# Exotic Plants are Invading Southeastern Forests

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## INTRODUCTION

Millions of acres of forest land in the Southeast are being occupied increasingly by non-indigenous harmful plants—-exotic invasive plants. They are called exotic invasive plants, because these plants from other continents invade areas in the U.S. faster and more completely than most native species. Invasive exotic plants impede forest productivity, hinder forest-use activities, and limit diversity and wildlife habitat on millions of acres of forest land in the Southeast. Infestations of these plants and their range are constantly expanding. The actual infested acreage and spread rates of encroaching exotic plants are surprisingly unknown, even though this information is essential for planning eradication and containment strategies for the region. Kudzu and Japanese honeysuckle alone occupy over 7 million acres each and their spread rates are obviously increasing. Exotic plant biopollution threatens plant and animal biodiversity across the landscape and continues to capture our highly valued nature preserves and recreational lands. All federal parks and forest lands in the Southeast have exotic infestations. The current problems with exotic imports grows worse, with no foreseeable declines.

The purpose of this article is two fold: (1) to bring attention to the problem of exotic plants in the sub-tropical part of the Southeastern Forest Region, focusing on the most troublesome invasive species; and (2) to begin to mobilize support for organizing Integrated Weed Management Programs for these species. Herbicide control research is summarized to foster proactive treatment of new infestations as a means to minimize spread. The severe problem with tropical exotic invaders in Florida has already prompted the development of integrated management programs for those species and these are not discussed specifically. It is however recognized that some tropical exotic species in Florida are advancing into the sub-tropical parts of the Southeastern Forest Region (e.g., cogongrass, tallowtree, and Japanese climbing fern) and represent common problems.

### Ecology of exotic plants

Exotic plants can spread rapidly because of our mobile society with "hitch-hiking" seeds and the intentional transportation of ornamental, wildlife food-plot, and forage plants. Crucial aspects of exotic plant ecology that influence control strategies are as follows:

- Invasive exotics continue to spread because natural predators were not imported from the plant's home range and native predators in the U.S. are too weak.
- After an exotic plant is introduced there is a "lag phase" of decades to centuries before an explosive spread phase. Thus, some species that currently appear non-invasive may eventually begin to spread rapidly. Kudzu is an example that has an apparent lag phase of 10 to 20 years before a rapid spread phase, as is now

being seen in its northern expansion.

- Most invasive exotic plants spread through abundant seed production, and perennial species spread by well-protected, below-ground rhizome roots.
- Invasive exotic plants can prevent or retard natural succession and reforestation by forming dense infestations, often in mixtures. Control measures for one species can release non-susceptible cohorts.
- Invasion by exotics continues to decrease biological diversity within natural reserves and parks, and detract from their primary mission.
- The partial shade tolerance of some exotic species (i.e., Chinese privet, Japanese honeysuckle, lespedeza bicolor, tallowtree, and Japanese grass) allows them to become established under developed forest canopies.
- Kudzu, Japanese honeysuckle, privets, mimosa, and Japanese grass are invading riparian habitats to the exclusion of native understory species and hardwood regeneration.
- The continuing spread of exotic plants along the extensive network of highway and utility right-of-ways and riparian systems, greatly facilitates migration into extensive forest areas.
- Because most exotics thrive in "disturbed habitats" that accompany urban and rural development, exotic plants can present severe problems for our urban and suburban environments.

### Control and eradication of exotic plants

Current control methods for invasive exotics can be expensive, lengthy, and risky because total eradication is required to prevent reestablishment. Effective site-eradication procedures for older established infestations require multi-year treatments, continued monitoring, and follow-up treatments. Infestations on adjacent lands must also be treated to prevent reinvasion. This seldom occurs without the leverage of noxious weed laws that places liability on neighbors that do not treat and allow reentry into adjacent lands. Infestations common along highway, railroad, and utility right-of-ways are rarely, if ever, treated for eradication, thus fostering widespread invasions to most lands.

Many State and federal agencies have policies that prevent the use of the most effective herbicides for a particular exotic species. This results in extremely high control costs (often without eradication) on highly valuable sites. It is also becoming clear that older infestations and those near streams, marshes, and other special habitat, and those having abundant seed banks, are probably impossible to eradicate with current methods. The best approach is to control the small, young infestations when they first appear. Eradication at this early stage can usually be accomplished with one application of commonly used herbicides.

