Invasive Plant Update

Nancy J. Loewenstein
School of Forestry and Wildlife Sciences
Auburn University

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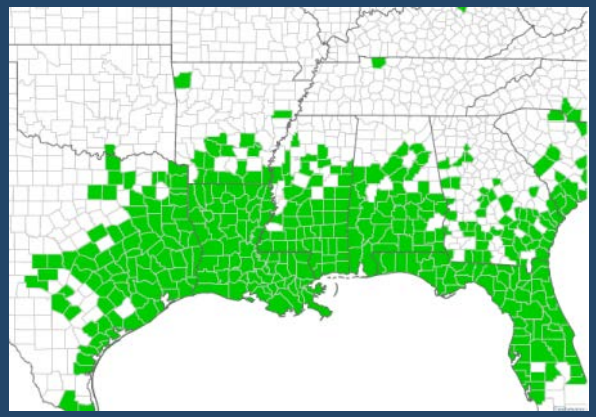
ALIPC
INVASIVE PLANT COUNCIL

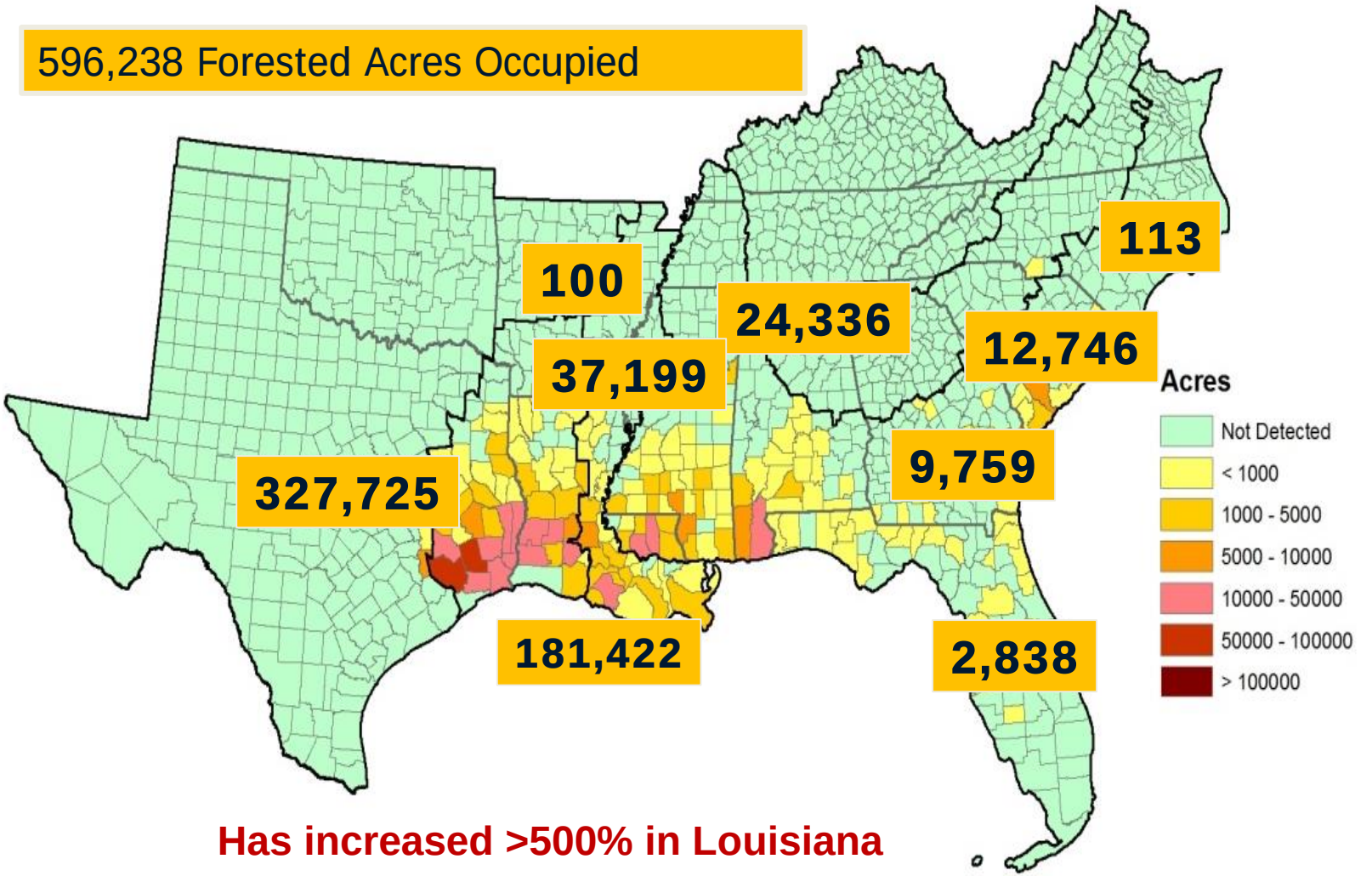
- Chinese tallowtree
- Cogongrass
- Invasive plants on the horizon

Chinese tallowtree, popcorn tree

(*Triadica sebifera*)

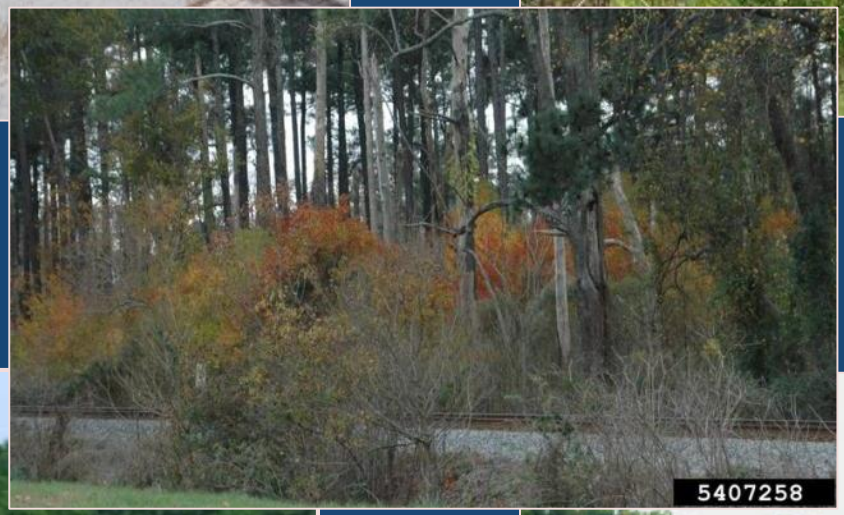


Chinese tallowtree, popcorn tree



~ 2000 acre increase in AL since 2008

http://www.invasive.org/fiamaps/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UGA2132049


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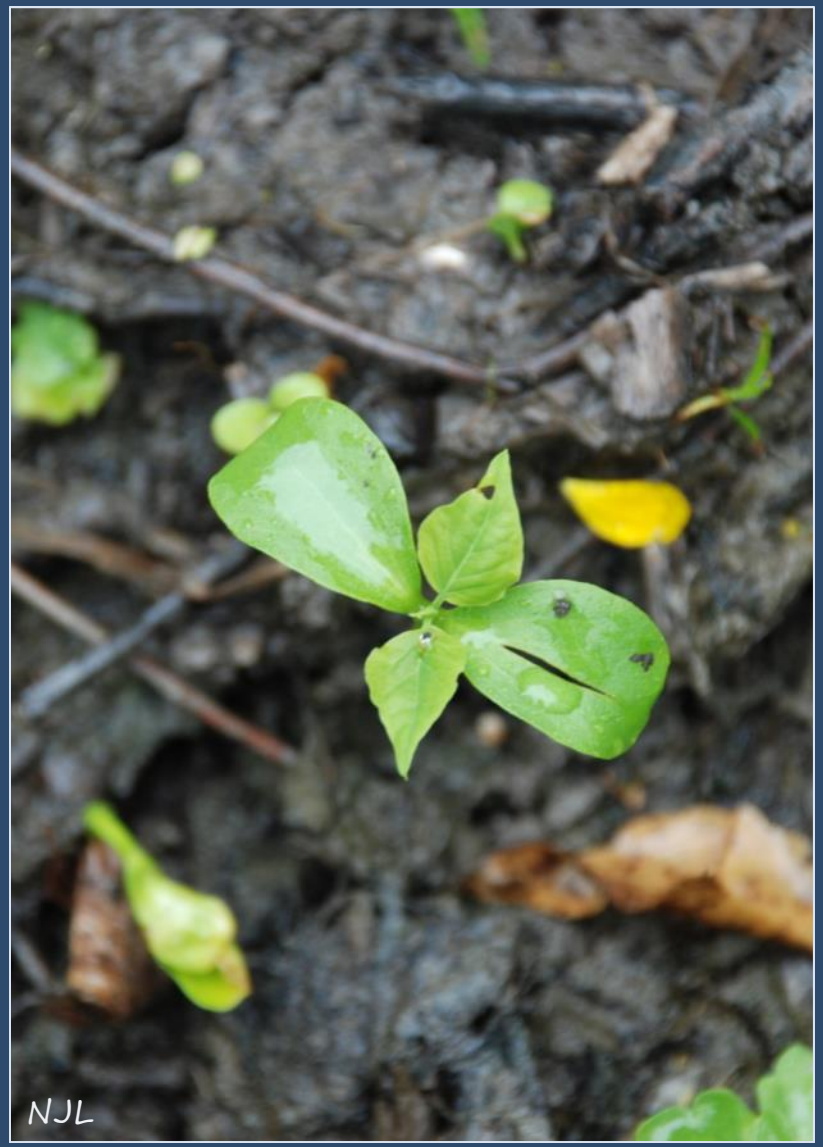
Seed Ecology

- Mature trees may produce 100K seeds per year
- Seeds are spread by birds and water
- Seed bank estimates of over 3 million per acre
- Seeds may be viable for seven years (possibly more)
- Seedlings emerge from spring through fall



Control Options

S. Enloe

Standard Foliar Herbicide Treatment Options for Tallowtree

- **Triclopyr ester** (Remedy, Garlon 4, Generics)
  - 2% v/v for spot treatment (high volume)
- **Triclopyr amine** (Garlon 3A, Generics)
  - 2% v/v for spot treatment (high volume)
- **Imazapyr** (Arsenal or Habitat)
  - 1% v/v (high volume)
- **Imazamox** (Clearcast)
  - 0.5-2%v/v for spot treatment
  - Labeled for tallowtree (64 -128 fl oz/A)

- Timing for all: after full leaf out through early fall

Standard Basal Bark Treatment Options for Tallowtree

- Triclopyr ester (Garlon 4, Remedy)
  - 20% v/v in oil carrier
  - Pathfinder II (ready to use product)

- Size: ≤6 inches ground line diameter
- Timing: anytime, but late fall is easiest

Standard Cut Stump Treatment Options for Tallowtree

- Triclopyr amine (Garlon 3A, Generics)
  - 10-50% v/v
  - Fall or winter
- Imazapyr (Arsenal)
  - 10% v/v
- Glyphosate
  - variable success with Chinese tallowtree

