Webinar Coordinator
Holli.Kuykendall@gnb.usda.gov

Today's presentation will start momentarily.
Press *1 from your telephone handset or toggle the raised hand on/off for Operator Assistance.

Use Notes addressed to "All Moderators" to ask questions during the presentation.

USDA NRCS
East National Technology Support Center
2014 Webinar Series

Webinar Moderator
Thomas.Ward@gnb.usda.gov

Date	2014 ENTSC Webinar Topics
Jan 29	Addressing Resource Concerns…NRCS' New Land Use Planning Criteria
Feb 26	Overview and Recent Updates of Engineering Field Tools
Mar 26	Wetland Restoration Hydrology and Design Overview
Apr 30	Writing a Seeding Plan for Conservation Practices: Critical Areas, Natives and More
June 18	**Managing Troublesome Invasive Grasses in Eastern Forests**
Jun 25	Forage Mixes and Cover Crops for Grazing Management
Jul 30	Planning Considerations for Confined and Other Animal Feeding Operations
Aug 27	Solar-powered Water Systems for Grazing Operations
Sep 24	Basic Pump and Pipeline Design
Oct 29	Planning and Design of Stream Crossings
Nov 19	Fencing for Livestock and Improved Pasture Management

Replays are available approximately one week after the live webinar.

CEUs and Certificates

Return to the webinar portal and complete Step 2 when the presentation has concluded

Take a brief post-test

Enter your certification credentials, including your certification number, if appropriate

Receive by email your training certificate

The ENTSC submits Professional CEUs the first of the month on your behalf (CCA, SAF, AFGC, TWS, and/or SRM), but not for Conservation Planner or other state-specific certification programs

Join information for our webinars is made available at the Science and Technology Training Library at ConservationWebinars.net. The webinar portal at ConservationWebinars.net is provided in partnership with Southern Regional Extension Forestry.

SREF

Managing Troublesome Invasive Grasses in Eastern Forests

Stephen F. Enloe

Extension Weed Specialist

Auburn University

ALABAMA COOPERATIVE Extension SYSTEM

Alabama A&M and Auburn Universities

AUBURN UNIVERSITY

Special thanks to:

- Nancy Loewenstein

  Invasive Plant Extension Specialist

  School of Forestry and Wildlife Sciences

  Auburn University

Invasive Grass Discussion Outline

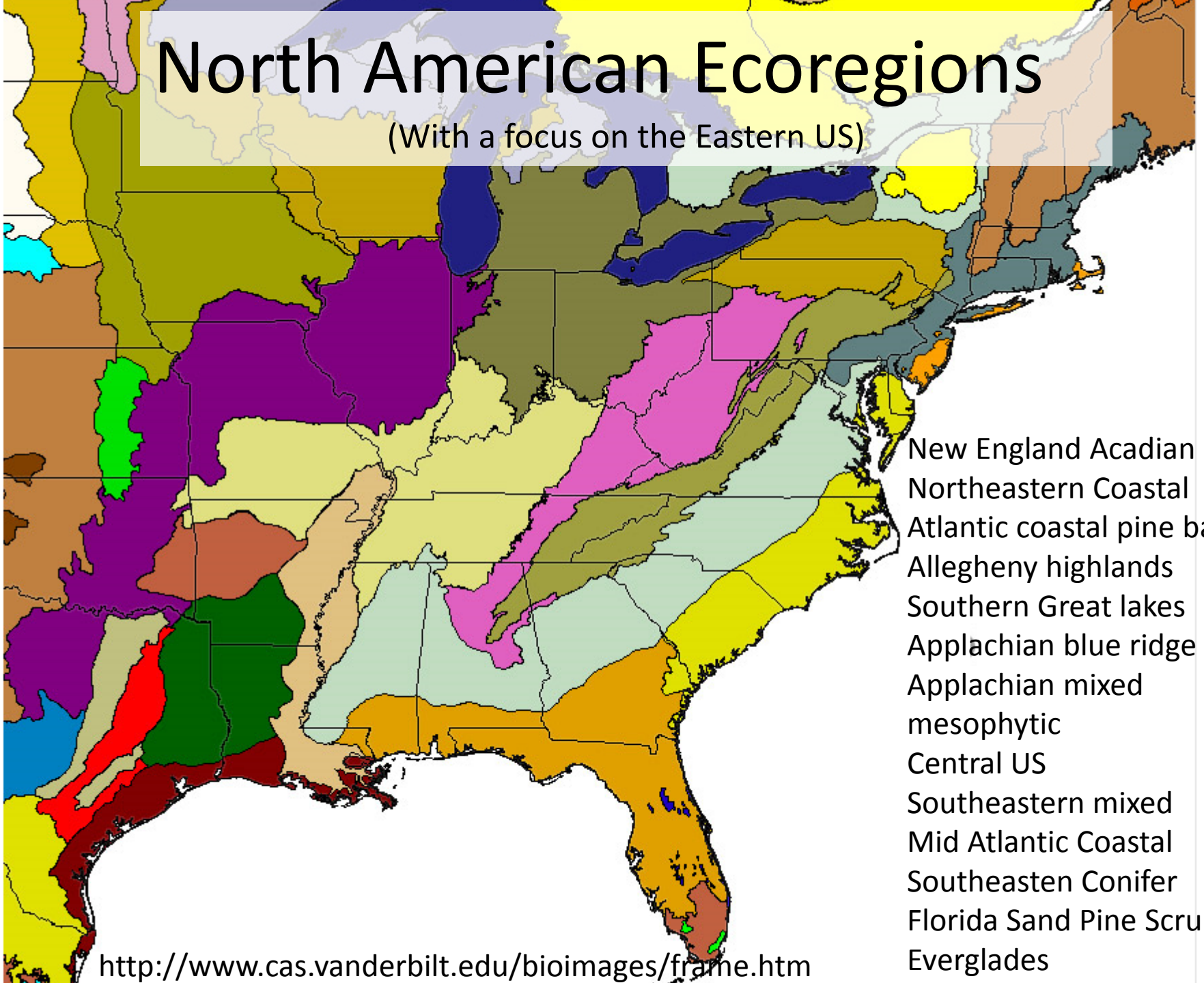
- Overall Concepts: the problem in and around Eastern US Forests
- Biology: Compare key reproductive characteristics of invasive grasses
- Management: Link biology and control techniques for maximum effectiveness
- Conclusions: Tie it all together