Past research studies for developing eradication methods have often been limited because the lack of a higher priority and appropriate long-term support and funding. Biocontrol projects offer the most logical, long-term solution but none have been attempted in the Southeastern Region. Traditional biological control is the process of returning to the homeland of the weed, selecting from its natural predators the most effective and those that will not attack other plants, then introducing them to the U.S. to feed on the weed. The high investments and long-term research required for biocontrol programs have been made only for western rangeland exotic plant species, and more recently for tropical exotics in Florida. One reason is that the mixture of land ownership that characterize eastern and southeastern forests presently stymies organized efforts, compared to the dominance of federal lands and interests in the West.

### Integrated Weed Management Programs

Integrated Weed Management Programs are needed for each exotic invasive plant that incorporate all available prevention and control treatments into a effective unified approach. Integrated weed management is a system that utilizes all proven methods based on the best available scientific facts, current technology, and economic considerations. Integrated Weed Management Programs combine methods of control using: preventative measures (such as noxious weed laws, quarantines, inspections, and embargoes), biocontrol agents using natural parasites and predators, herbicides, prescribed burning, mechanical and manual treatments, and developed commercial uses. These programs present proven eradication treatments for all the various land use situations.

### Problems in organizing Integrated Weed Management Programs

The extensive weed infestations in southeastern forests often go unseen by the public—hidden invaders. Conflicting attitudes between user groups (e.g., horticulturists, hunters, seed producers, etc.) and landowners with exotic infestations as well as between urban and rural constituents hinders organizing aggressive control programs. Imported plants with developed uses in agriculture and horticulture can and have become noxious invasive plants in forests. Widespread chemophobia, or the fear of pesticide use, often reenforces a do-nothing approach to site eradication methods that use herbicides, even though herbicides are now endorsed by conservation groups for treating some sites. In the past, a general attitude of resignation at all levels of both the public and private sectors in the Southeastern Region has hindered gaining support for integrated control and containment programs.

Federal and State Governments have no unified policy for limiting entry, reacting to emergency importation, or fostering integrated control methods as concluded in a report by the U.S. Congress Office of Technology Assessment entitled "Harmful non-indigenous species in the United States". There is no regional agency or organization that has clearly-defined responsibility or jurisdiction to organize regional Integrated Weed Management Programs. The formation of state exotic pest plant councils such as the one in Tennessee may eventually fill some of this gap. And recently, federal agencies have started to address noxious weed problems in a unified manner by forming the Federal Interagency Committee for Management of Noxious and Exotic Weeds.

### Prevalent Exotic Plant Species Invading Southeastern Forests

The exotic plants discussed below are some of the most noxious for forestry and other land use sectors in the Southeast. General descriptions of their biological nature and range are presented have been compiled. An extensive literature search has yielded some herbicide control recommendations. However, very few recommendations for forested areas were found. It is apparent that more research is urgently needed. Only the most effective herbicide treatments are outlined. Follow herbicide label instructions, prohibitions, and precautions. For sprays, use a low pressure and coarse spray pattern to reduce spray drift. Damage to surrounding plants may occur.

## EXOTIC TREES

Exotic tree species hinder reforestation and rights-of-way management because of scattered isolated infestations. Silktree is continually spreading along stream networks, chinaberry is appearing more in new forests, and tallowtree has extensive infestations in wet forests, replacing native species. These species occur in mixtures with other exotic invasive plants on disturbed habitats.

**Silktree or mimosa** (*Albizia julibrissin*)
Nature: Leguminous, small trees growing 30 to 40 ft that reproduce by seed and root sprouts. It has feathery deciduous leaves, showy pink blossoms, and smooth light brown bark. Native to Tropic America.
Herbicide control: Apply Accord™, Roundup™, Garlon 3A™, or Garlon 4™ as 2 % solutions in water with a wetting agent to thoroughly wet all leaves. Apply Transline™ as a 0.2% solutions in water to thoroughly wet all leaves, stems, and bark. Transline controls only legumes and is often safe on surrounding non-leguminous species.

**Chinaberry** (*Melia azedarach*)
Nature: Medium tree growing to about 50 ft that spreads by prolific seeding. It has lacy, bipinnate leaves that is dark green, blue flowers, and sticky yellow fruits. Introduced from Asia and traditionally planted at home sites in the Southeast.

Herbicide control: Apply Garlon 3A or Garlon 4 as a 2% solution in water with a wetting agent to thoroughly wet all leaves.