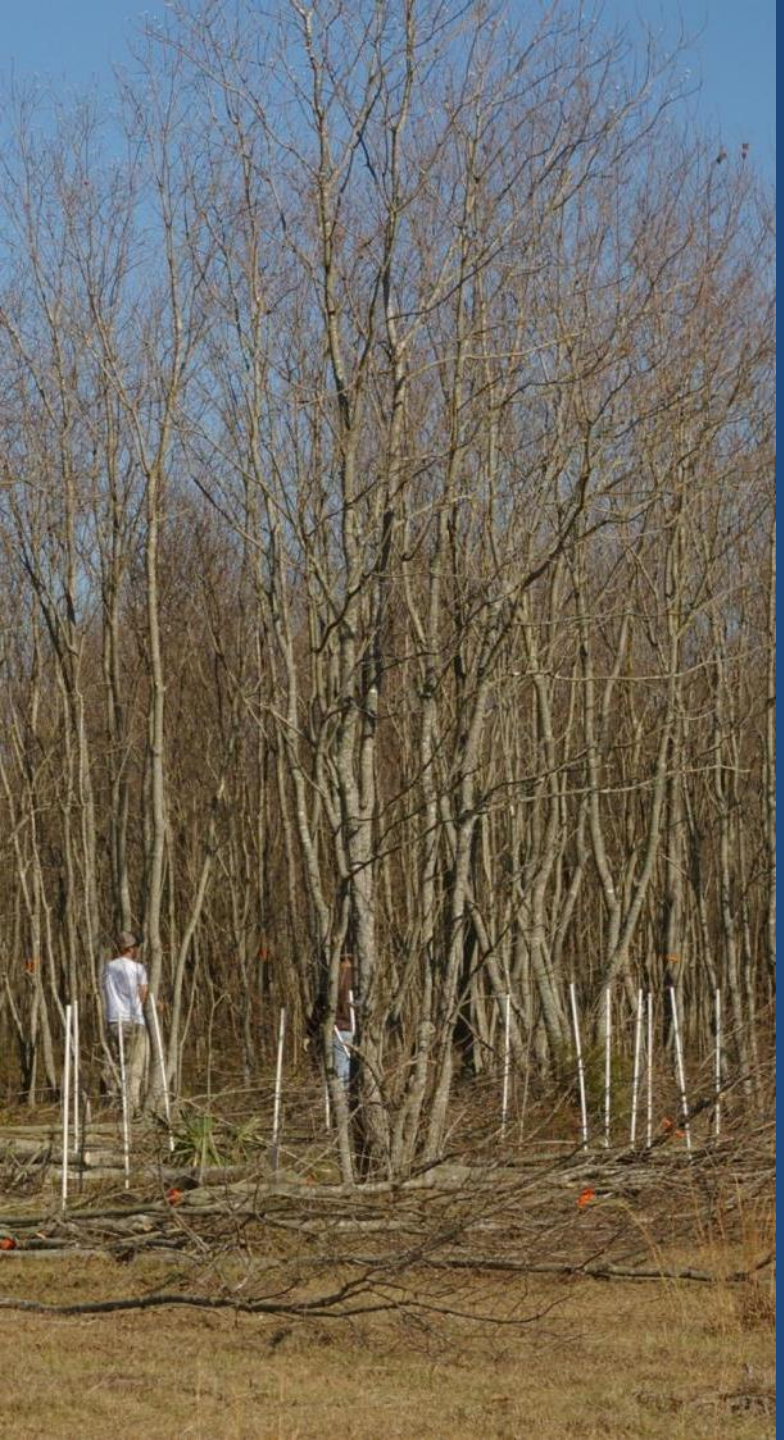
- For homeowners: OrthoMax Poison Ivy and Tough Brush Killer Concentrate (8.8% triclopyr amine)
  - 100% product

Common problem:

Sprouting following treatment

… from root collar
and
from lateral roots


Lateral roots
S. Enloe



Tallowtree control study

- 3 sites
  - Montgomery, AL (black belt)
  - Wetumpka, AL
  - Pineville, LA
- 3 control methods
  - Cut stump
  - Basal bark
  - Foliar
- Compared standard and ‘new’ herbicides

- Funded by Forest Service

- Aminocyclopyrachlor - Streamline, Method, others …
  - Selective for broadleaf weeds, woody species, vines and grasses (possible damage to pines)
- Fluroxypyr - Vista XRT
  - Broad spectrum control of annual and perennial broadleaf weeds
- Aminopyralid - Milestone
  - broadleaf weeds, legumes, Japanese stiltgrass

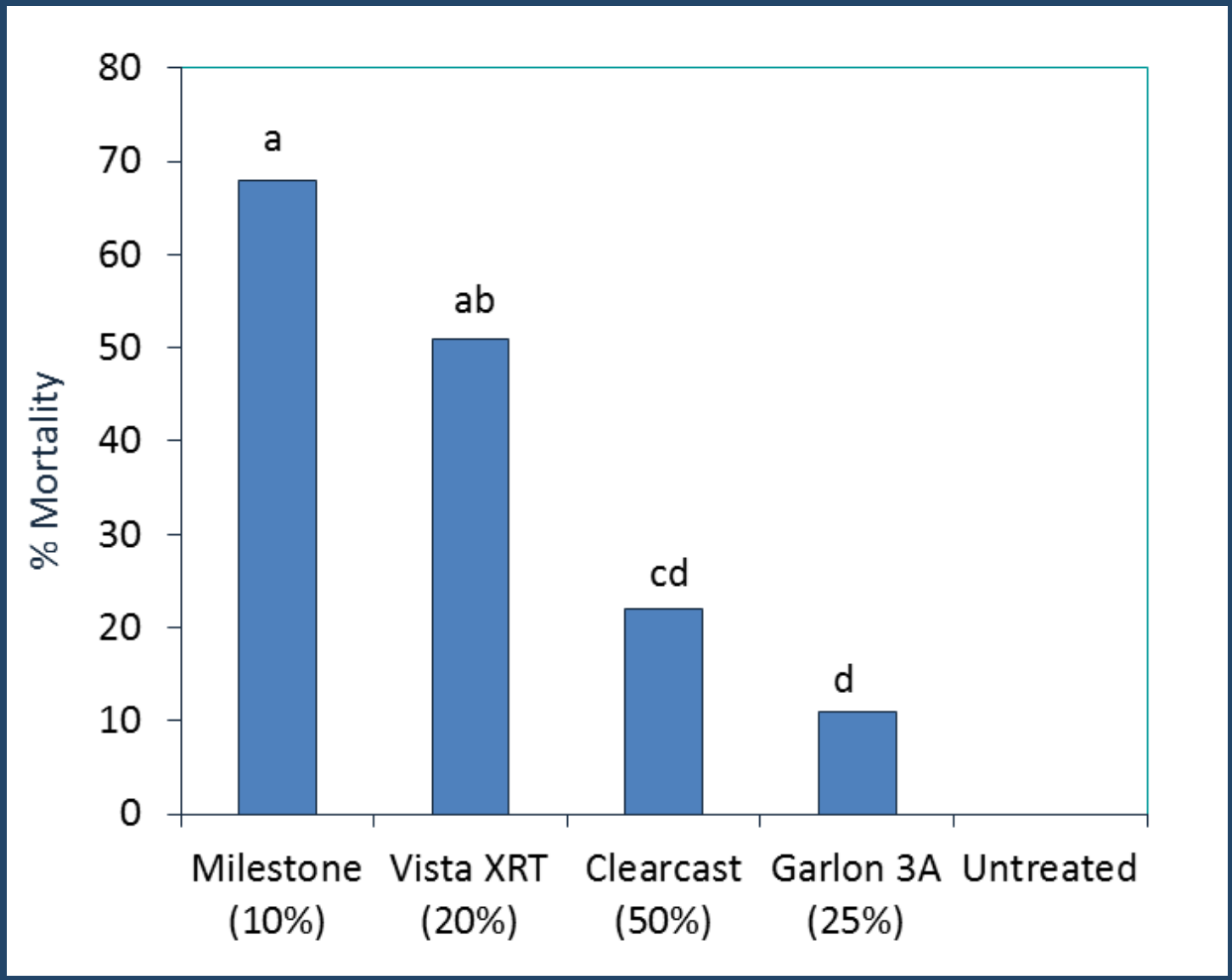
Cut Stump Treatments
Applied December 2011

- Garlon 3A
  - 25% v/v
- Clearcast
  - 25% v/v
  - 50% v/v
- Milestone
  - 10% v/v
- Vista XRT
  - 10% v/v
  - 20% v/v
- Untreated

Untreated cut stumps

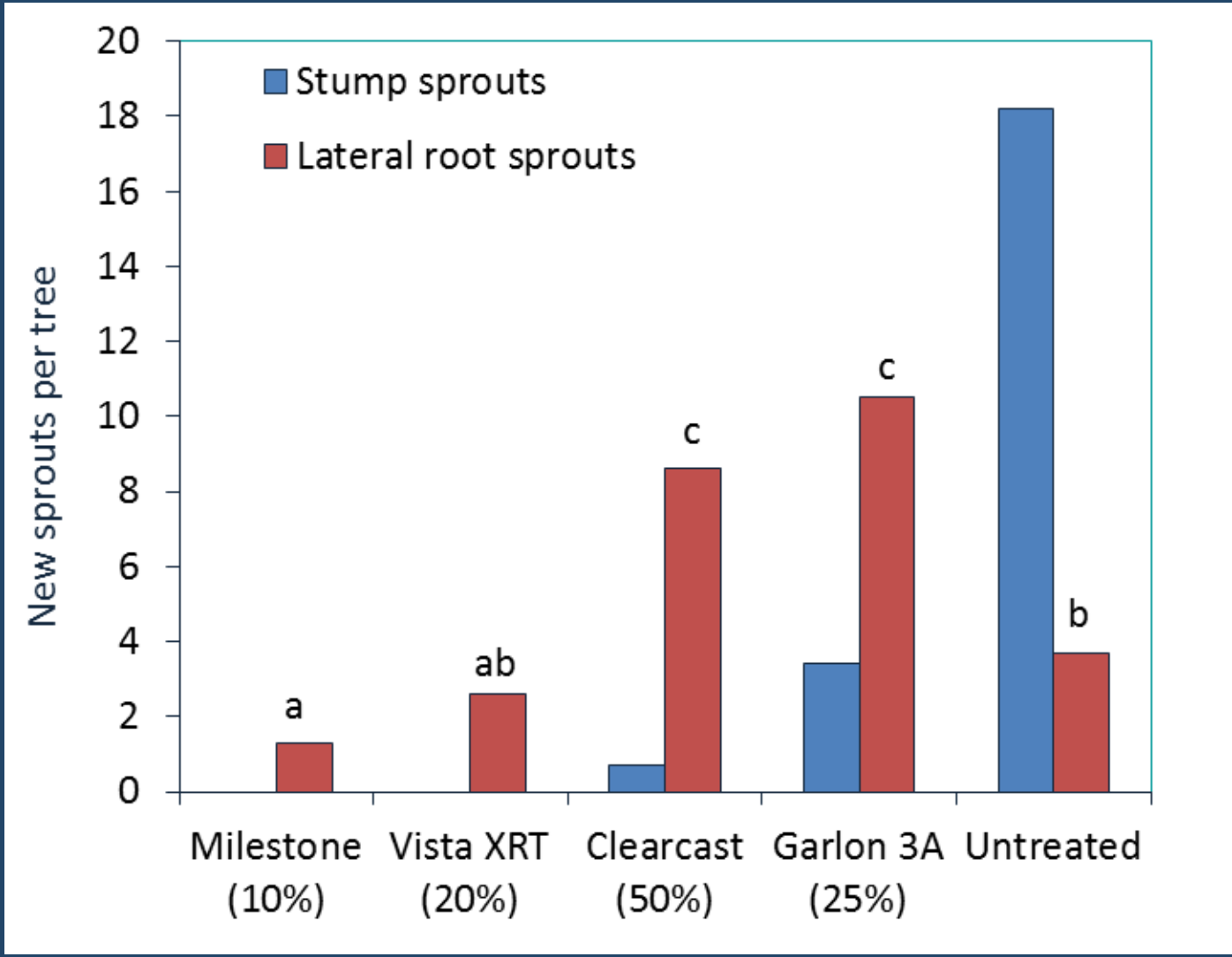
averaged 18 sprouts per stump with mean ht=11.8 ft

