

Identification and Management of Invasive Plants

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Outline

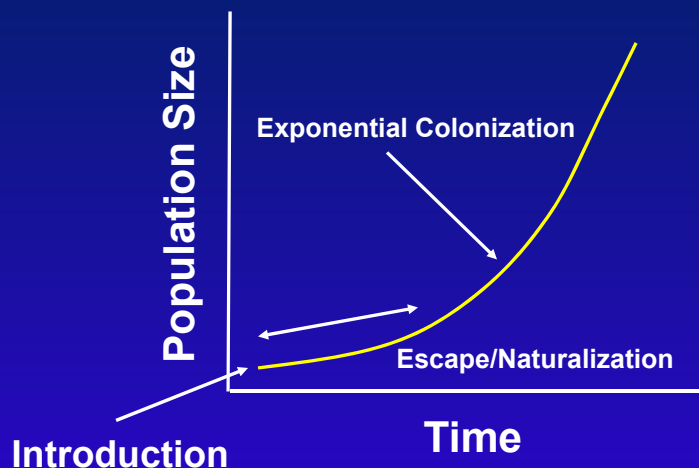
- Native vs. Exotic vs. Invasive
- How Does a Plant Become Invasive?
- Characteristics of Invasive Plants
- Effects on Ecosystems
- Hurricanes and Invasive Plants
- Vulnerable Areas
- ID and Management



Native, Exotic, and Invasive

- Native-Organism found in a given ecosystem or region-native organisms can be pests or unwanted
- Exotic-Organism not naturally found in a specific ecosystem or region-but may not cause ecological or economic harm
- Invasive-Species not native to a region or ecosystem
 - Escaped and naturalized from introduced population
 - Causes or has the potential to cause economic, environmental, or ecological damage

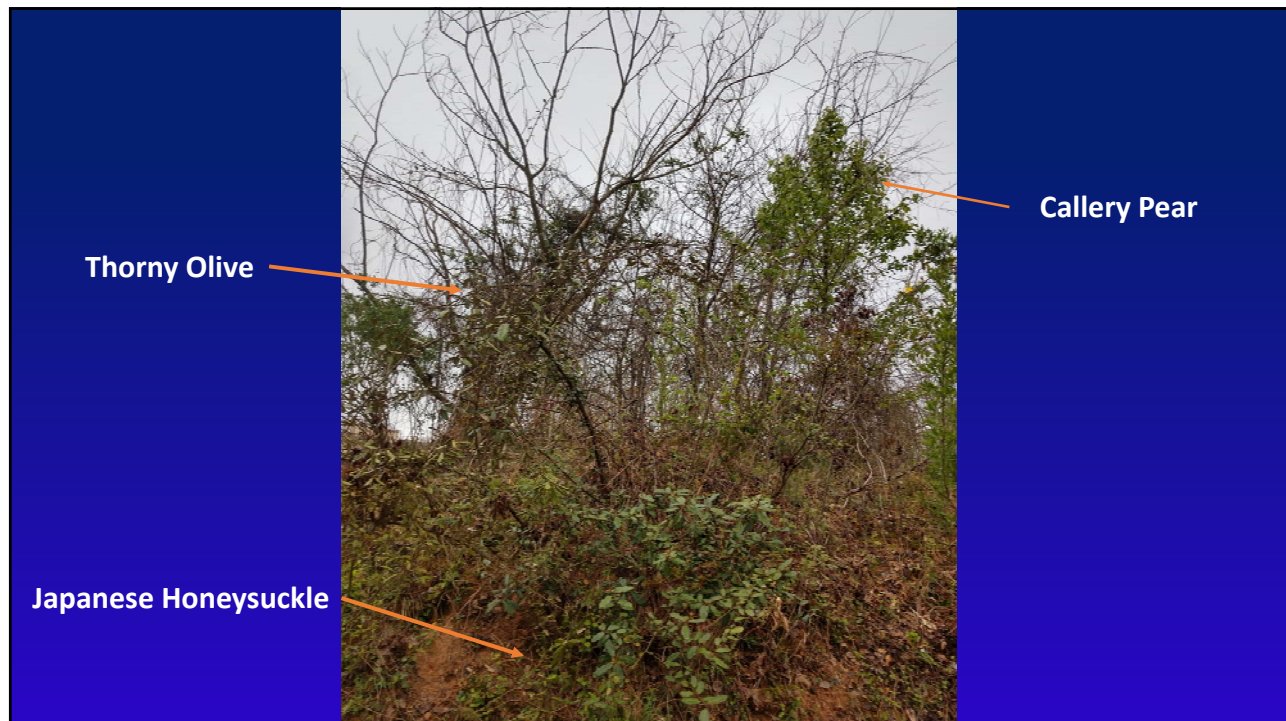
How Does a Plant Become Invasive?



**Lag Phase-Spread
and Colonization
takes time after
establishment**

Characteristics of Invasive Plants

- Habitat and soil generalist
- Can quickly colonize an area through multiple reproductive means—seed, stump sprouts, root sprouts, and rhizomes
- Lack of competitors, predators, and pathogens
- Fast maturation
- Great fecundity—wind or animal dispersed seed
- Pioneer species on disturbed sites and/or very shade tolerant
- Multiple species can establish on a site at once



Effects on Ecosystems

Ecosystem-level effects

- Altered geomorphological processes
 - Erosion rate
 - Sedimentation rate
 - Elevation
 - Water channels
- Altered hydrological cycling
 - Water-holding capacity
 - Water-table depth
 - Surface-flow patterns
- Altered biogeochemical cycling
 - Nutrient mineralization rate
 - Nutrient immobilization rate
 - Soil or water chemistry
- Altered disturbance regime
 - Type
 - Frequency
 - Intensity
 - Duration