**Popcorn tree or tallowtree (*Sapium sebiferum*)**
Nature: Shade-tolerant, small trees growing to 40 ft that spread by bird-dispersed seeds. It has light-green heart-shaped leaves that have bright fall colors, long drooping flowers, and bundles of white waxy seeds.
Origin: Introduced from China to the U.S. gulf coast in early 1900's.
Range: Coastal plain from NC south to FL to TX with severe infestations on wet forest sites and coastal prairies in east TX to FL. Occurs as ornamental in OK and AR and is spreading into all upland areas.
Uses: Waxy seeds traditionally used to make candles. Honey plant for beekeeping. Ornamental.
Herbicide control: Apply Garlon 4 as a 5% (less than 6 inch dbh) to 20% (greater than 6 inch dbh) solution in mineral or vegetable oil with a penetrant to the young bark up to 16 inches above the ground completely around the trunk in Spring. Apply Arsenal AC™ as a 1% solution in water and a wetting agent to the foliage of seedlings. For large trees, make stem injections using Arsenal AC or Garlon 3A in dilutions and cut spacings specified on the herbicide labels.

## EXOTIC SHRUBS

Exotic shrubs often occur with exotic tree species and present similar problems. The most extensive invader in forested areas is chinese privet that is replacing native riparian species and prevents regeneration of bottomland hardwood-pine forests. These exotic shrubs have value for game forage, and are often established by hunter groups.

**Bicolor (*Lespedeza bicolor*)**
Nature: Shade-tolerant, leguminous shrub up to 10 ft tall that spreads by bird- and animal- dispersed seeds. It is a three leaved plant with purple flowers. Introduced from Japan.
Herbicide control: No control research reported.

**Chinese privet (*Ligustrum sinense*)**
Nature: Shade-tolerant, tall shrub or small tree growing to about 30 ft, with evergreen leaves, that spreads by bird-dispersed seeds and by rhizomes. It has leafy stems with opposite leaves less than 1 inch long, small white flowers, and clusters of round berries. Introduced from China.
Herbicide control: Apply Accord or Roundup as a 2% solution or Arsenal AC as a 1% solution in water with a wetting agent to thoroughly wet all leaves in middle to late summer.

**Japanese privet (*Ligustrum japonicum*)**
Nature: Shade-tolerant, tall shrub or small tree growing to about 35 ft, with evergreen leaves, that spreads by bird-dispersed seeds and by rhizomes. It has opposite leaves 1 to 3 inches long, white flowers, and clusters of round berries. Introduced from Japan and Korea.
Herbicide control: Apply Accord or Roundup as a 2% solution or Arsenal AC as a 1% solution in water with a wetting agent to thoroughly wet all leaves in middle to late summer.

## EXOTIC VINES

Exotic vines are some of the most troublesome invaders because they form the most dense infestations. Kudzu and Chinese wisteria can overtop even mature forests, while Japanese honeysuckle can form dense cover below the canopy. Reforestation after harvest of infested stands require high-cost treatments. Japanese climbing fern is a relatively new entry that is extending its range through wind-blown spore dispersal and infest forest margins along rights-of-ways and disturbed sites.

**Japanese honeysuckle (*Lonicera japonica*)**
Nature: Shade-tolerant, climbing and trailing semiwoody vine with evergreen leaves that spreads by stolons and seeds. This is the only exotic of 7 species of honeysuckle in SE. Introduced from Japan.
Herbicide control: Apply Escort™ at 2 oz per acre in water and a wetting agent in May when pine tolerance is needed. Apply Accord or Roundup as a 2% solution in water with a wetting agent in middle to late summer to the leaves.

**Japanese climbing fern (*Lygodium japonicum*)**
Nature: Rhizomatous delicate vine, climbing and twining to form clumps that can cover shrubs and trees. One of three species of climbing fern (the others—*Lygodium palmatum* in the Blue Ridge and *Lygodium microphyllum* in FL—are native.). Perennial vine with lacy leaves and wiry vines. Introduced from Japan
Herbicide control: No control research reports found.

**Kudzu (*Pueraria lobata*)**
Nature: Leguminous, trailing or climbing, semi-woody vine that spreads by vine growth, rhizomes, and seeds. Introduced from Japan with the home range in China.
Herbicide control: Apply foliar sprays of Tordon™ for successive years from June to September. Other options provide partial control and may be useful in specific situations .

**Chinese wisteria (*Wisteria sinensis*)**
Nature: Leguminous semiwoody vine (or shrub) that spreads by vine growth and seeds. One of four species in SE with one other being exotic but rare, (Japanese wisteria) *Wisteria floribunda* .
Herbicide control: Apply foliar sprays of Tordon, Arsenal AC, or Accord for successive years applied from July to September.

## EXOTIC GRASSES

Exotic grasses present severe competition for establishing forest plantations on abandoned row-crop and pasture lands. Some of these are generally considered naturalized, e.g., bermudagrass (*Cynodon dactylon*, crabgrass (*Digitaria* spp.), and giant fescue (*Festuca arundiacea*). and are not listed here. Most exotic grasses spread and reside along highway and utility right-of-ways. where eradication treatments are not applied.