Tallowtree mortality 21 months after cut stump treatment



means followed by same letter are not significantly different (p=0.05)

Tallowtree sprouting 21 months after cut stump treatment



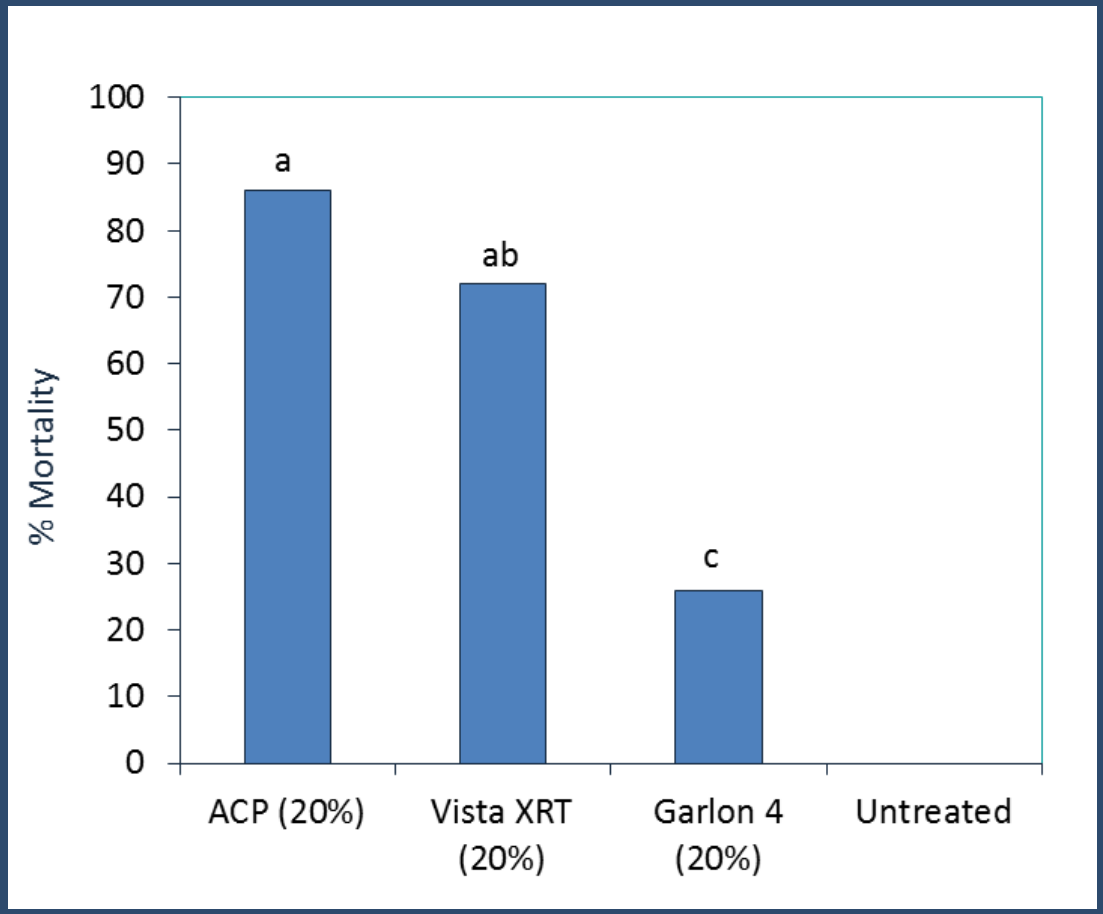
means followed by same letter are not significantly different (p=0.05)

Basal bark treatments

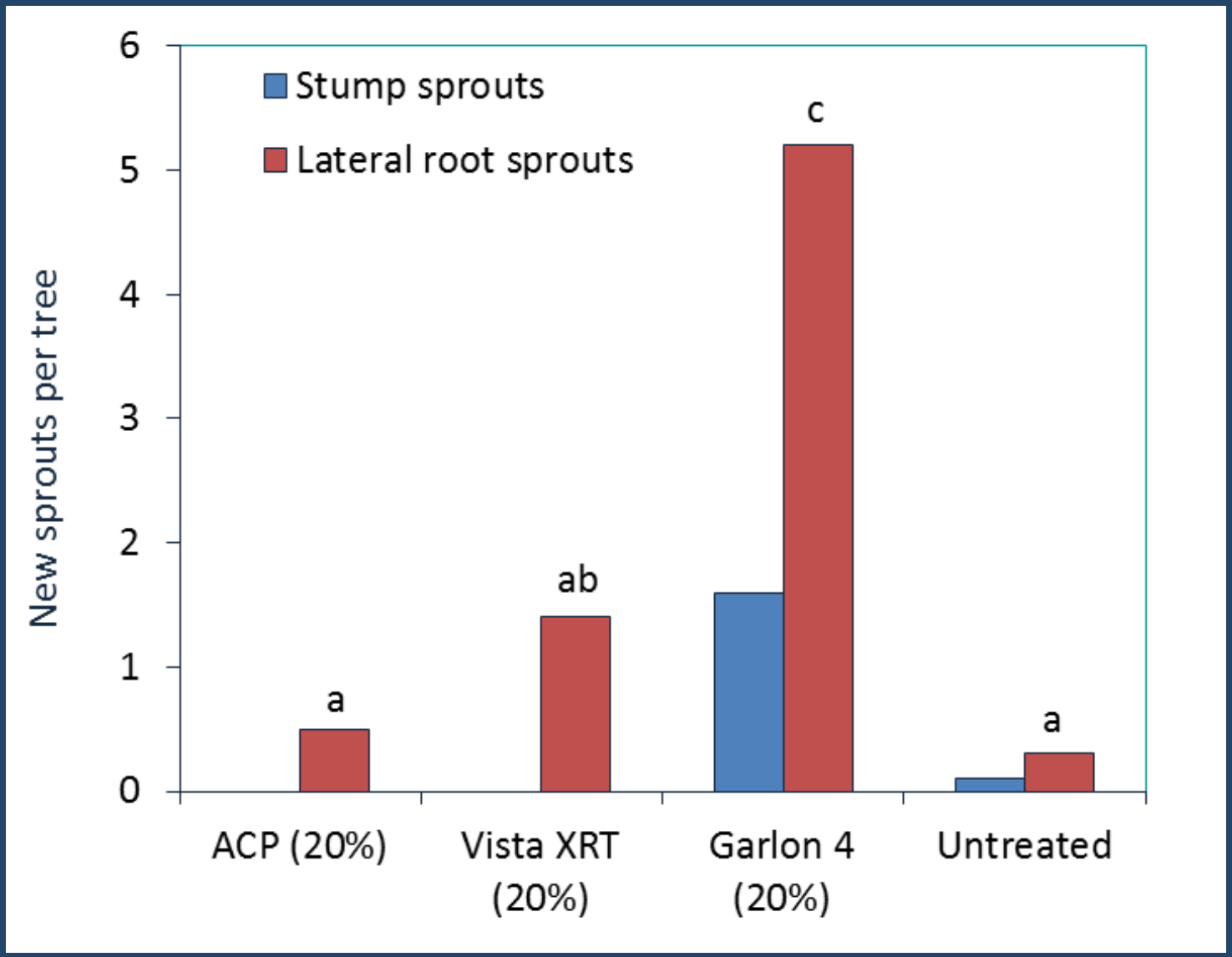
Applied December 2011

- Garlon 4
  - 10% v/v
  - 20% v/v
- Vista XRT
  - 10% v/v
  - 20% v/v
- Aminocyclopyrachlor (ACP)
  - 10% v/v
  - 20% v/v
- Untreated

Chinese tallowtree mortality following basal bark treatment (at 21 months)



Tallowtree sprouting 21 months after basal bark treatment



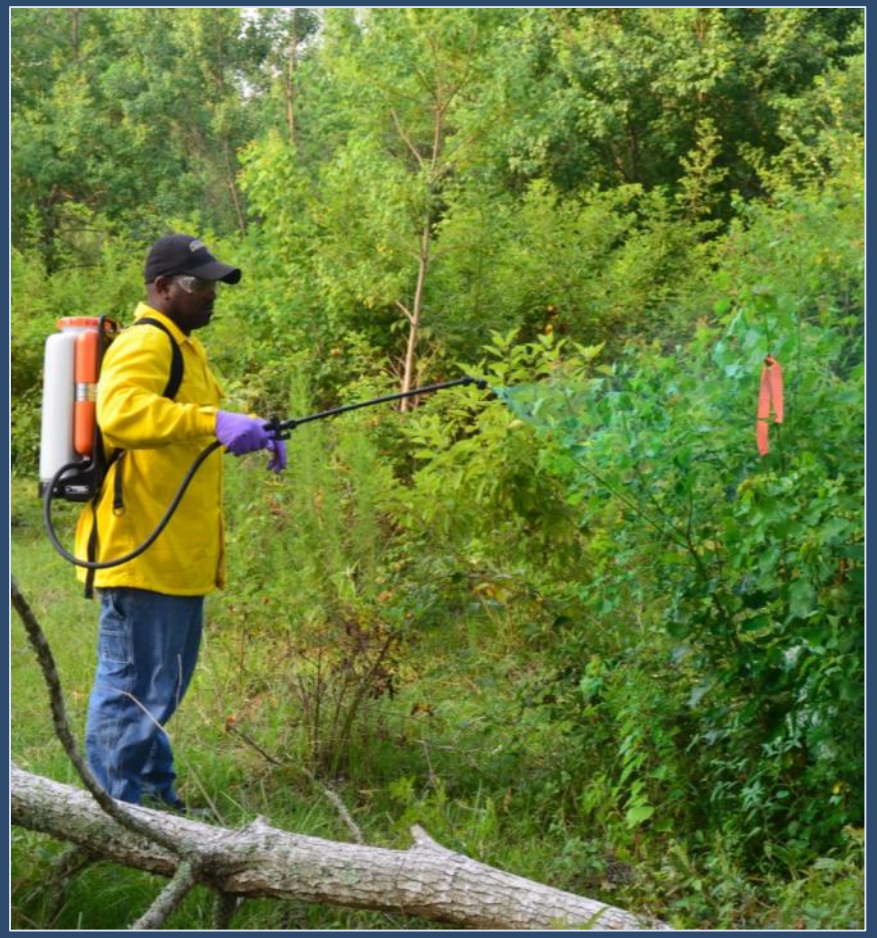
means followed by same letter are not significantly different (p=0.05)