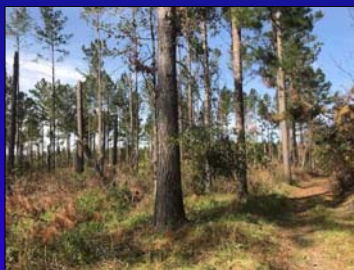
Community/population-level effects

- Altered stand structure
 - New life form
 - Vertical structure
- Altered recruitment of natives
 - Allelopathy
 - Microclimate shift
 - Physical barrier
- Altered resource competition
 - Light absorption
 - Water uptake
 - Nutrient uptake
 - Space preemption

Adapted from
Gordon (1998)

Hurricanes and Invasive Plant Spread

- Plants disperse due to flooding
 - Seed and plant parts-vegetative growth
- AND wind disturbance
 - Greater sunlight in once forested areas and disturbed soil due to root heaving
- No flooding with Michael—focus on wind effects



Hurricanes and Invasive Plant Spread

- Previous closed canopy forests at high risk for invasive plant colonization following storm windthrow—GREATER RESOURCES
 - Increased light levels, less water competition
 - Possibility for increased bare mineral soil exposure (pits and mounds from uprooted stems)—good seed germination conditions
 - Most invasive plants set seed in the fall
 - Disturbed forest patches increase in size with greater severity storms
 - Forests with a minor invasive plant infestation pre-storm may have severe infestations post-storm

Hurricanes and Invasive Plant Spread

- Plant spread from adjacent areas to new areas or introduction of invasive plants to a new locale from distant countries following hurricanes has been documented

Invasive Plant	Spread Notes	New infestation Location	Source
Common Reed	Hurricane-force winds highly correlated with increased rate of spread over three decades	Wetlands along the Atlantic and Gulf Coasts	Bhattarai and Cronin (2014)
Japanese honeysuckle; tufted knotweed	Hurricane wind damage resulted in nearly 48% increase in percent cover in damaged stands	Maryland	Snitzer et al. (2005)
Cogongrass	Invasions more likely in hurricane paths than outside them	Florida Panhandle	Holzmueller and Jose (2012)

Vulnerable Areas

- Agricultural Fields
- Road right-of-ways
- Forest edges and openings
- Utility corridors
- Recently harvested or disturbed sites
- **BUT** closed canopy forests can still be invaded



Preventative and Control Methods

- Learn how to ID invasive plants
- Monitor thoroughfares and high traffic (disturbed) areas regularly
- Check storm or fire damaged stands
- Best Management Practices (BMPs)
- Clean and sanitize equipment prior to moving between sites and clean in one central site
- Work from uninfested to infested areas



Chemical Control Methods

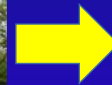
- Most invasive plants are perennials with extensive roots, tubers, or rhizomes
- Proper and effective herbicide control offers the best means of containment or eradication because herbicides can kill roots without disturbing soil (Miller et al. 2013)
 - Other methods may be suitable for improving the efficacy of chemical treatments
 - E.g.-Burning kudzu during winter to make herbicide applications easier
 - Possible consequences—desirable vegetation damage

Chemical Control Methods

- Choose herbicides most effective for the target species based on **plant size, form, and vigor**
- New infestations are easier to treat than older ones
- Be patient! many herbicides require months to work
- Repeated application can be necessary for up to 3-5 years or longer (e.g. kudzu, cogongrass)-CONTINUE MONITORING

Determining a Chemical Application Method

- Method used depends mostly on vegetation size
- Most grasses and forbs ground treatments and foliar sprays
 - Notable exception: bamboo
- Vines often require a combination of methods
- Combination of removal from objects, foliar sprays, and cut surface sprays



Determining a Chemical Application Method

- Woody trees and shrubs can be treated several ways depending on size and receptiveness of a species to a given method
- Stems less than 8' tall—spot foliar spray
- Stems less than 12-14' tall-can spot foliar spray with electric pump on four-wheeler or tractor

Determining a Chemical Application Method

- Basal spray stems <6" diameter first 15-18" from groundline around stem-usually thin bark species
 - Requires carrier oil for bark penetration
- Injection for larger stems-cuts made into stem and herbicide applied
- Cut stump treatment-usually larger stems-herbicides must be applied within an hour after cutting

Application Methods



High Risk Invasive Plants

- Lists were compiled by the Georgia Invasive Species Task Force
- South Georgia and terrestrial emphasis
- Other species could become problems not listed here—only top 3