Species to cover today

- Cogongrass
- Common reed (Phragmites)
- Golden bamboo
- Giant reed (Arundo)
- Japanese stiltgrass
- Miscanthus (Chinese silvergrass)

North American Ecoregions

(With a focus on the Eastern US)



New England Acadian
Northeastern Coastal
Atlantic coastal pine barrens
Allegheny highlands
Southern Great lakes
Applachian blue ridge
Applachian mixed mesophytic
Central US
Southeastern mixed
Mid Atlantic Coastal
Southeasten Conifer
Florida Sand Pine Scrub
Everglades

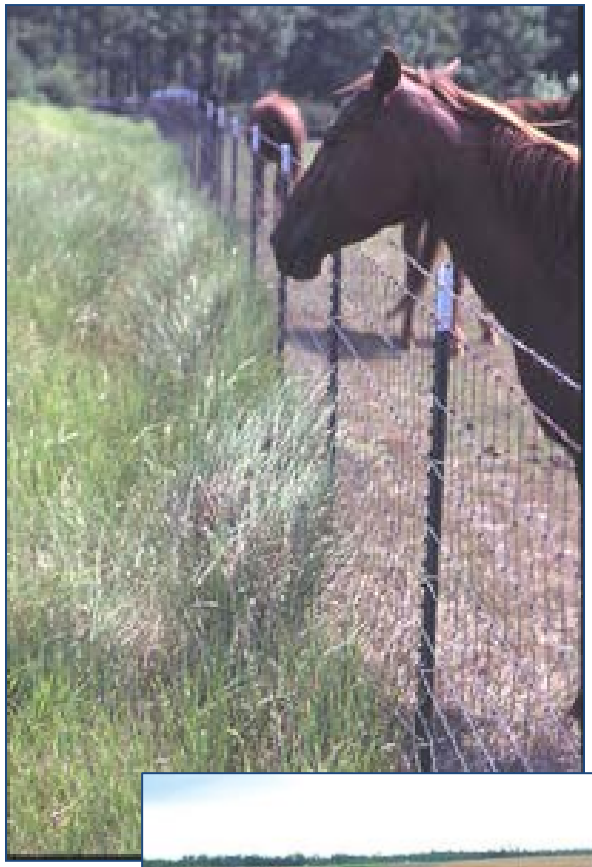
http://www.cas.vanderbilt.edu/bioimages/frame.htm

