **Population Impacts:**
  - Competition
  - Predation
  - Nutrition
  - Physical
  - Diseases

- **Community Impacts:**
  - Species composition
  - Lower biodiversity
  - Species interactions
  - Extinction

- **Impacts on Ecosystem Function:**
  - Fire regimes
  - Soil health
  - Hydrology
  - Erosion
  - Aquatic nutrients
Invasive Species: Harm

**Economic**
- Invasives management and control
- Damage repair
- Maintenance costs
- Agricultural, fisheries, forest losses
- Tourism losses
- Losses in ecosystem functions

**Human Health**
- Allergies
- Injury/disease
- Pesticide and herbicide application

**Social/Recreational**
- Sport fishing & boating
- Aesthetics & Outdoor activities

---

2USFS

4http://el.erdc.usace.army.mil/zebra/zmis/zmishelp/impacts_on_federal_state_and_municipal_facilities.htm
Monthly iWire Invasive Species Email Newsletter.

Hello Zebra Mussels. Goodbye Texas Boating.

Hello Bastard Cabbage. Goodbye Bluebonnets.

Hello Giant Salvinia. Goodbye Texas Lakes.
Emerald Ash Borer Damage

(Ohio)

June 2006
Credit: D. Herms

August 2009
Credit: D. Herms

http://www.americanforests.org/magazine/article/will-we-kiss-our-ash-goodbye/
Chinese Privet
(Ligustrum sinense)

- Competes for pollinators
- Replaces natives
- Competes for seed dispersers
- Changes soil chemistry and nutrient cycling
- Negative impacts on mycorrhizal fungi community
- Soil arthropod community
- Impacts on stream communities
Why Do We Battle Invasive Species?

Recall

Invasive species

HARM
SPREAD

Increase in population size
How Invasive Species Spread

• **Natural Dispersal**
  - Production of offspring
    - Wind- or water-borne seeds or larvae
    - Animal-borne seeds or larvae
  - Movement of adults
    - Swim, fly, walk/run, etc.
  - But.... can’t always explain expansion

1 National Health Museum, 2009  2 Alan Vernon, Fliker
How Invasive Species Spread

- **Natural Dispersal**
  - Production of offspring
    - Wind- or water-borne seeds or larvae
    - Animal-borne seeds or larvae
  - Movement of adults
    - Swim, fly, walk/run
  - Can’t always explain expansion

- **With Human Assistance**
How Invasive Species Spread

With Human Assistance

- **Accidental**
  - Produce
  - Nursery stocks
  - Ship ballasts
  - Packing materials & shipping containers
  - Recreational travelers
  - Hay
  - Flowers
  - Mowing practices
  - Vehicles
  - Firewood
  - Boots and gear

1 XXXXXXXXXXXXX 2 XXXXXXXX 3 Aelwyn Fliker 2007
How Invasive Species Spread

With Human Assistance

• Purposeful
  – Ornamental planting
  – Erosion control
  – Wildlife value
  – Agriculture/Sport
  – Pets/Aquariums
  – Biological Controls

1Aelwyn Fliker 2007  2http://io9.com/5833022/10-of-the-worlds-worst-invasive-species
Characteristics of a Useful Landscape Plant

- Easy to propagate
  - Lots of seeds
  - Good seed viability
  - High germination success
  - Asexual propagation
  - Grows fast
- Easy to Grow and Care For
  - Hardy
  - Grows fast
  - Few/no pests, diseases
  - Habitat generalist
  - Water-wise
- Beauty/Interest
  - Good color
  - Bright berries
Routes of Introduction of Invasive Plants

**Pathways into CA**

- **Horticultural/ornamental**: 37%
- **Seed/other contaminant**: 48%
- **Dye, medicinal, forage**: 13%
- **Aquarium trade**: 2%

Bell 2007
Invasive Species: Contradictions
Invasive Species: Contradictions

Georgia Wildlife Federation
Invasive Species: Contradictions

Keep Austin Beautiful
HELLO INVASIVE SPECIES.
GOODBYE TEXAS.

Tools
How to Stop Species from Spreading?