Sprouting following basal bark treament

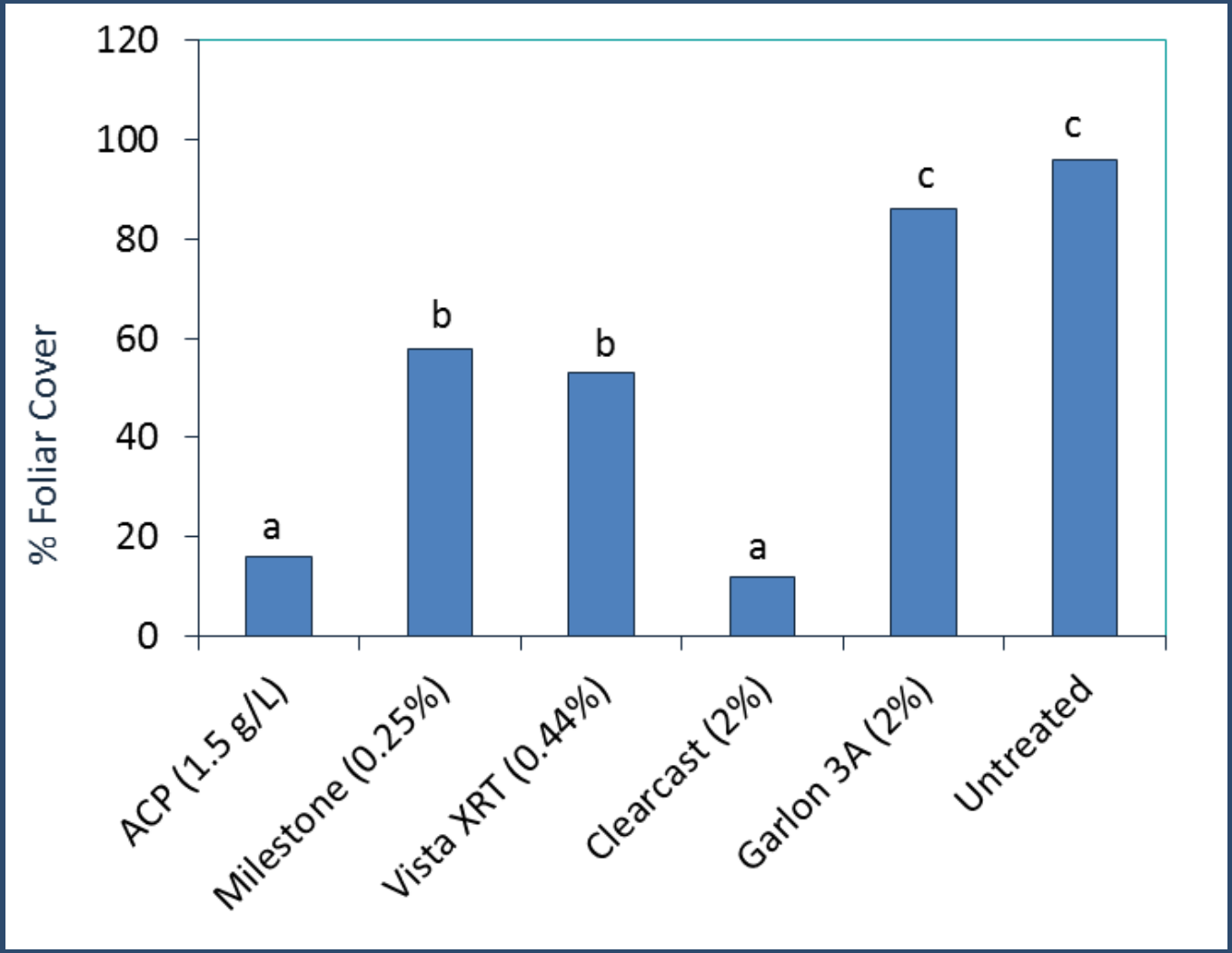
Foliar treatments

Applied June 2012 … after about 4.5 ft of regrowth (cut Jan 2011)

- Garlon 3A
  - 2% v/v
- Clearcast
  - 2% v/v
- Milestone
  - 0.25% v/v
- Vista XRT
  - 0.44% v/v
- ACP
  - 1.5 g/L
- Untreated

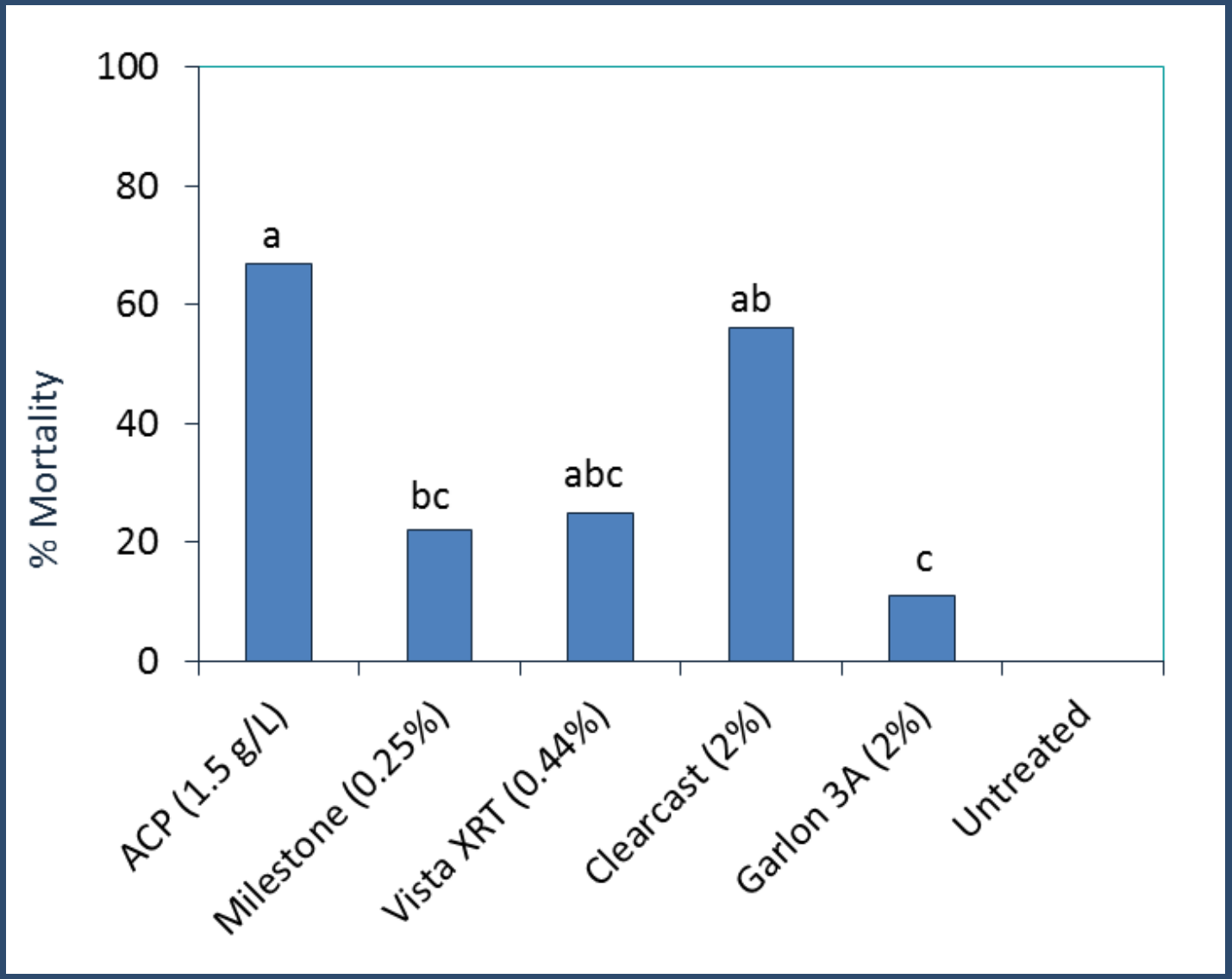


Chinese tallowtree response to foliar treatment at 15 months- foliar cover



means followed by same letter are not significantly different (p=0.05)

Tallowtree mortality 15 months after foliar treatment



means followed by same letter are not significantly different (p=0.05)

Promising new herbicides for tallowtree control

- Milestone for cut stump
- ACP and Vista XRT for basal bark
- Clearcast and ACP for foliar

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ANR-2232

Management Options for Chinese Tallowtree

Chinese tallowtree has slender yellow flowers that bloom during the early summer. The distinctive diamond-shaped leaves turn red in the fall.

Chinese tallowtree, *Triadica sebifera* (L.) Small, is one of the most invasive trees in the southeastern United States. It is a classic example of a plant introduced into the United States with good intentions but with very bad outcomes.

Benjamin Franklin is often cited as having introduced the tallowtree into the United States in 1772, but the species has been repeatedly promoted over the past 100 years for numerous purposes, including in the soap industry, as an ornamental shade tree, for honey production, and, most recently, for bioenergy. Chinese tallowtree is an ecosystem transformer with tremendous negative impacts in wetlands, pastures, prairies, and forests. In almost all of these areas, tallowtree invasion frequently results in a closed canopy tallowtree forest with few other species present.

Multiple factors can make tallowtree management difficult. It produces large numbers of fruits, which are spread by water and are consumed and spread by many species of birds. Bottomlands subject to periodic flooding may be repeatedly reinfested from upstream seed sources. Tallowtree is also an aggressive sprouter and rapidly regenerates from both stumps and lateral roots, so mechanical control methods frequently exacerbate the problem.

Multiple factors can make tallowtree management difficult.

This publication provides recommendations for several control techniques that can be used for tallowtree across a range of environments. Some discussion of techniques that do not work is also provided. Not all techniques can be used in all situations, and tallowtree frequently grows along water in places that are difficult to access.