Invasive Grasses: Origin, History and Introductions

- Primarily of Asian Origin
- Both unintentionally and intentionally introduced
  - Accidental Contaminants (cogongrass, Japanese stiltgrass)
  - Potential Forages (cogongrass)
  - Soil stabilization (cogongrass)
  - Horticultural purposes (Giant reed, bamboo, Miscanthus)
  - Unknown (Common reed)

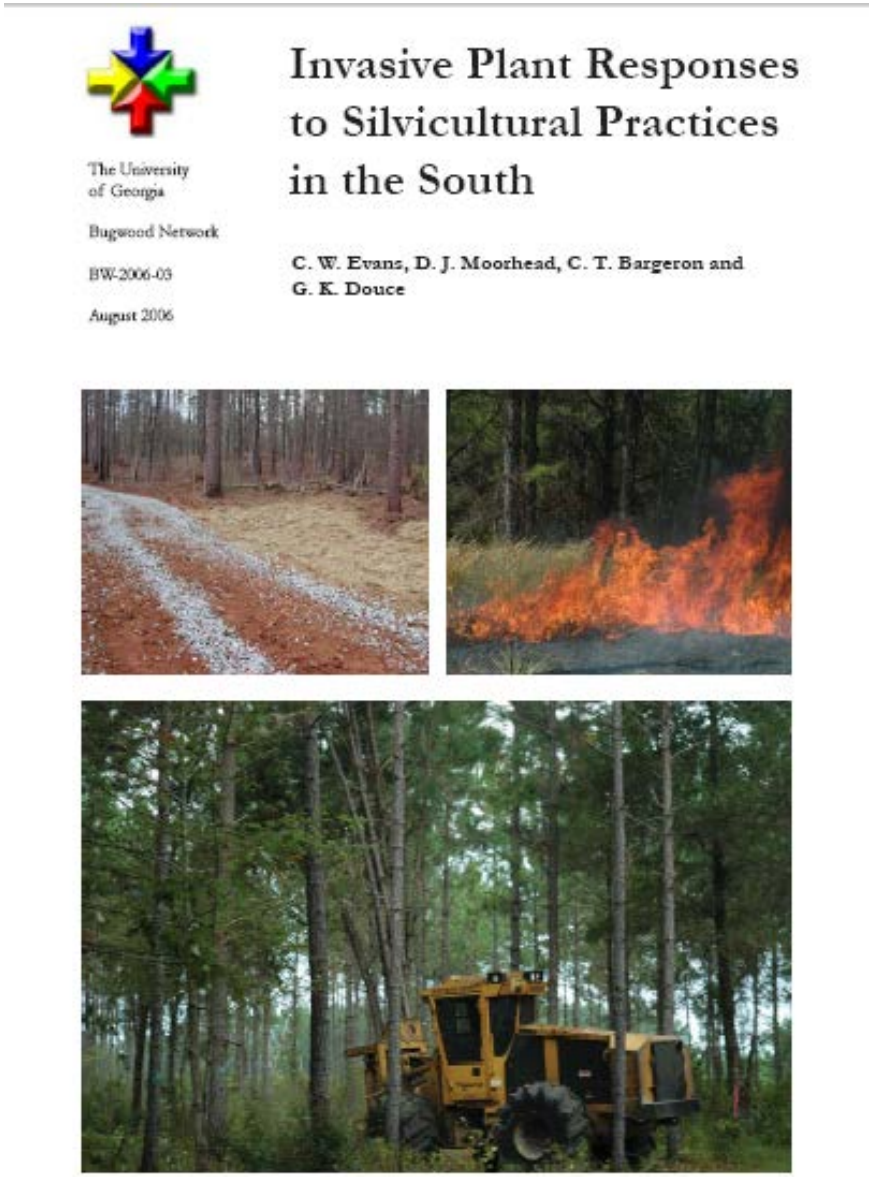
Be careful who you pick up…

Forage and soil stabilization



Horticultural uses of Miscanthus, Giant reed, and bamboo

Land use change has greatly enhanced opportunities for invasion



http://www.invasive.org/weedcd/pdfs/silvicsforinvasives2.pdf

Impacts of Invasive Grasses

- Minor alterations to complete ecosystem transformation
  - Change ecosystem structure
    - Form monotypic stands
      - Reduce plant species richness and diversity
  - Change disturbance regimes
    - Create continuous, fine fuel (litter and thatch) layers
      - Increased fire frequency and fire intensity
  - Change nutrient cycling and microbial communities
    - Altered nitrogen and carbon cycles
  - Inhibit forest regeneration
    - Loss of conifer and hardwood establishment and growth
  - Alter management options