Prevent Transport

- **WE** aid the spread of invasives
- **WE** can help prevent the spread of invasives
  - Clean, Drain, Dry
  - Don’t Move Firewood
  - Remove seeds from boots, clothes
  - Plant Natives
Texasinvasives.org

- A partnership between the Texas Forest Service, USDA-APHIS, Texas Parks and Wildlife Department, and others.
- Designed to present a coordinated approach to address invasive species throughout Texas.

Goals
- **Facilitate communication** among the state's invasive species stakeholders
- **Implement a coordinated response** to address invasive species issues on a statewide level
- Provide a venue for **sharing information** about key invasive strategies
- Create **public awareness** of the problems posed by invasive species in Texas
Invasives Database

- Illustrated Descriptions
- Ecological Information
- Distribution & Habitat
- Biology & Spread
- History of Introduction
- Ecological Threats
- Control & Management
- Native Look-a-likes
- Native Alternatives
- References
Horticultural Code of Practice

All Users
• Dispose of plant waste responsibly
• Know exactly what you are growing and buying
• Take advice on the best control techniques
• Control invasive non-native plants safely
• Be aware of relevant legislation

Suppliers and retailers
• Know what you are supplying or selling; label plants clearly and accurately
• Provide substitutes for invasive plants
• Provide advice on disposal

Buyers and Importers
• Beware of hitch-hiking pests on plants and in soil

Department for Environment, Food and Rural Affairs (UK)
2011
Weed Risk Assessment

Assessments of a plant's potential to be invasive

- USDA-APHIS

- States
  - Texas
Weed Risk Assessment for *Ligustrum sinense* Lour. (Oleaceae) – Chinese privet

Infestation of *L. sinense* (source: John D. Byrd, Mississippi State University, Bugwood.org).

Agency Contact:

Plant Epidemiology and Risk Analysis Laboratory
Center for Plant Health Science and Technology

Plant Protection and Quarantine
Animal and Plant Health Inspection Service
United States Department of Agriculture
1730 Varsity Drive, Suite 300
Raleigh, NC 27606

---

Figure 2. *Ligustrum sinense* risk score (black box) relative to the risk scores of species used to develop and validate the PPQ WRA model (other symbols). See Appendix A for the complete assessment.

Figure 3. Monte Carlo simulation results (N=5,000) for uncertainty around the risk scores for *Ligustrum sinense*.

*The blue “+” symbol represents the medians of the simulated outcomes. The smallest box contains 50 percent of the outcomes, the second 95 percent, and the largest 99 percent.*
PROFESSIONALS

WELCOME PROFESSIONALS
TIPPC
STATE CONFERENCE
ABSTRACT DATABASE
CONTROL & MANAGEMENT
INVASIVE PLANT INVENTORY
CWMAS & CISMAS

PROFESSIONALS

In this section we provide information for stakeholders who have a professional interest in invasive species in Texas. It contains information about the Texas Invasive Plant & Pest Council (TIPPC), the statewide Invasive Species Conference, abstracts from past conferences and Species Assessments.

WHO ARE THE PROFESSIONALS?

Land management specialists from local, state, and federal agencies, including municipal, regional, state and federal parks.

Environmental organizations such as The Nature Conservancy, Native Plant Society, Audubon, Land Conservancies, Land Trusts, etc.
Noxious Weeds Program Risk Assessments

Last Modified: Dec 9, 2016

PPQ conducts weed risk assessments (WRA) as part of its process for safeguarding U.S. agriculture and natural resources from weeds and invasive plants. A weed risk assessment is a science-based evaluation of the potential of a plant species to establish, spread, and cause harm in the United States. PPQ may initiate an assessment for any number of reasons, including: evaluation of commodity import requests, detection of a new weed in the United States, and petitions for listing from stakeholders.