Trees
Chinese Tallowtree
Chinaberry
Mimosa

Shrubs
Chinese Privet
Coral Ardisia
Shrubby Lespedeza

Vines/Ferns
Japanese Climbing Fern
Kudzu
Japanese Honeysuckle

Grasses/Canes
Cogongrass

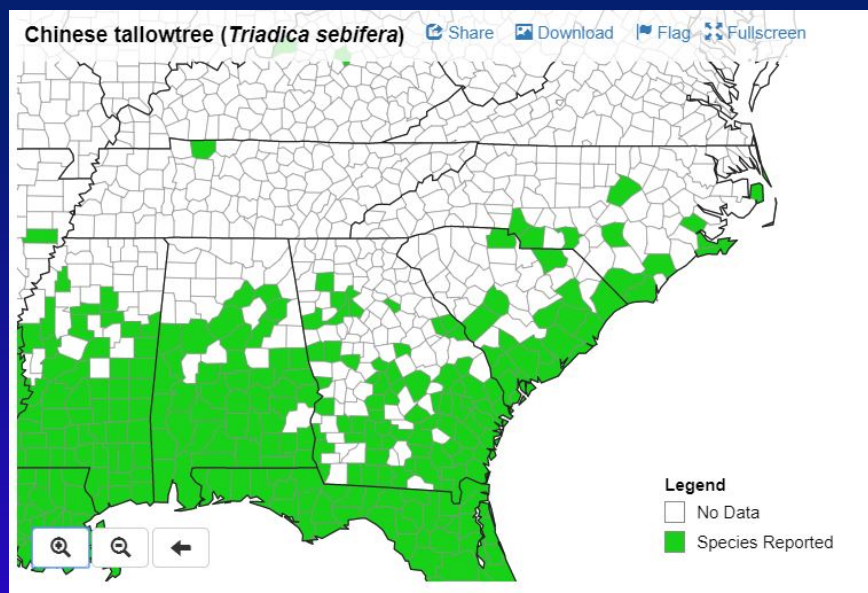
Forbs
Chinese Lespedeza
Wild Taro



Chinese Tallowtree *Triadica sebifera*



- Deciduous tree up to 60' tall and 3' diameter
- Popcorn-like seeds--sometimes called popcorn tree
- Invades a variety of sites--usually riparian areas
- Shade tolerant and allelopathic
- Root sprouts and prolific seed production (100,000 per year; viable 2-7 years)



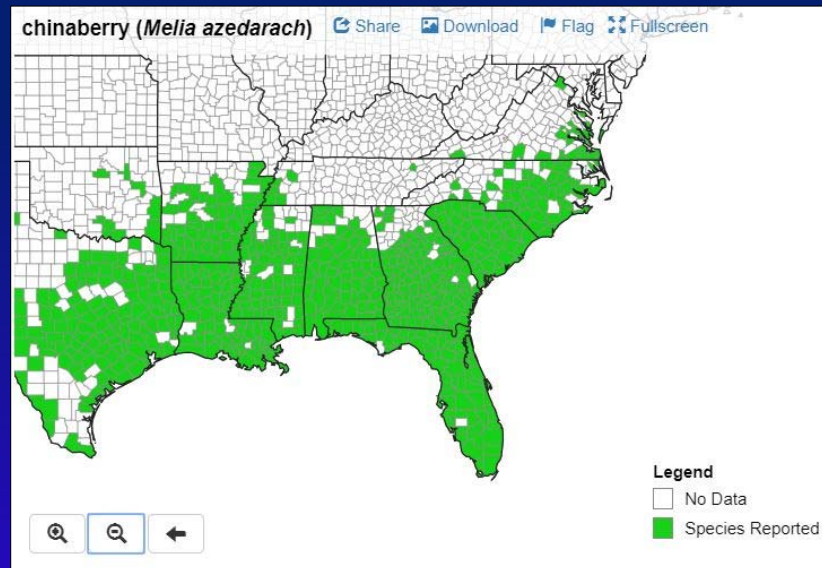
Chinese Tallowtree *Triadica sebifera* Herbicide Control Recommendations

- Foliar-Arsenal AC (imazapyr 53.1%) as a 0.75% solution with surfactant OR Krenite S (fosamine 41.5% ai) as a 20% solution with surfactant OR Garlon 4 (*temp <86 deg F) as a 2% solution (July-Oct)
- Basal Spray-Garlon 4 as a 11-20% solution in basal oil
- Cut Surface-Garlon 4 as a 10% solution in basal oil within 1 hour or Milestone (aminopyralid 40.6% ai) as a 10% solution
- Injection-Arsenal AC as a 20% solution placed in wounds every 3" around stem at 1 ml rate
- Large Infestations in Forests-Clearcast (imazamox 12.1% ai) as an aerial spray at 64 oz/ac (safe to most hardwoods) (July-Oct)
- *when using Garlon 4 (ester formulation) in sensitive areas (near cotton fields, other high value fields or in a pine stand) and foliar applying use when temp is less than 86 deg F

Chinaberrytree *Melia azedarach*

- Deciduous tree-50' tall up to 2' diameter
- Many branches with multiple stems
- Common on fence lines, roadsides, and forest margins
- Moderately shade tolerant
- Reproduces from root sprouts, stump sprouts, and abundant seed
- Resembles elderberry



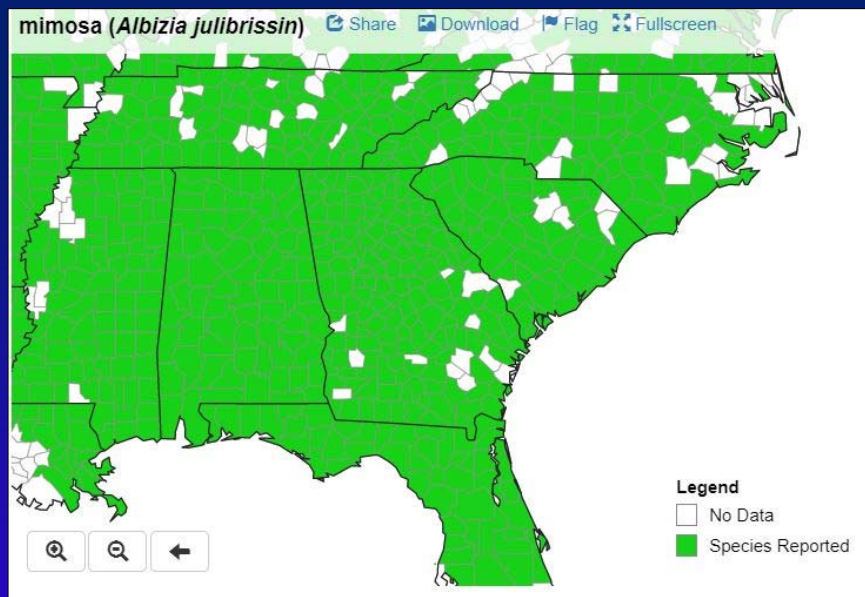


Chinaberrytree *Melia azedarach* Herbicide Control Recommendations

- **Foliar Spray**-(seedlings and resprouts)-Garlon 3A (amine triclopyr 44.4% ai) or Garlon 4 (*temp <86 deg F) as a 2% solution OR Arsenal AC as 1% solution with 1% nonionic surfactant (July-Oct)
- **Basal Spray**-Apply Garlon 4 as a 20% solution
- **Cut Stump**-Garlon XRT (triclopyr 83.9% ai) as a 15% solution in water within 1 hour
- **Injection**-Apply Arsenal AC as a 20% solution with one hack per 3" diameter—1 ml solution-Anytime except March-April
- *when using Garlon 4 (ester formulation) in sensitive areas (near cotton fields, other high value fields or in a pine stand) and foliar applying use when temp is less than 86 deg F