**Cogongrass (*Imperata cylindrica.*)**
Nature: Dense, erect perennial grass that spreads by prolific seed (short-lived) production and rhizome movement in fill-dirt. A South American species, *I. brasiliensis*, is less invasive. Both species invade new forests and prevent establishment of planted seedlings. Native to Southeast Asia and listed as the world's seventh worst weed.
Control: Apply Arsenal AC as a 1% solution or Accord as a 2% solution (or combination of the two) in water with a wetting agent to thoroughly wet all foliage in September or October with multiple applications to regrowth.

**Japanese grass or stiltgrass (*Microstegium vimineum*)**
Nature: Dense, mat-forming annual grass that roots at nodes and is shade tolerant and occupies various habitats including creek banks, floodplains, forest roadsides and trails, damp fields, and swamps. Native to temperate and tropical Asia, it was introduced near Knoxville, Tennessee around 1919.
Control: Apply Accord or Vantage™ as dilute foliar sprays in late summer.

## RECOMMENDATIONS

Weed scientists and extension specialists in the region need to coordinate efforts and be aggressive in performing research projects aimed at developing integrated control approaches for these species. Legal and policy strategies are needed at all governmental levels to prevent future importation and spread, as well as, to support development of regional-scope integrated management programs. Extension specialists can help to educate various public sectors to the need for weed management, the cost-benefits, and how to perform effective control treatments. Land owners can make annual surveys of their property and actively treat all new infestations.

### Caution

Pesticides used improperly can be injurious to humans, domestic animals, desirable plants, and fish or other wildlife. Use all herbicides and pesticides selectively and carefully, Follow recommended practices for the disposal of surplus herbicides and pesticides and their containers.

Use of trade names is for reader's information and does not constitute official endorsement or approval by the U.S. Department of Agriculture to the exclusion of any suitable product or process.

# EXOTIC SHRUBS

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Japanese privet
(*Ligustrum japonicum*)

Chinese privet
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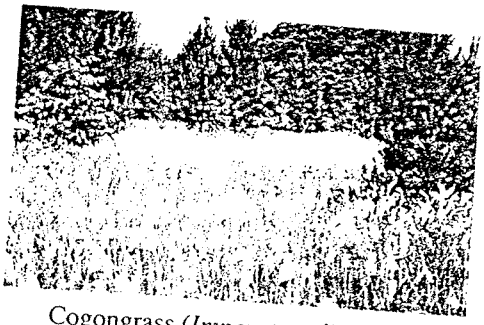
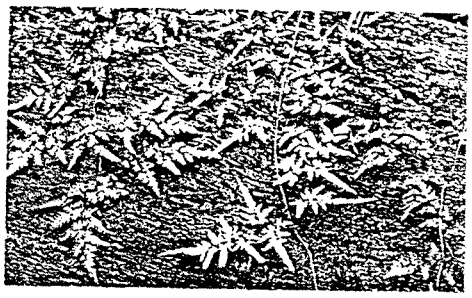
(*Microstegium vimineum*)



Cogongrass (*Imperata cylindrica.*)

PHOTOS BY TED BODNER, JAMES H. MILLER & CHARLES BRYSON

Chinese wisteria
(*Wisteria sinensis*)



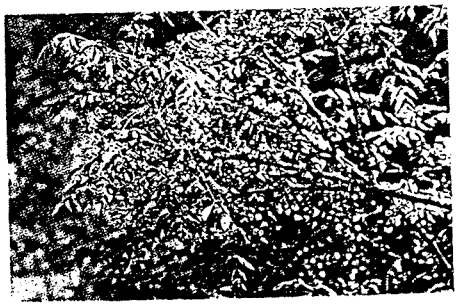
Japanese climbing fern
(*Lygodium japonicum*)

Japanese honeysuckle
(*Lonicera japonica*)

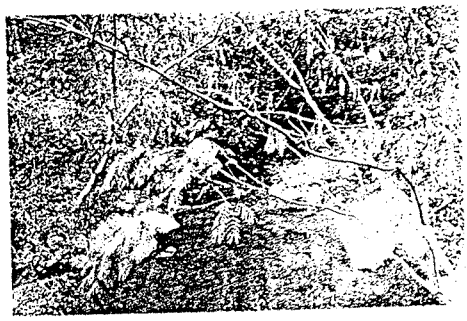
Kudzu
(*Pueraria lobata*)

# EXOTIC VINES

Popcorn tree or tallowtree
(*Sapium sebiferum*)



Chinaberry (*Melia azedarach*)



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