Below is a list of the available WRAs that PPQ has conducted. They are provided for interested stakeholders and may be useful in setting local policies or for informing resource managers. While most of the risk assessments were prepared by PPQ using our current weed risk assessment process [see Guidelines document below], others
### Invasives Where You Live

**Which plants are invasive in your area of California? Find out here**

<table>
<thead>
<tr>
<th>State</th>
<th>Invasive Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>List of invasive species</td>
</tr>
</tbody>
</table>

### Retail Nursery Partners

**California Retail Nurseries: Join us today!**

<table>
<thead>
<tr>
<th>Nursery Name</th>
<th>Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example Nursery</td>
<td>Address, Phone, Email</td>
</tr>
</tbody>
</table>

### Invasives 101

**Get the facts on invasive plants**

- Continuing Education:
  - Impacts
  - Research
  - Spread the word

Or, find a PlantRight Partner near you

© 2007–2011 California Horticultural Invasives Prevention (Cal-HIP)
Non-native invasive species are organisms that have been introduced by humans either purposely or by accident and that have become serious environmental pests. One reason for their success as pests is that they are typically introduced without the array of associated natural controls (herbivores, parasites, pathogens, predators) that occur in their native range. In addition to the great loss of biodiversity, habitat degradation and other ecological consequences, invasive species cause huge economic damages valued in billions of dollars annually and some pose a human health threat.

Invasive alien plants threaten native species and habitats by competing for critical and often limited resources like sunlight, water, nutrients, soil and space. They succeed through vigorous growth, prolific reproductive capabilities and by causing changes that favor their growth and spread. Invasive plant species displace and alter native plant communities, impede forest regeneration and natural succession, change soil chemistry, alter hydrologic conditions, alter fire regimes, cause genetic changes in native plant relatives through hybridization and some serve as agents for the transmission of harmful plant pathogens.

The Invasive Plant Atlas of the United States is a collaborative project between the National Park Service, the University of Georgia Center for Invasive Species and Ecosystem Health, the Invasive Plant Atlas of New England and the Lady Bird Johnson Wildflower Center. The purpose of the Atlas is to assist users with identification, early detection, prevention, and management of invasive plants. The focus is on non-native invasive plant species impacting natural areas, excluding agricultural and other highly developed and managed lands. Four main components are species information, images, distribution maps, and early detection reporting procedures. The Invasive Plant Atlas is one step in the effort to combat invasive species, preserve our natural landscapes and the native plants, animals, and other creatures that inhabit them.
Texas Parks and Wildlife Prohibited Aquatic & Exotic Species

<table>
<thead>
<tr>
<th>Botanical Name - Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salvinia sp. - salvinia</td>
</tr>
<tr>
<td>Panicum repens - torpedograss</td>
</tr>
<tr>
<td>Eichhornia crassipes and azurea - floating and rooted</td>
</tr>
<tr>
<td>Waterhyacinths</td>
</tr>
<tr>
<td>Pistia stratiotes - waterlettuce</td>
</tr>
<tr>
<td>Ipomoea aquatica - water spinach</td>
</tr>
<tr>
<td>Solanum tampicense - wetland nightshade</td>
</tr>
</tbody>
</table>

**TITLE 31. NATURAL RESOURCES AND CONSERVATION. Part 2. TEXAS PARKS AND WILDLIFE DEPARTMENT. Chapter 57. FISHERIES.**

**SUBCHAPTER A. HARMFUL OR POTENTIALLY HARMFUL FISH, SHELLFISH, AND AQUATIC PLANTS**

§57.111. Definitions.