Mimosa Albizia julibrissin

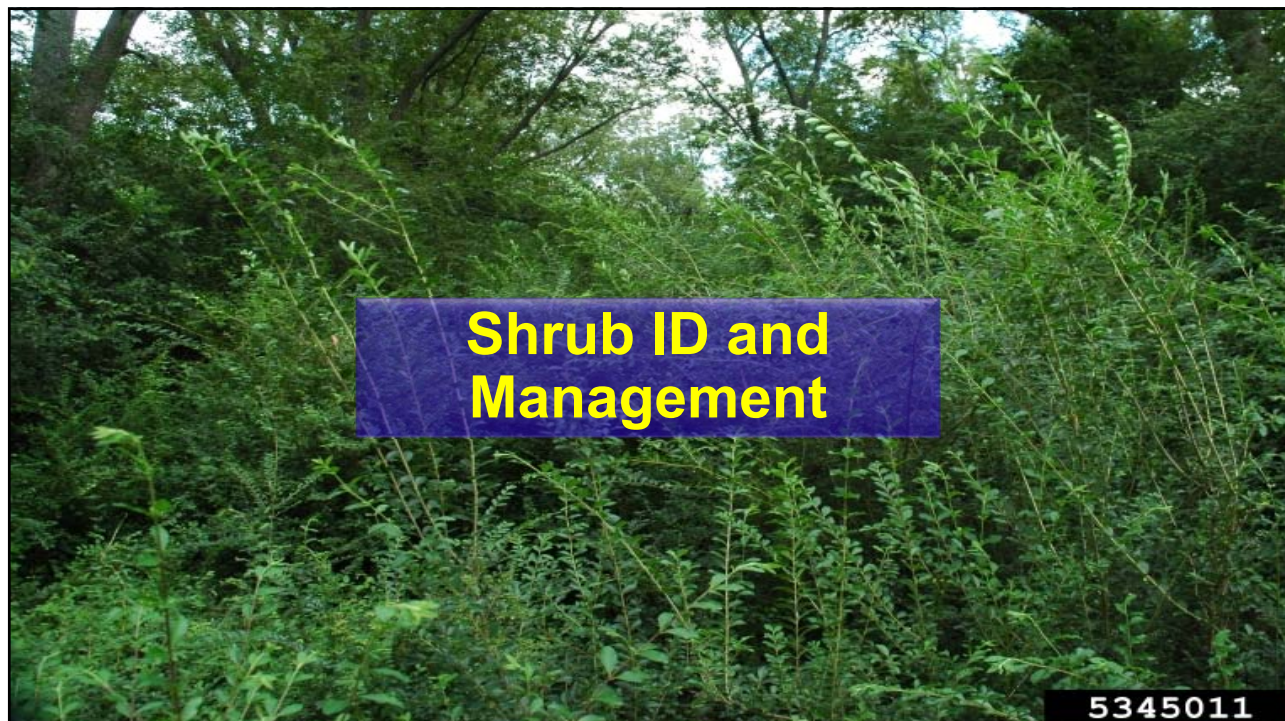
- Deciduous, leguminous tree 10 to 50' tall
- Often has multiple stems
- Dry to wet sites—spreads along streambanks
- Open to shaded conditions
- Forms dense stands on abandoned agricultural land
- Root sprouts and abundant seed