Physical Removal

Seedlings may be pulled when they are very small, but hand pulling is not generally an effective option for controlling established tallowtree. Tallowtree rapidly establishes a deep taproot, making saplings difficult to

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Herbicide Treatment and Application Method Influence Root Sprouting in Chinese Tallowtree (*Triadica sebifera*)

Stephen F. Enloe, Nancy J. Loewenstein, Douglas Streett, and Dwight K. Lauer*

Chinese tallowtree is an invasive tree found throughout the southeastern United States and in California. Its negative effects can be seen in numerous natural and managed ecosystems, including bottomland hardwood forests, pastures, pine plantations, and along lakes, ponds, streams, and rivers. Despite its troublesome presence for many decades, relatively few effective control strategies are available. Root sprouting following management efforts is a major impediment to successful control. Studies were conducted in Alabama and Louisiana at three locations to test several herbicides for cut stump, basal bark, and foliar individual plant treatment (IPT) methods. Herbicide treatments included triclopyr amine and ester formulations, imazamox, aminopyralid, aminocyclopyrachlor, and fluroxypyr. Data were collected just before leaf senescence at one and two growing seasons after treatment and included Chinese tallowtree foliar cover, number of stump or root collar sprouts, and number of sprouts originating from lateral roots within a 1-m radius of each tree. For the cut stump and basal bark studies, most herbicide treatments prevented sprouting from the stump or root collar region better than they did from the lateral roots. Aminopyralid reduced total sprouting better than all other treatments in the cut stump study. The high rates of aminocyclopyrachlor and fluroxypyr resulted in the highest mortality in the basal bark study. Aminocyclopyrachlor reduced total sprouting better than all other herbicides in the foliar treatment study. Triclopyr amine and ester formulations, which are commercial standards, did not consistently control Chinese tallowtree across these IPT studies. These studies provide some promising treatments to increase the number of effective tools that can be used to manage Chinese tallowtree. Additional research is needed to address the prolific nature of lateral root sprouting following any of these treatment methods.

Nomenclature: Aminocyclopyrachlor; aminopyralid; fluroxypyr; imazamox; triclopyr; Chinese tallowtree, *Triadica sebifera* (L.) Small.

Key words: Basal bark, cut stump, foliar treatment, individual plant treatment, invasive plant control.

Chinese tallowtree [*Triadica sebifera* (L.) Small], is an aggressive tree from southeast Asia capable of invading a wide variety of habitat types, including coastal prairies, bottomland hardwood forests, pastures, pine plantations, and areas along lakes, ponds, streams, and rivers (Gan et al. 2009; Meyer 2005). Spread primarily through avian dispersal (Renne et al. 2002), Chinese tallowtree populations have increased rapidly during the past two decades. In Louisiana, Chinese tallowtree has increased more than 500% between 1991 and 2005, and it ranks as the fifth most-common tree (Oswalt 2010). Similar explosive increases in local populations are occurring across the Gulf Coast, extending as far north as central Alabama and southern Arkansas (EDDMapS 2014). Furthermore, models predict that the range of Chinese tallowtree could expand as far north as the Ohio River (Pattison and Mack 2008).

The rapid spread and the ability of Chinese tallowtree to form monospecific stands are of concern to managers of natural areas and managed forests and farms. Chinese tallowtree is reported to displace native species (Bruce et al. 1997), is potentially toxic to livestock (Russel et al. 1969), affects nutrient cycling (Cameron et al. 1989), and is having an increasing effect on production forestry (Wang et al. 2012). In addition to rapid growth, the tremendous reproductive pressure of Chinese tallowtree contributes to invasion success. Mature trees can produce 100,000 seeds yr^{-1} or more (Renne and Gauthreaux 2000), and saplings

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*Associate Professor, Department of Agronomy, University of Florida, Gainesville, FL 32611; Research Fellow IV, School of Forestry and Wildlife Sciences, Auburn University, Auburn, AL 36849; Project Leader, Insects Diseases and Invasive Plants, U.S. Department of Agriculture, Forest Service, Southern Research Station, Pineville, LA 71360; Analyst, Silvics Analytic, Wingate, NC 28174. Corresponding author's E-mail: sfenloe@ufl.edu

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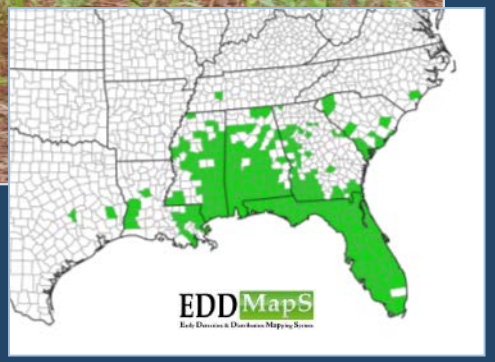
cogongrass research and control

Cogongrass

- **Leaves**
  - Yellowish green
  - 0.5-1 inch wide, serrated edge
  - No obvious stem
  - Dense winter thatch
- **Flowers**
  - 2-8 inches, bright white
  - Wind-dispersed seed
  - Spring (March-June)
- **Rhizomes**
  - Very sharp points
  - Segmented with papery scales
- **Form**
  - Often in circular patches
  - Dense growth (not a bunch grass)
  - 1-5 feet tall



Cogongrass Control with Herbicides

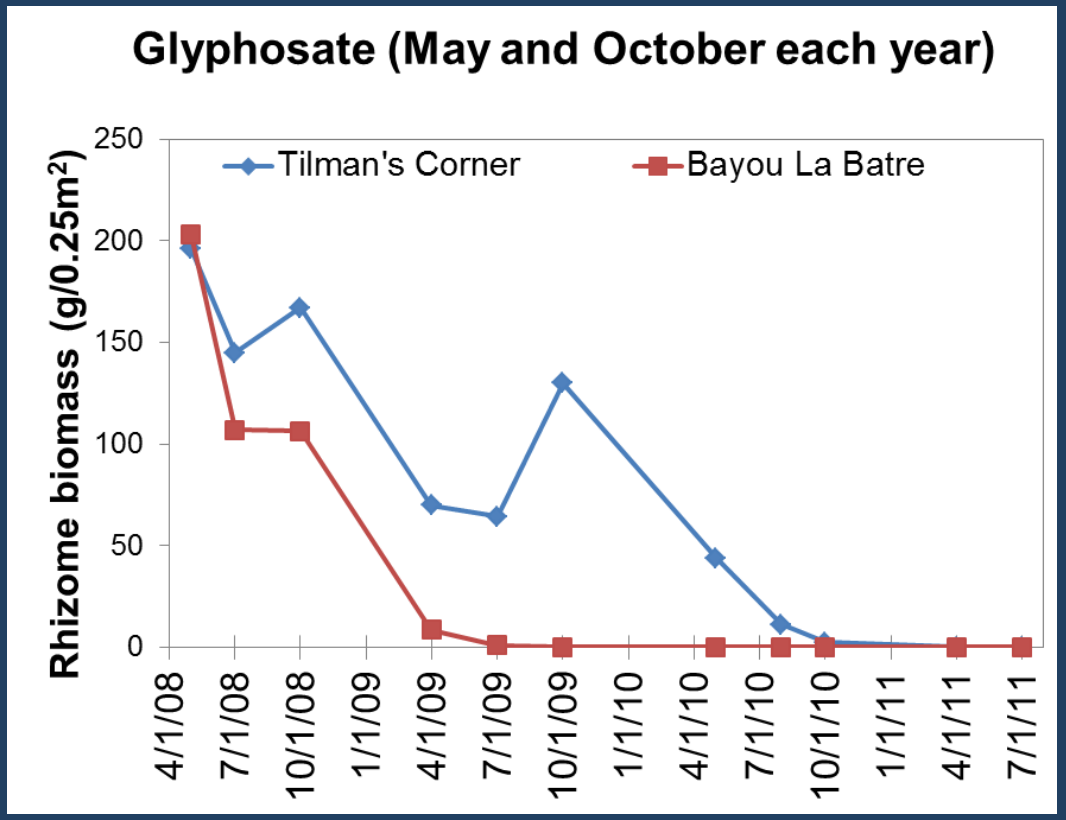
- **Glyphosate** (Accord, Roundup, Glypro, …)
  - 3-4 lb ai/A broadcast
  - 2-5% v/v spot
- **Imazapyr** (Arsenal, Arsenal AC, Chopper Gen 2, …)
  - 0.5-1 lb ai/A broadcast
  - 0.5-2% v/v spot
- **Glyphosate + Imazapyr**

- **Aminocyclopyrachlor with imazapyr** may help with seed suppression on ROWs

Summary of cogongrass control research

- **Glyphosate**
  - One application per year of glyphosate can control cogongrass, but it will take longer
  - Two applications per year of glyphosate is more effective
- **Imazapyr**
  - consistently more effective than glyphosate
- **Glyphosate + Imazapyr**
  - did not provide better control than either used alone in our studies

- Cogongrass can be eradicated on individual sites, but …
- Some sites are easier to control than others, especially when using glyphosate.



Current research: Determine response to glyphosate treatments

- Cogongrass populations from across the Southeast
- Grown in greenhouse
- Dose-response testing with glyphosate
- Evaluate results in light of population genetics and phenotype
- Cooperative agreement with the Forest Service (Dr. Rima Lucardi), with Dr. Stephen Enloe (Univ. of Florida)

Example of phynotypic differences in cogongrass

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ANR-2230

Cogongrass Management FAQ

Cogongrass (*Imperata cylindrica*) is one of the greatest invasive plant threats in Alabama and in the southeastern United States. Although it has been here for more than a century, the problem has dramatically increased in the last 20 years. Many land managers actively and aggressively manage cogongrass and Auburn University researchers have been working on solutions for cogongrass for many years. This publication provides a summary of many years of research and is in the form of answers to the most common questions regarding cogongrass management.

Q: Can I hand pull cogongrass?

Cogongrass has sharp leaf edges and razor-sharp sprouts at ground level making hand pulling quite hazardous. Furthermore, it is extremely difficult to pull cogongrass without leaving behind rhizomes (underground stems), making this approach largely ineffective, even for very small patches.

Q: Will tillage alone control cogongrass?

In areas that can be accessed with machinery, repeated tillage that breaks up the entire rhizome layer will eventually exhaust the energy reserves of cogongrass rhizomes. Tillage fragments the rhizome network, resulting in an increase in new shoot emergence. When repeated after new shoot emergence, tillage will further disrupt growth and decrease stored energy reserves. This approach of repeated tillage can work well over time. If tillage is not repeated, the cogongrass patch may end up thicker than it was to start with. Likewise, shallow, infrequent tillage will generally not control cogongrass. Care must also be taken to clean tillage equipment to avoid spreading rhizomes.

Q: Will prescribed fire control cogongrass?

NO. Prescribed fire at any timing promotes cogongrass to the detriment of almost all other species. Cogongrass can burn hot enough to kill fire tolerant species, even young loblolly and longleaf pine. Burning dense patches of cogongrass when trees are at risk is not recommended. Cogongrass can also be spread by fire-plows that can drag rhizome pieces to uninfested areas.

Fig. 1. Cogongrass fires burn extremely hot.

Q: Will grazing control cogongrass?

Cogongrass was tested as a potential forage crop in Mississippi and Florida more than 80 years ago and was found to be virtually useless. Cattle will graze very young cogongrass shoots, but they tend to avoid it as it matures. Cogongrass is high in silica and low in forage quality. Some cattle producers have used mowing to stimulate new growth for cattle grazing, but this is not an effective control strategy.