N= 19 species

*Botanical Name - Common Name*

Alternanthera philoxeroides - alligatorweed
Limnophila sessiflora - ambulia
Schinus terebinthifolius - Brazilian peppertree
Ottelia alismoides - duck-lettuce
Landolitia punctata - giant or dotted duckweed
Myriophyllum spicatum - Eurasian watermilfoil
Sparganium erectum - exotic bur-reed
Monochoria vaginalis - heartshaped false pickerelweed
Hydrilla verticillata - hydrilla
Lagarosiphon major - lagarosiphon
Monochoria hastata - narrowleaf false pickerelweed
Melaleuca quinquenervia - paperbark
Lythrum salicaria - purple loosestrife
<table>
<thead>
<tr>
<th>Botanical Name</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rottboellia cochinchinensis</td>
<td>itchgrass</td>
</tr>
<tr>
<td>Cuscuta japonica</td>
<td>Japanese dodder</td>
</tr>
<tr>
<td>Pueraria montana var. lobata</td>
<td>kudzu</td>
</tr>
<tr>
<td>Lagarosiphon major</td>
<td>lagarosiphon</td>
</tr>
<tr>
<td>Melaleuca quinquenervia</td>
<td>paperbark</td>
</tr>
<tr>
<td>Lythrum salicaria</td>
<td>purple loosestrife</td>
</tr>
<tr>
<td>Eichhornia azurea</td>
<td>rooted waterhyacinth</td>
</tr>
<tr>
<td>Tamarix spp.</td>
<td>salt cedar</td>
</tr>
<tr>
<td>Salvinia spp.</td>
<td>salvinia</td>
</tr>
<tr>
<td>Nassella trichotoma</td>
<td>serrated tussock</td>
</tr>
<tr>
<td>Panicum repens</td>
<td>torpedo grass</td>
</tr>
<tr>
<td>Solanum viarum</td>
<td>tropical soda apple</td>
</tr>
<tr>
<td>Ipomoea aquatica</td>
<td>water spinach</td>
</tr>
<tr>
<td>Cryptocoryne beckettii</td>
<td>water trumpet</td>
</tr>
<tr>
<td>Eichhornia crassipes</td>
<td>waterhyacinth</td>
</tr>
<tr>
<td>Pistia stratiotes</td>
<td>water lettuce</td>
</tr>
<tr>
<td>CHINABERRY</td>
<td>Melia azedarach</td>
</tr>
<tr>
<td>JAPANESE CLIMBING FERN</td>
<td>Lygodium japonicum</td>
</tr>
</tbody>
</table>
City of Austin Top 25 Invasive Plant Species

- **Herbaceous**
  - Giant reed
  - King Ranch Bluestem
  - Malta star-thistle
  - Bermudagrass
  - Japanese netvein hollyfern
  - Golden bamboo
  - Bastard cabbage
  - Johnsongrass

- **Vines**
  - Japanese honeysuckle
  - Catclawvine
  - Kudzu

- **Woody**
  - Tree of heaven
  - Paper mulberry
  - Chinese parasoltree
  - Glossy privet
  - **Chinaberry tree**
  - Heavenly (sacred) bamboo
  - Chinese pistache
  - Scarlet firethorn
  - **Salt cedar**
  - **Chinese tallow tree**

- **Aquatic**
  - Elephant ears
  - **Common water hyacinth**
  - **Hydrilla**

*TPWD Prohibited Aquatic & Exotic species

TDA Noxious Plant List (§19.300) species
Invasives Database

- Illustrated Descriptions
- Ecological Information
- Distribution & Habitat
- Biology & Spread
- History of Introduction
- Ecological Threats
- Control & Management
- Native Look-a-likes
- Native Alternatives
- References
Texasinvasives.org

**NANDINA DOMESTICA**

**HEAVENLY BAMBOO**

*Synonym:* Nandina domestica

*Family:* Berberidaceae

*Description:* Evergreen shrub in the barberry family (Berberidaceae) that grows to a height of 6-10 feet and width of 3 to 6 feet. Other names include dwarf nandina or Chinese nandina. The plant has multiple branches like stems that resemble bamboo. The alternate leaves are elliptical and compound, alternating in pairs, pointed, oval leaves. Young foliage is golden yellow, and turns to soft light green in winter. Early summer terminal clusters of bright white to pink flowers. Each flower is 1/4 to 1/2 inch across, appearing in June, with 6 to 10 inch clusters at the end of the branches. Fruits are grouped, shiny red spherical berries. 1/2 inch in diameter, follow the flowers in fall and winter. Single plant seldom fruit heavily.

*Ecological Threat:* Nandina has renovated and invasive habits. It relies on spreading underground root sprouts and by aerial-dropped seeds. It can spread slowly. Plant species and disrupt plant communities. Berries are toxic to cats and some grazing animals.