Mimosa Albizia julibrissin

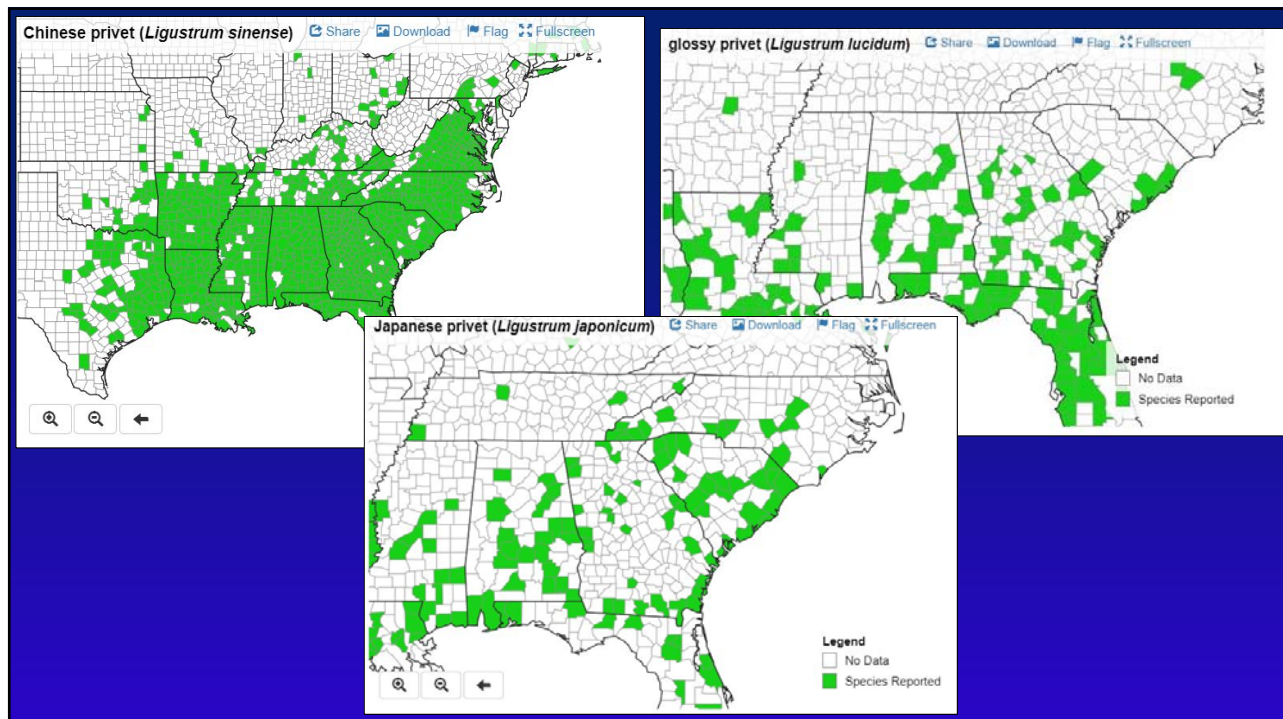
Herbicide Control Recommendations

- Foliar-Escort (metsulfuron methyl 60% ai) at 1 ounce per acre or Milestone VM Plus (aminopralid 1.15% ai and triclopyr 11.63% ai) at 6-9 pints per acre from June to August OR triclopyr amine as a 4% solution plus 0.25% solution Transline (clopyralid 40.6% ai) (July-Sep)
- Basal Spray-Garlon 4 as a 20% solution applied in a basal oil product, vegetable oil or mineral oil with a penetrant, or fuel oil or diesel fuel (where permitted)
- Cut Surface-Undiluted Garlon 3a along cambium



Privet spp. *Ligustrum* spp.

- Chinese and European privet most common—difficult to differentiate
- Hybridization
- Thicket-forming shrubs to 30' tall
- Aggressive and widely dispersed
- Shade tolerant
- Root sprouts and abundant seed-bird dispersed



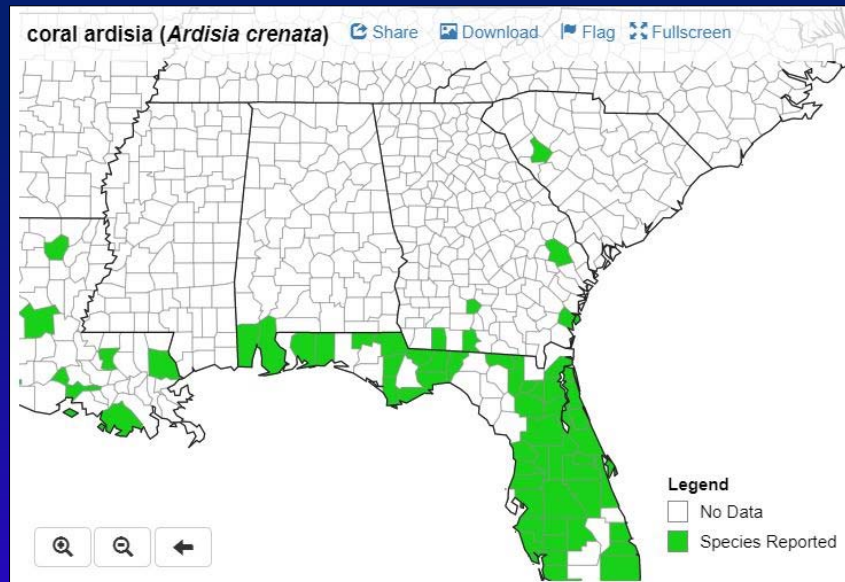
Privet spp. *Ligustrum* spp. Herbicide Control Recommendations

- Foliar spray-3-5% glyphosate solution (41% ai) during winter to prevent non-target vegetation damage.
- Foliar spray-Arsenal AC (imazapyr 53.1% ai) as a 1% solution and Escort (metsulfuron methyl 60% ai) at 1 oz per acre in summer to fall.
- Basal spray-easiest to apply to clumps of stems, Garlon 4 (triclopyr ester 60.4% ai) as a 20% solution in basal bark oil
- Cut surface-Treat outside edge of stumps with 20-50% solution of Garlon 4 in water
- Injection-Arsenal AC as a 20% solution in water. Apply 1 ml per 3 inches of stem diameter

Hen's Eyes *Ardisia crenata*



- Evergreen, erect shrub 2-6' tall
- Short stems or multi-stemmed bushy clumps
- Also known as coral ardisia, Christmas berry, coralberry, or spiceberry
- Forms infestations in full or partial shade
- Animal dispersed seed



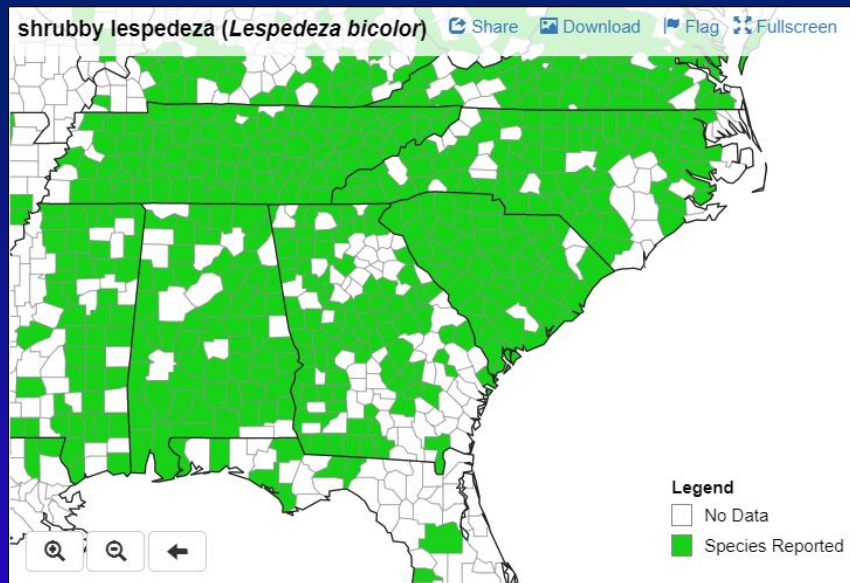
Hen's Eyes *Ardisia crenata* Herbicide Control Recommendations