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WSSA

Pushing toward Cogongrass (*Imperata cylindrica*) Patch Eradication: The Influence of Herbicide Treatment and Application Timing on Cogongrass Rhizome Elimination

Jatinder S. Aulakh, Stephen F. Enloe, Nancy J. Loewenstein, Andrew J. Price, Glenn Wehtje, and James H. Miller*

Cogongrass, an invasive grass native to Asia, has infested thousands of hectares in the southeastern United States. Although numerous studies have examined cogongrass control, no published studies, to our knowledge, have tested strategies for cogongrass eradication. Cogongrass has a persistent, thick rhizome mat but an ephemeral seedbank; therefore, successful eradication methods must largely focus on the rhizomes. A field study to evaluate specific herbicide treatments and application timings for cogongrass patch eradication was conducted at two locations in southwestern Alabama. Herbicide treatments included glyphosate at 4.48 kg ai ha^{-1}, imazapyr at 0.84 kg ai ha^{-1}, and a tank mix of glyphosate and imazapyr at the same rates. Treatments were applied in May, August, or October for 3 consecutive yr, and the May glyphosate treatment included a second annual application each October. Cogongrass visual control, shoot biomass, rhizome biomass, rhizome depth, and total nonstructural carbohydrate (TNC) content were sampled during the course of the study. Cogongrass response to treatments varied by location but by 36 mo after initial treatment (MAIT), complete elimination of cogongrass shoot and rhizome biomass and 100% visual control was achieved in several herbicide treatment–timing combinations at both locations. These included glyphosate plus imazapyr at any application timing, imazapyr in August or October, and glyphosate applied in May and October each year. TNC levels of surviving healthy rhizomes were not affected by herbicide treatments, but a seasonal pattern was observed. The maximum live-rhizome depth was not influenced by any treatment, indicating that herbicides were not preferentially leaving deeper, surviving rhizomes. These results demonstrate, for the first time, that the entire rhizome layer of cogongrass can be eliminated within 3 yr with multiple treatment options and that cogongrass patch eradication is possible for many land managers.

Nomenclature: Glyphosate; glyphosate plus imazapyr; imazapyr; cogongrass, *Imperata cylindrica* (L.) Beauv. IMPCY.

Key words: Cogongrass, application timing, eradication, herbicide, rhizome elimination.

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* First, second, and fifth authors: Graduate Research Assistant, Associate Professor, and Professor, Department of Agronomy and Soils, Auburn University, Auburn, AL 36849; third author: Extension Specialist, School of Forestry and Wildlife Sciences, Auburn University, Auburn AL 36849; fourth author: Plant Physiologist, National Soil Dynamics Laboratory, Agricultural Research Service, U.S. Department of Agriculture, 411 South Donahue Drive, Auburn, AL 36852; sixth author: Research Ecologist (Emeritus), G. W. Andrews Forestry Sciences Laboratory, U.S. Department of Agriculture, Forest Service, 521 Devall Drive, Auburn, AL 36849. Corresponding author's email: jsa0005@tigermail.auburn.edu

The term *weed eradication* is often misinterpreted to mean *weed control*, especially by public policy makers; however, the terms are not synonymous (Zamora et al. 1989). *Eradication* is broadly defined as the destruction of every propagule of a species from an area, with sufficient natural or constructed barriers to prevent reinvasion (Newsom 1978; Zamora et al. 1989). Eradication is clearly a difficult prospect, and there is a widespread view that it is not generally feasible for most invasive plants. However, several weed eradication projects have been successful, including the eradication of southern sandbur (*Cenchrus echinatus* L.) from Laysan islands in northwestern Hawaii

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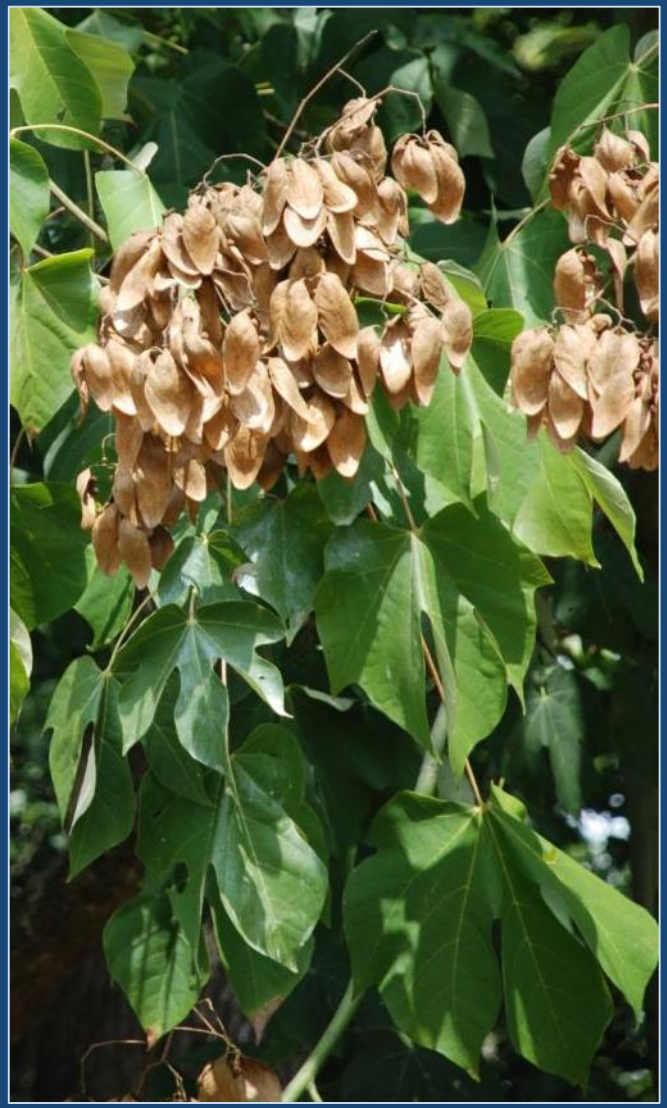
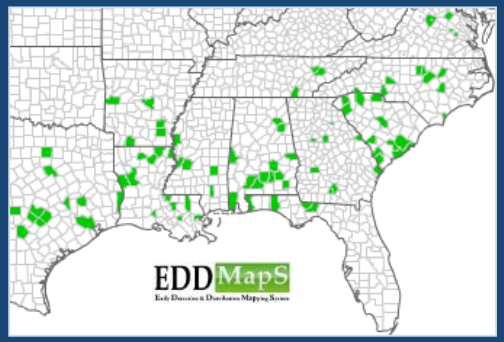
Invasive Plants on the Horizon

Chinese parasoltree
(*Firmiana simplex*)

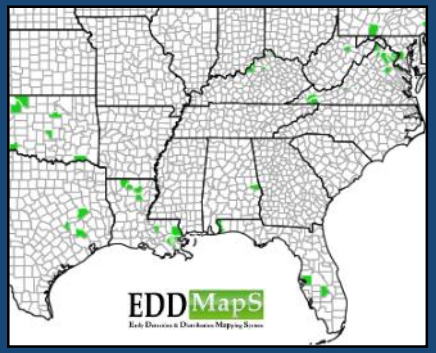




Chinese elm, lacebark elm *(Ulmus parvifolia)*

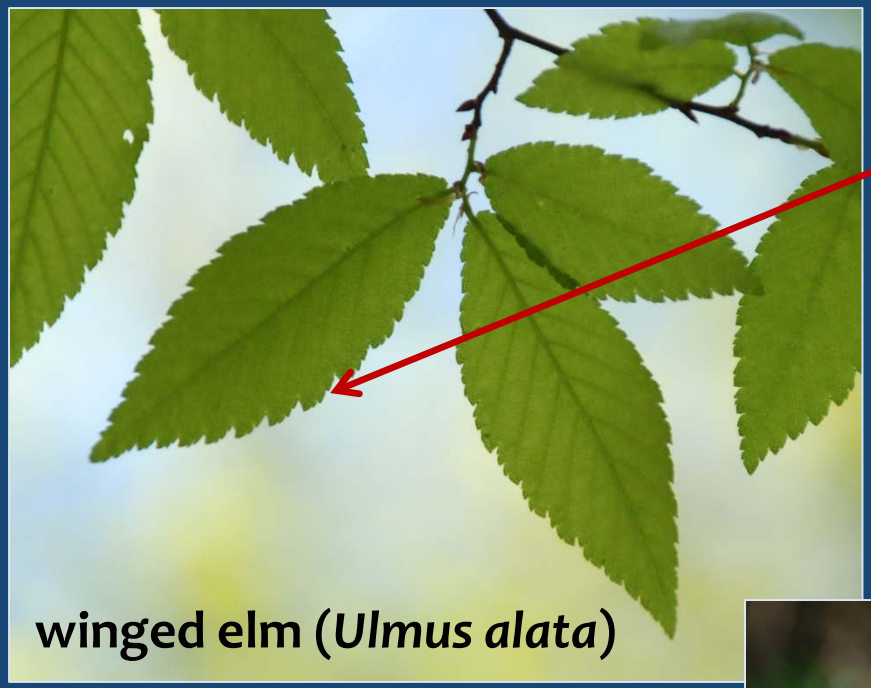
distinctive bark

flowers and fruits in the fall



serrate margin, base may be slightly unequal

no corky ridges on stems



winged elm (*Ulmus alata*)