**Resembles/Alternatives:**
- *Laurophyllum heterops (Texas baymount bush)*
- *Makosa platia (wild oleanders)*
- *Gevia gossyp (autumn sage)*
- *Pflanzengeschicht (pochtidiatus)*

**Management:**

- **Manual:** It is difficult to remove manually because even the smallest piece of root will re-sprout.
- **Chemical:** It can be effectively controlled using any of several readily available general use herbicides such as glyphosate or triclopyr. For tall plants, cut stems then apply herbicide. Collect and destroy fruit.

Repeat applications may be necessary to reduce densities. Follow label and state requirements.

Managers should evaluate the specific circumstances of each infestation, seek professional advice and guidance if necessary, and use the herbicide in a manner that is consistent with the product label and.
Emerald Ash Borer

*Agrilus planipennis*

Order: Coleoptera (Beetle)

Family: Buprestidae (Metallic wood boring beetle)
Emerald Ash Borer
Introduction and Distribution

Native Range: Eastern Russia, Northern China, Japan and Korea
Primary Transmission: Wood material shipping, firewood, infested nursery stock
First Detection: Michigan 2002
Emerald Ash Borer
Biology: Host Trees

- Attacks Ash trees (*Fraxinus* sp.)
  - 17 species of ash in North America
  - 9 ash species in Texas
    - Green Ash
    - Texas Ash
    - White Ash

[Images of green, white, and autumn-colored trees]
Emerald Ash Borer
Damages

- Urban forests
  - 1/3 of urban trees nationally are susceptible
  - Compensatory value $669 billion.

- Agricultural
  - Timber industry
  - Maple syrup
  - Nursery production

- Recreational tourism
Emerald Ash Borer
Biology: Life Cycle

Biology: Life Cycle
Egg → Larva → Pupa → Adult
Emerald Ash Borer
Biology: Life Cycle

Larvae:
- Creamy-white
- Flattened, 10 bell-shaped segments
- Small appendages at end of body
Emerald Ash Borer
Biology: Life Cycle

Adult:
- Bright, metallic green
- ½” long, flattened back
- Surface of abdomen, coppery-red
Emerald Ash Borer
Signs and Symptoms

- Canopy die-back
- D-shaped exit holes
- Epicormic shoots (sprouts from roots and trunk with abnormally large leaves)
- Vertically split bark over s-shaped feeding galleries
- Increased woodpecker activities
Emerald Ash Borer
Signs and Symptoms

• Canopy die-back
• D-shaped exit holes
• Epicormic shoots (sprouts from roots and trunk with abnormally large leaves)
• Vertically split bark over s-shaped feeding galleries
• Increased woodpecker activities
Emerald Ash Borer
Signs and Symptoms

- Canopy die-back
- D-shaped exit holes
- Epicormic shoots (sprouts from roots and trunk with abnormally large leaves)
- Vertically split bark over s-shaped feeding galleries
- Increased woodpecker activities
Emerald Ash Borer
Signs and Symptoms

- Canopy die-back
- D-shaped exit holes
- Epicormic shoots (sprouts from roots and trunk with abnormally large leaves)
- Vertically split bark over s-shaped feeding galleries
- Increased woodpecker activities
Take Action!

The Sentinel Pest Network
Sentinel Pest Network
Training Citizen Scientists to Detect & Report Invasive Pests

- Trains citizens to identify and report pests that threaten the natural biodiversity of the state.
- **Participants will:**
  - Lean to identify symptoms
  - Work with state and federal agency partners to report detections
  - Educate and engage other citizen scientists in early detection and monitoring
  - Participate in outreach campaigns to disseminate information to the public
Sentinel Pest Network:
Background

Serves as a **sentinel network**
- increase the probability of **early detection** of pests of high regulatory significance

**What are “pests of high regulatory significance”?**
- From the APHIS PPQ (Plant Protection and Quarantine):
  - plant pests that can create an economic impact on the nation’s natural resources and agriculture
## The “Dirty Dozen” Pest List