- **Basal Spray**-Apply 20% solution of Garlon 4 in basal oil, vegetable oil, or mineral oil with a penetrant oil during the fall to stems
- **Foliar Spray**-Apply glyphosate or Garlon 4 (*temp <86 deg F) product as a 5% solutions with a surfactant at any time. Avoid contact with desirable foliage using glyphosate
- *when using Garlon 4 (ester formulation) in sensitive areas (near cotton fields, other high value fields or in a pine stand) and foliar applying use when temp is less than 86 deg F

Shrubby Lespedezas *Lespedeza* spp.



- Leguminous shrub 3-10' tall- stems can be clustered or single depending on species
- Abundant seed production even under a dense overstory
- Forms thick infestations
- Dormant brown plant remains upright most of the winter and may sprout at branches in the spring
- Shrubby lespedeza and Thunberg's lespedeza



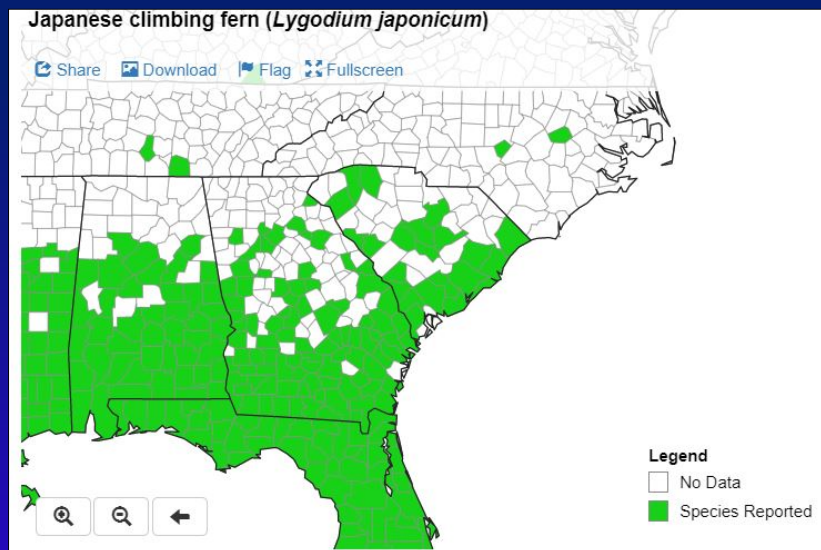
Shrubby Lespedezas *Lespedeza* spp. Herbicide Control Recommendations

- Mowing or mulching prior to herbicide application is beneficial to allow resprouts
- Foliar-Garlon 4 (*temp <86 deg F) as a 2% solution or Velpar L (hexazinone 25% ai) as a 2% solution (non-target plant damage possible) (July-Sep for both)
- * when using Garlon 4 (ester formulation) in sensitive areas (near cotton fields, other high value fields or in a pine stand) and foliar applying use when temp is less than 86 deg F



Japanese Climbing Fern *Lygodium japonicum*

- Actually a type of fern
- Perennial climbing and twining fern up to 90' long
- Frequently forms infestations of shrub- and tree-covering mats
- Occurs frequently along forest margins as well as riparian areas
- Alters fire intensity and severity of pine plantations-ladder fuel



Japanese Climbing Fern *Lygodium japonicum*

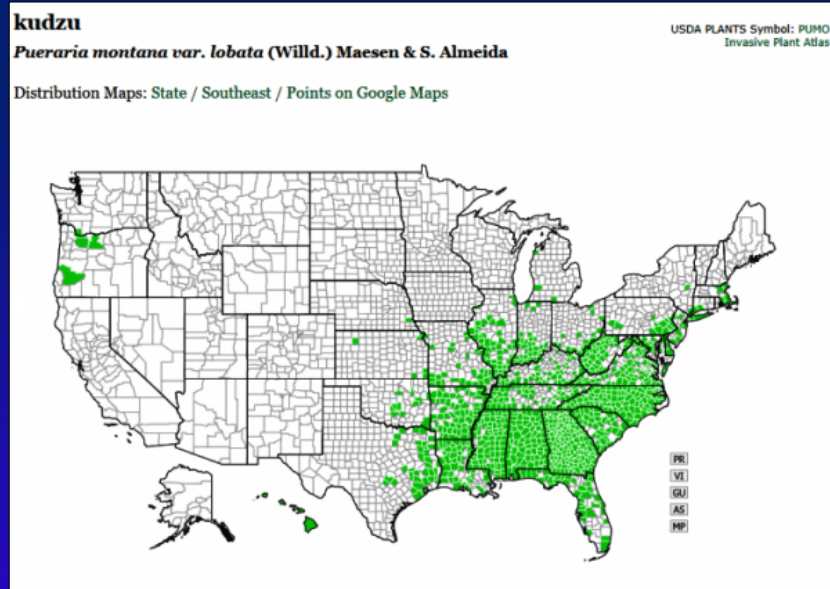
Herbicide Control Recommendations

- **Foliar**-Use a 2-4% solution of a glyphosate (41% ai) herbicide with a surfactant (July-Sep before spore production) Escort XP at a 0.5-1 oz/ac rate is also recommended if damage to non-target vegetation is not a concern
- **Mechanical**- Removal by hand of small infestations or machinery for large clumps can facilitate spraying