doubly serrate margin

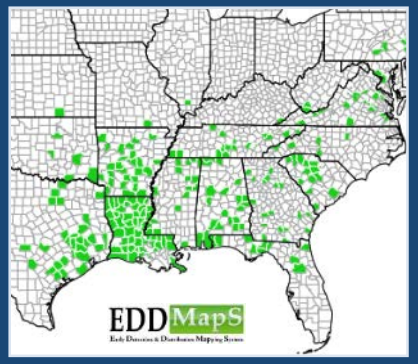
singly serrate margin

Chinese elm

Photos: Nancy Loewenstein, Auburn University

trifoliate orange *(Citrus trifoliata syn. Poncirus trifoliata)*

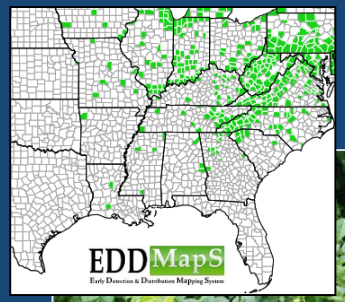
white flowers with five petals



fruit … small oranges with big seeds

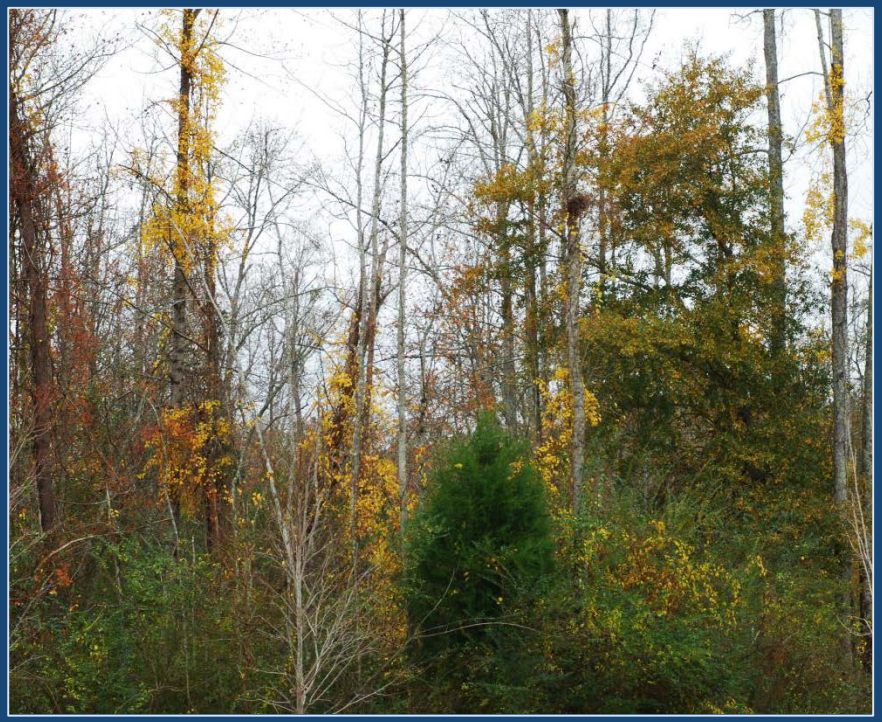
dense growth

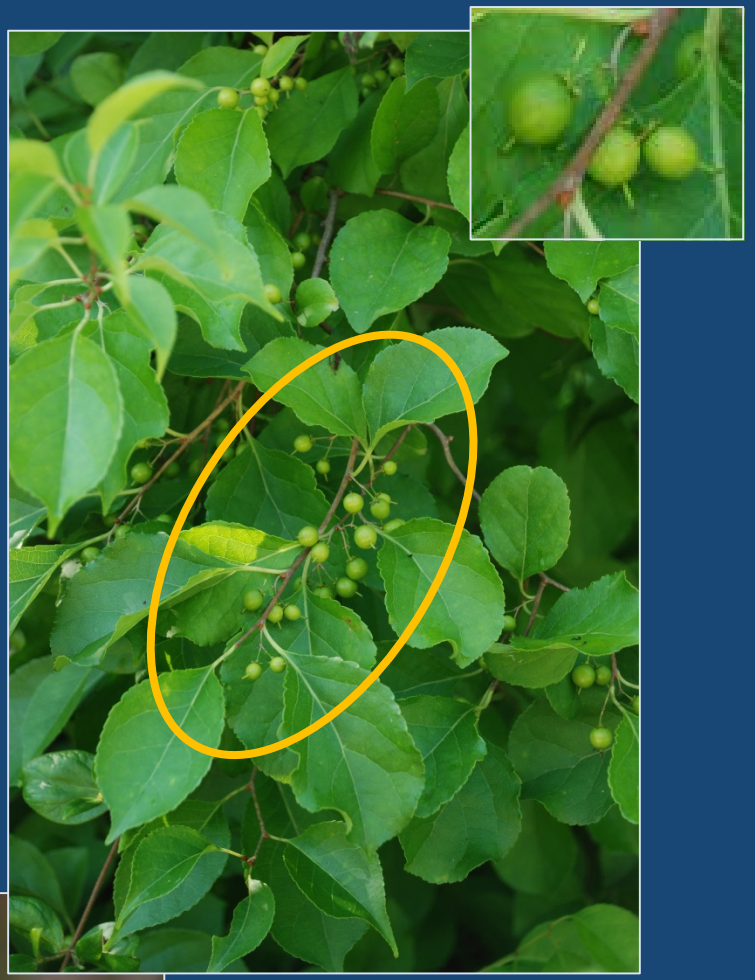
Oriental bittersweet *(Celastrus orbiculatus)*



Photos: Nancy Loewenstein, Auburn University

Oriental bittersweet





fall color – yellow leaves, red fruit

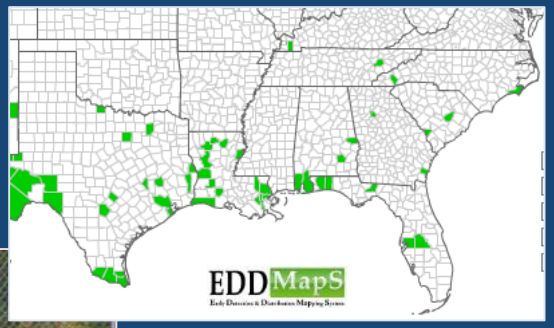
plants are usually dioecious … separate male and female plants

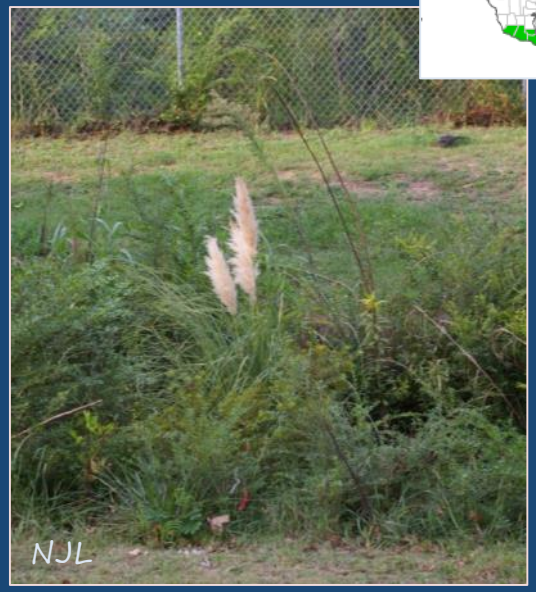
tropical bushmint (*Hyptis mutabilis*)

mint family – stems square

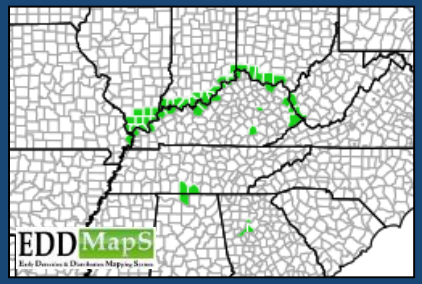
leaves opposite, serrate margin, unpleasant odor when crushed

pampas grass
(Cortaderia selloana)

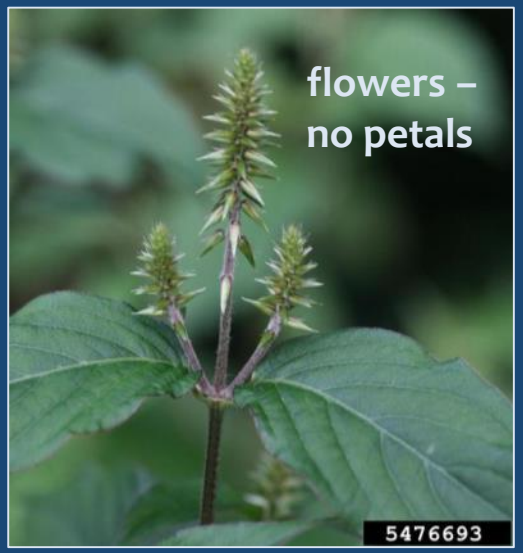




Japanese chaff flower *(Achyranthes japonica)*



blooms late summer through early fall

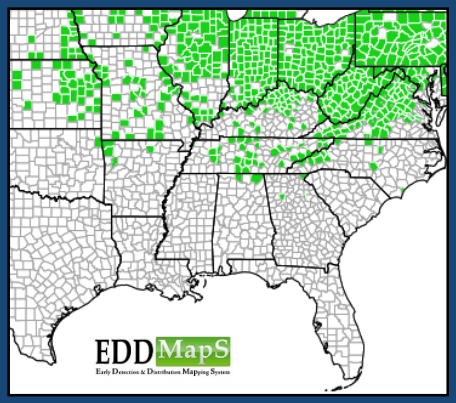


Leaves opposite with entire margins

seed dispersal!

Photos: Chris Evans, www.bugwood.org

garlic mustard *(Alliaria petiolata)*



basal rosette the first year … leaves kidney shaped with coarsely toothed margins.

cool season biennial … garlic odor when crushed

garlic mustard

Second year … stems elongate and flowers are produced. Leaves more triangular.

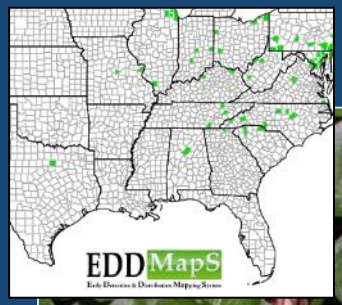
flowers - 4 white petals

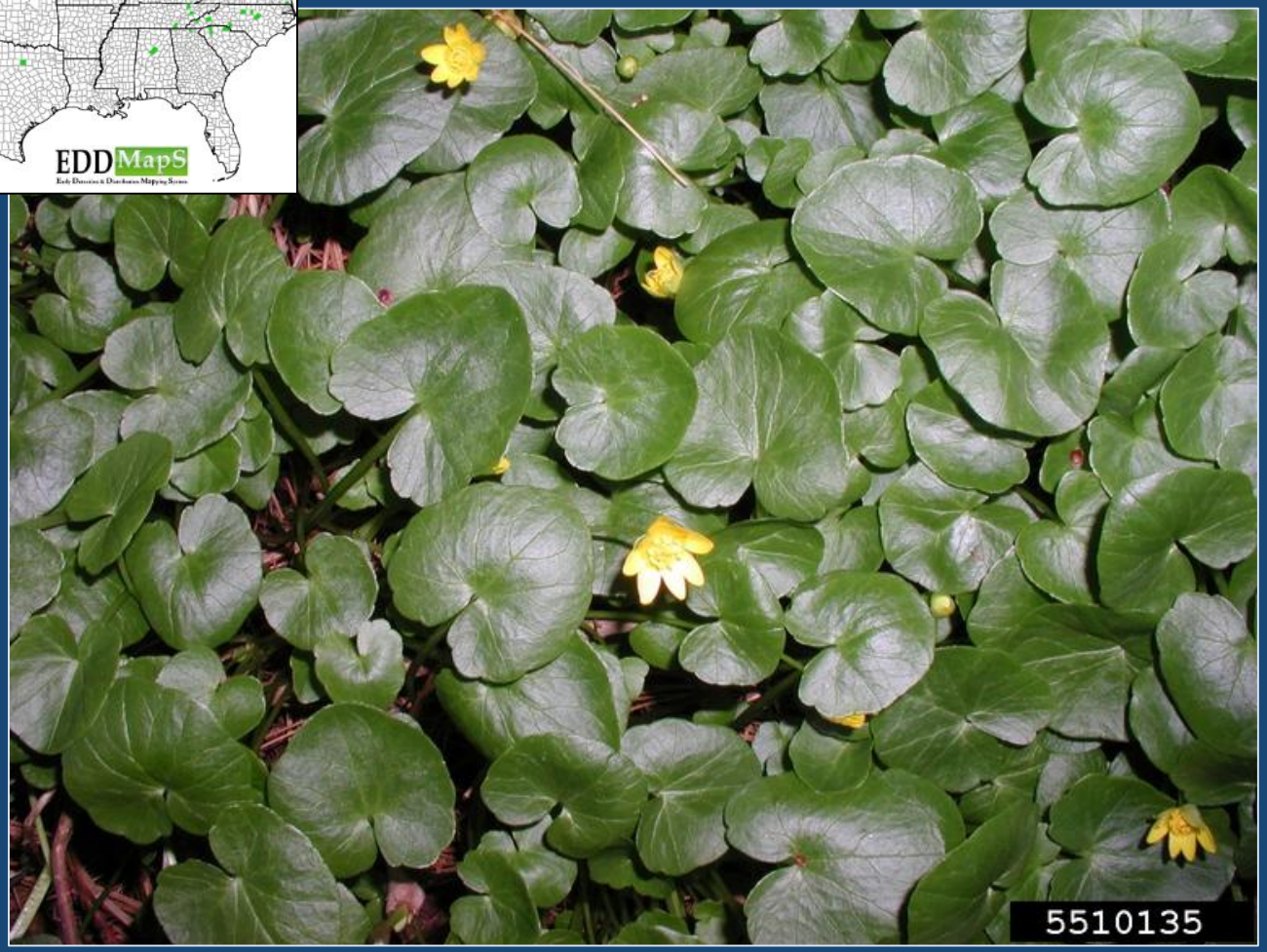
fruit – narrow green pods, turn tan then explode, dispersing seed