<table>
<thead>
<tr>
<th>COMMON NAME</th>
<th>SCIENTIFIC NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian Longhorned Beetle</td>
<td><em>Anoplophora glabripennis</em></td>
</tr>
<tr>
<td>Brown Fir Longhorned Beetle</td>
<td><em>Callidiellum villosulum</em></td>
</tr>
<tr>
<td>Cactus Moth</td>
<td><em>Cactoblastis cactorum</em></td>
</tr>
<tr>
<td>Emerald Ash Borer</td>
<td><em>Agrilus planipennis</em></td>
</tr>
<tr>
<td>Gypsy Moth</td>
<td><em>Lymantria dispar</em></td>
</tr>
<tr>
<td>Sirex Woodwasp</td>
<td><em>Sirex noctilio</em></td>
</tr>
<tr>
<td>Cogongrass</td>
<td><em>Imperata cylindrica</em></td>
</tr>
<tr>
<td>Giant Hogweed</td>
<td><em>Heracleum mantegazzianum</em></td>
</tr>
<tr>
<td>Onionweed</td>
<td><em>Asphodelus fistulosus</em></td>
</tr>
<tr>
<td>Tropical Soda Apple</td>
<td><em>Solanum viarum</em></td>
</tr>
<tr>
<td>Tropical Spiderwort</td>
<td><em>Commelina benghalensis</em></td>
</tr>
<tr>
<td>Giant African Land Snail</td>
<td><em>Lissachatina fulica</em></td>
</tr>
</tbody>
</table>
Report It!
Early Detection and Rapid Response (EDRR)

Report online on Texasinvasives.org

Does not require an Invaders of Texas Citizen Scientist login account!
Texas Invaders phone app

Reporting a Species for the Sentinel Pest Network

 DOES NOT REQUIRE LOGIN! 

SPECIES
ALL SPECIES
BY CATEGORY
REPORT IT
UPLOAD
LOGIN
MORE OPTIONS
Take Action!

The Invaders of Texas Citizen Scientist Program
The more trained eyes watching for invasive species, the better our chances of lessening or avoiding damage to our native landscape.
Invaders of Texas
Detect and Report Invasive Species

- Innovative campaign whereby volunteer "citizen scientists" are trained to detect and report invasive species in their communities.
- 11-years
- Texas-wide
- Data collected systematically and reported nationally.
- Data available to the public, and to local, state, and federal resource managers to facilitate their management efforts.
Invaders of Texas Data

Data Collection

REQUIRES LOGIN!
“Texas Invaders” phone app

Submitting observations

REQUIRES LOGIN!
Invaders of Texas Data

Contribution – Data Mapping

Interactive and searchable by Species or Satellite and linked to individual records.

SPECIES OBSERVATION #13431

**Arundo donax** - Giant reed

**SPECIES DATA**
- USDA Code: AR004
- Patch Type: Polygon
- Abundance: Common
- Disturbance: Other

**COLLECTION DATA**
- Collector: Michael Murphy
- Satellite: Pineywoods Invaders
- Date: 2011-01-29
- Time: 8:06 minutes
- Location Error: 

**VALIDATION**
- Validated: Yes

**Collection Notes:** Scattered Patches all the way around the Lake Brown Rosacal Lake, East of University Blvd, on the Univ. of Texas-Brownsville Campus. Mainly south of the Education and Business Departments.

BECOME A CITIZEN SCIENTIST

MAP INVASIVES
- Map Satellites

826 Observations Found

View site record #13431
- Michael Murphy
- Pineywoods Invaders
- Species: Arundo donax
- Validated: Yes
The iWire monthly email newsletter

• Important updates
• Invasive species spotlights
• News from TX and beyond
• Citizen Scientist of the Month (person, group or project)
• Workshop Schedules
HELLO INVASIVE SPECIES.
GOODBYE TEXAS.
**Invasive Species** are a **Cause for Concern** because:

- Introduced species cause economic, environmental, or human health damages
- Spreading widely and quickly

**Many Invasive Plants Originated from Horticulture**

- Several are still being sold

**Control the spread:**

- Plant with native species
- Know your species

**Keep an eye out for important pests**
Thank you!

Hans Landel, Ph.D.
Invasive Species Coordinator
Lady Bird Johnson Wildflower Center
(512) 232-0107
hlandel@wildflower.org