Kudzu *Pueraria montana*



- Deciduous twining, trailing, deep-mat forming, woody, leguminous vine
- Large, semiwoody tuberous roots reaching depths of 3-16'
- Capable of growing 60' per year
- Usually found along right-of-ways, forest edges, and stream banks
- Forms dense mats by twining on objects <4" diameter
- Leguminous nitrogen fixer



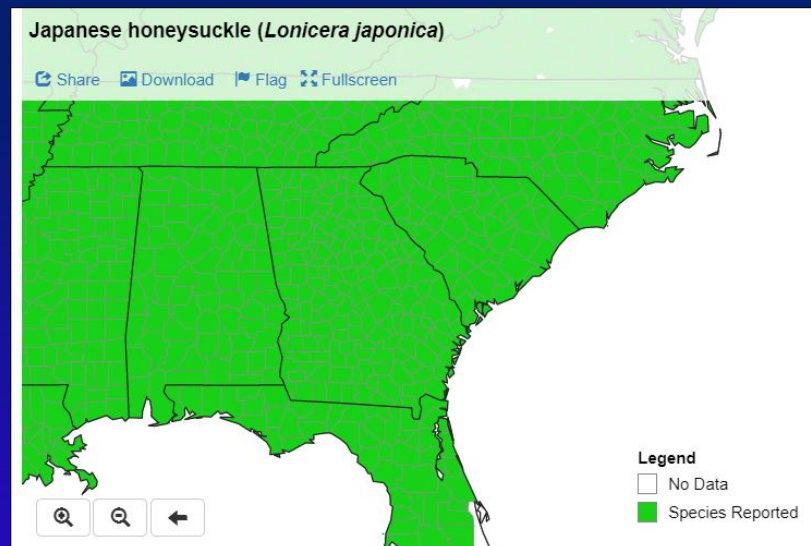
<https://www.aces.edu/blog/topics/invasive-species/history-use-of-kudzu-in-southeastern-united-states/>

Kudzu *Pueraria montana* Herbicide Control Recommendations

- Prescribed fire can be used during winter months to clear vines covering objects-spraying following resprouting is necessary
- **Foliar**-Escort XP at 4 oz/ac OR Method 240 SL (aminocyclopyrachlor 25% ai) at 16 oz/100-gallon mix OR Milestone VM at 7 oz/ac Or for safety to surrounding vegetation Transline as a 0.5% solution. Use surfactant and July-September
- **Foliar with NO soil Activity**-Garlon 4 (*temp < 86 deg F) or glyphosate (41% ai) as a 4% solution during growing season with a surfactant
- **Basal spray**-Vines less than 2" diameter Garlon 4 as a 20% solution in oil carrier
- **Injection**-Glyphosate such as Accord XRT II (50.2% ai) undiluted
- *when using Garlon 4 (ester formulation) in sensitive areas (near cotton fields, other high value fields or in a pine stand) and foliar applying use when temp is less than 86 deg F

Japanese Honeysuckle *Lonicera japonica*

- Semi-evergreen to evergreen woody vine
- Climbs up to 80'
- Can form arbors in young or older forests-along edges and in mature forest
- Most commonly occurring invasive plant in the South
- Spreads mainly by rooting at vine nodes
- Infrequently spreads by animal dispersed seed



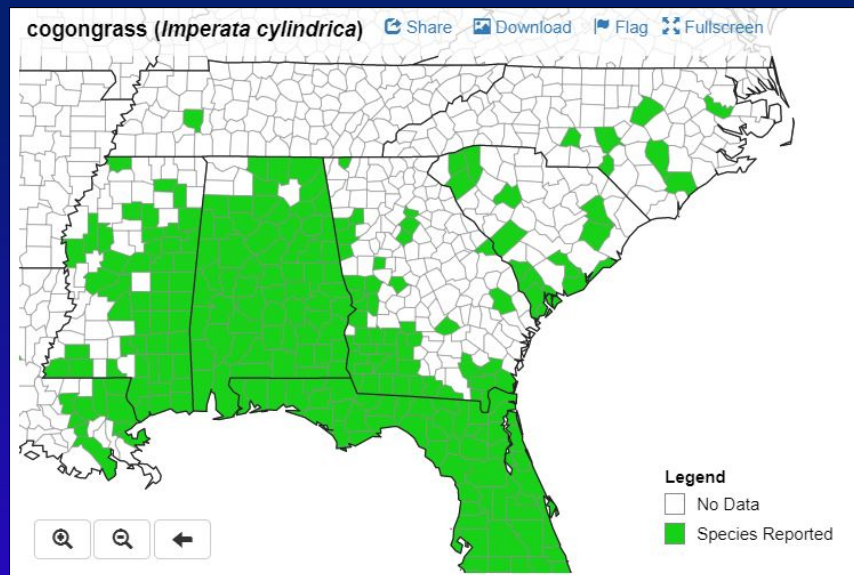
Japanese Honeysuckle *Lonicera japonica* Herbicide Control Recommendations

- Prescribed burning usually not a good choice-worse infestations and lack of fine fuels
- Foliar-Broadcast spray Escort XP at 2 oz/ac OR spot spray at 2-4 oz/ac with a surfactant (June-Aug) possible damage to non-target vegetation
- Foliar Safe to Surrounding Vegetation-Glyphosate (41% ai) as a 2% solution or Garlon 3A or 4 as 3-5% solutions with a surfactant (July-Oct)
- Cut surface-Cut just above soil surface, then treat with Garlon 3A or 4 as a 3-5% solution