photos: www.bugwood.org

fig buttercup, lesser celandine

(Ficaria verna)





leaves are dark shiny green, kidney- to heart-shaped, rubbery

Showy flowers, typically eight petals

Under the radar?

Ficaria verna quietly naturalizing in the Southeast

Fig buttercup is not well-known in the Southeast. More accurately, most people have never even heard of it.

A few minutes on the internet reveals that fig buttercup — aka lesser celandine (*Ficaria verna*, formerly *Ranunculus ficaria*) is a perennial with origins in Europe and northern Africa; that it has been cultivated in the US for over 150 years; that Wordsworth wrote poems praising it; that it is available in the nursery trade; and that it is reported to be invasive in ten states and the District of Columbia, and is on the noxious weed list in Connecticut and Massachusetts.

In April 2013 it was discovered in Greenville County, SC. After having met the plant, we feel that it is vital to make the Southeast's invasive plants community aware that it is HERE (not just in the Northeast), and that it poses a very serious threat.

An article documenting its discovery in Asheville, NC, in 2011 first brought the plant to our attention:

"Fig buttercup is a vigorously growing herbaceous plant that completes its growth cycle during winter and spring.... Its emergence before most native species gives it a great competitive advantage. Once established, it spreads rapidly, forming a solid green blanket... which native plants are unable to penetrate.... The plant makes numerous tubers and bulblets, each of which can grow into a new plant once separated from the parent plant. These are spread by animals, well-meaning human weed pullers and water events. Because of its short growth cycle [Dec.-May] there is a limited window of opportunity for controlling it..." (Cone 2011).

Two years later we would have the opportunity to see it for ourselves, when a birder spotted a patch of unfamiliar bright yellow flowers in Lake Conestee Nature Park, and, on April 4, 2013, was curious enough to ask about them.

Most North American floristic treatments have not emphasized sub-specific differences, but a recent review of herbarium collections has confirmed that all five currently recognized subspecies are present in the United States (Post et al. 2009). The one we found is *Ficaria verna* subsp. *verna* (Weakley 2012).

Once established, Ficaria verna forms a solid green blanket which excludes all other vegetation.

Fig buttercup's flowers are yellow with a slightly darker center, typically with 8 petals.

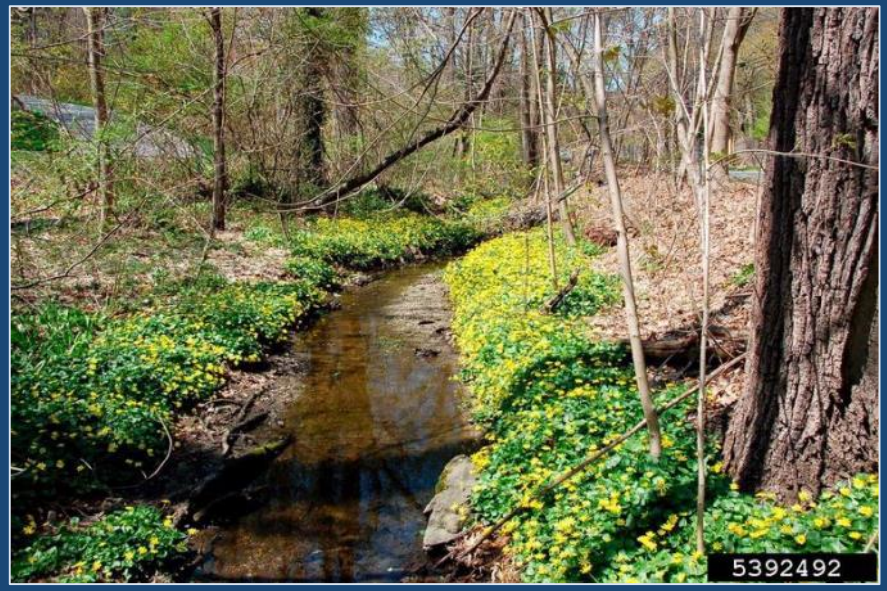
On April 9th, the newly discovered plants were in full bloom. Flowers are a buttery yellow with a slightly darker center, typically with 8 petals but sometimes more (Swearingen 2010).

The Plant Conservation Alliance states, "When in full bloom, large infestations of lesser celandine appear as a green carpet with yellow dots, spread across the forest floor" (Swearingen 2010). These mono-cultural "carpets" may cover several acres. By way of comparison, ours were "scatter rugs" — some loosely strung together in furrows channeled by the adjacent Reedy River. The Reedy flows

WILDLAND WEEDS 11

Wildland Weeds - Spring 2014

fig buttercup



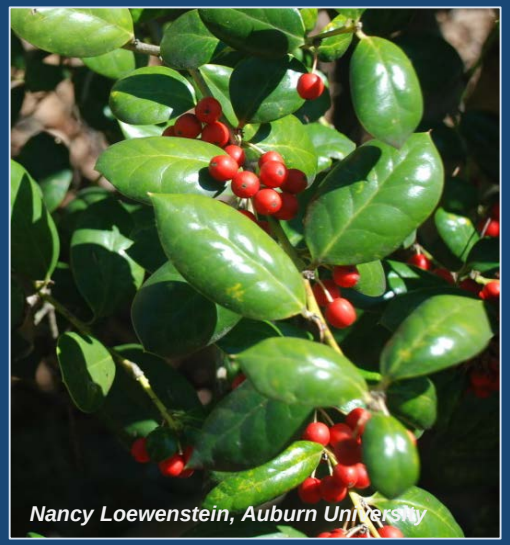
Plants form dense infestations and then die back after flowering (short life cycle).

tubers and bulbils* produce new plants

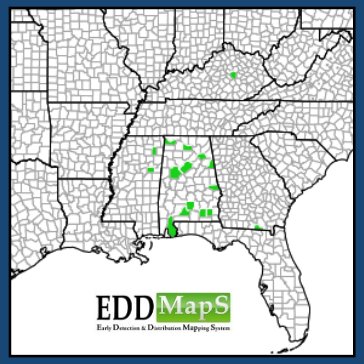
photos: www.bugwood.org

*** not all subspecies produce bulbils**

Chinese holly *(Ilex cornuta)*



There are many cultivars … spines are lacking in some.



glossy, leathery, evergreen leaves … terminal spine points down, next two point up like horns (scientific name '*cornuta*' means horn)

EDDMapS

Early Detection & Distribution Mapping System

Welcome:
Nancy Loewenstein , Auburn University
Logout

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Invasive Species Mapping Made Easy!

EDDMapS, started in 2005, is now providing a picture of the distribution of invasive species across the U.S. and Canada

- Fast and easy to use - no knowledge of GIS required
- Web-based mapping of invasive species distribution to help fill gaps and identify "leading edge" ranges
- Facilitates Early Detection and Rapid Response implementation with online data entry forms, e-mail alerts and network of expert verifiers
- One Database for both local and national data
- Data can be searched, queried and downloaded in a variety of formats
- Cooperates with and aggregates data from other invasive species mapping projects
- Custom/hosted applications can be quickly and inexpensively developed

BRING THE POWER OF EDDMAPS TO YOUR SMARTPHONE

Introducing BugwoodApps - comprehensive mobile

Who's Using It?

- Southeast Exotic Pest Plant Council
- Alaska Exotic Plant Information Clearinghouse
- Missouri River Watershed Coalition
- Biological Control Agents of Weeds
- Florida Invasive Species Partnership
- Invaders of Texas
- Mid-Atlantic Invasive Plant Council
- Appalachian Trail Conservancy
- EDDMapS Alberta - Alberta Invasive Plants Council
- National Wildlife Refuge Early Detection Network for New England
- Outsmart Invasive Species
- Invasive Plant Atlas of New England
- What's Invasive - Coming Soon

Statistics

1,947,176 County Reports
1,081,095 Point Reports
2,433 Species / 11,930 Users

Educational Resources

http://www.eddmaps.org

Bugwood Apps - the Center for Invasive Speices and Ecosystem Health - Windows Internet Explorer

http://apps.bugwood.org/seedn.html

File Edit View Favorites Tools Help

Favorites | Trees, Shrubs, and Woody ... | apa Alabama Plant Atlas | 7-Day Forecast for Latitude... | Trees of Alabama & the Sou... | AlaBama Plant conservation...

Bugwood Apps - the Center for Invasive Speices and ...

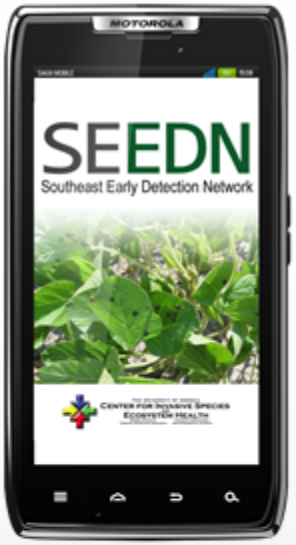
Page Safety Tools

Southeast Early Detection Network

Submit invasive species observations directly with your iPhone from the field.

Features:

- GPS automatically captures your current location
- Submit an image of your sighting to add validity to your report
- Online reporting
- Offline reporting: reports saved on your phone to upload when you have network connectivity
- Species ID Guides include images and information on the worst non-native invasive plants, insects and plant pathogens in the Southeastern United States
- Provides real-time point distribution maps centered on your current location
- Invasive species resources



There's an APP for that!
http://apps.bugwood.org

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Questions?
loewenj@auburn.edu