Cogongrass *Imperata cylindrica*

- Perennial grass 1-6' tall often leaning in mats
- Aggressive and colony forming often originating as circular shaped infestations
- Full sunlight to partial shade on dry to wet sites
- Colonizes by rhizomes and wind dispersed seed
- Fire hazard, especially during winter



Cogongrass *Imperata cylindrical* Herbicide Control Recommendations

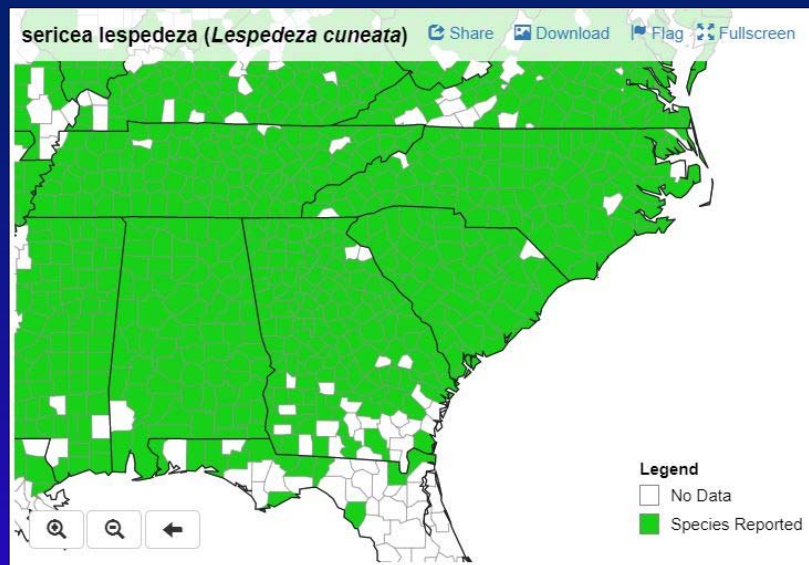
- Best to treat when plants are young
- Prescribed fire or mowing for standing plants
 - Rapid infestation expansion can occur after burning if native plants that constrain spread are killed
 - Difficult to kill rhizomes—repeat applications and monitoring will be necessary
 - Cover crops and grasses could be used to restore infested areas
- Foliar-Arsenal AC as a 1% solution OR a 5% glyphosate (41% ai) solution plus Arsenal AC as a 1% solution with a surfactant (June-Sep)



Chinese Lespedeza *Lespedeza cuneata*



- Perennial leguminous forb 3-6' tall
- Occurs in young to older forests in dry uplands to moist areas-flood tolerant
- Forms dense stands by root sprouts
- Spread by seed is slow



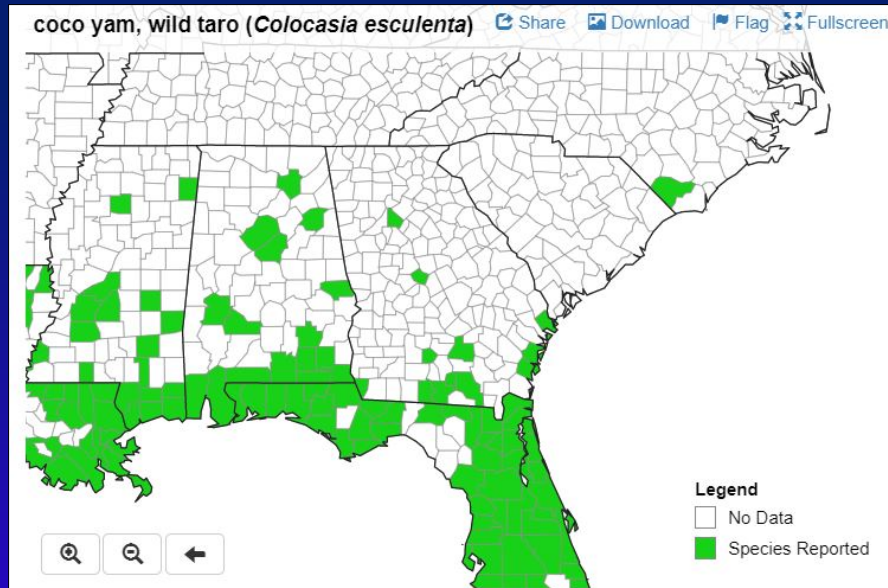
Chinese Lespedeza *Lespedeza cuneata* Herbicide Control Recommendations

- Treat when seeds are not present
- Mow 1-3 months prior to spraying
- Foliar-Garlon 4 (*temp <86 deg F) as a 2% solution OR a mix of Vista XRT (fluroxypyr 45.5% ai) at 6-12 oz plus Garlon 4 at 1 qt per 100 gallons of water with 0.5% surfactant (June-late-July)
- *when using Garlon 4 (ester formulation) in sensitive areas (near cotton fields, other high value fields or in a pine stand) and foliar applying use when temp is less than 86 deg F

Wild Taro *Colocasia esculenta*

- Also known as coco yam or elephant's ears
- Perennial forb that can grow up to 4' tall
- Tolerant of a range of dry to wet sites
- Easily invades riparian areas
- Spreads through rhizomes, stolons, offshoot corms, or plant pieces





Wild Taro *Colocasia esculenta* Herbicide Control Recommendations

- **Foliar**-Specialty aquatic formulations for riparian areas with glyphosate (Rodeo 53.8% ai) as a 2% solution is the only herbicide that has been tested and known to be effective on taro.



Summary

- Learn to ID invasive plants
- Stands with hurricane damage are at an increased risk for infestation
- Use best management practices with equipment movement
- Use foliar direct spray herbicides when damage to desirable species is possible (e.g. triclopyr and glyphosate)
- For woody species, choose application methods suitable for the size of the vegetation
- Always follow herbicide label instructions

Literature Cited

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