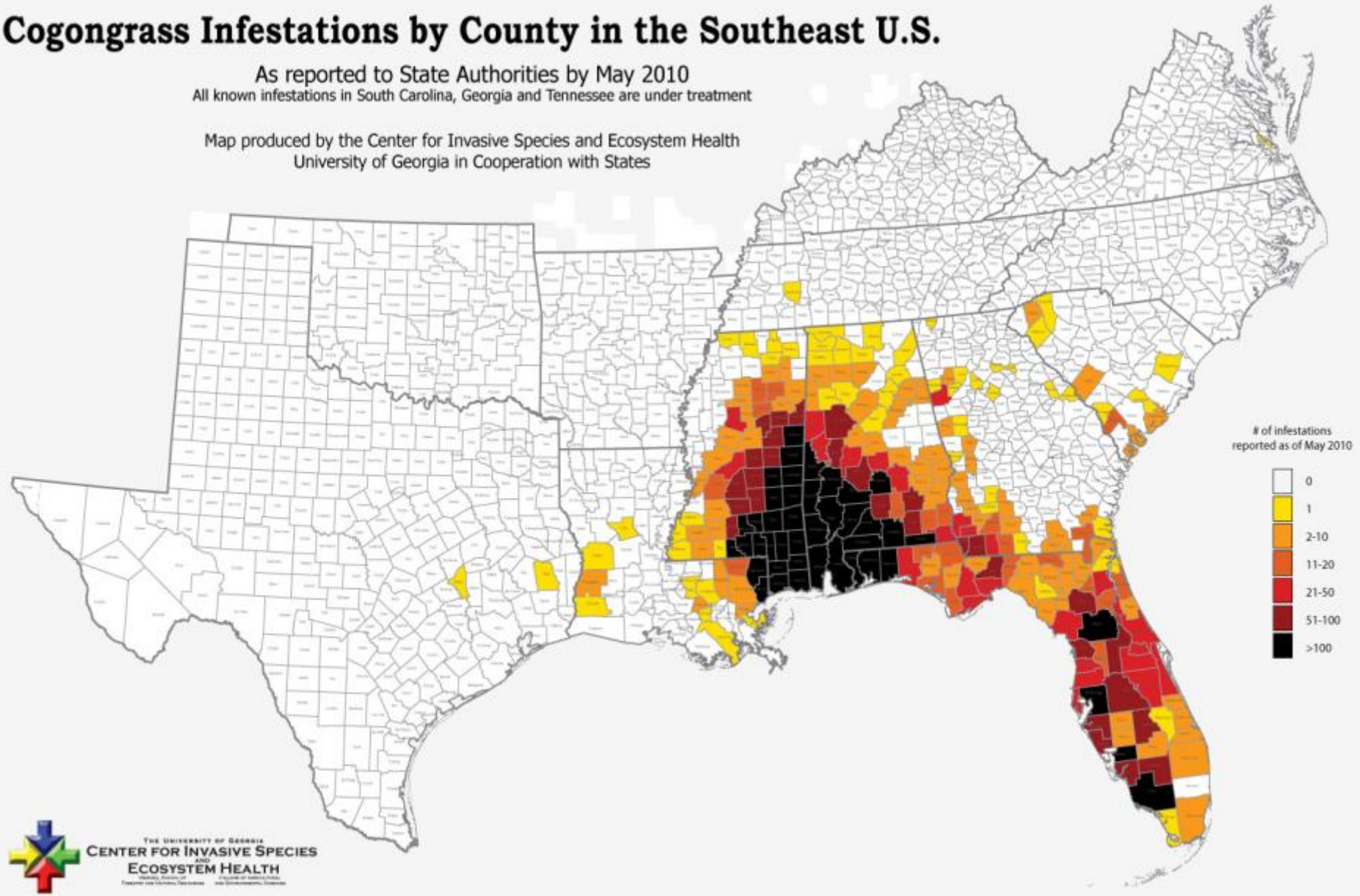

Cogongrass (*Imperata cylindrica*)

Cogongrass Infestations by County in the Southeast U.S.

As reported to State Authorities by May 2010

All known infestations in South Carolina, Georgia and Tennessee are under treatment

Map produced by the Center for Invasive Species and Ecosystem Health
University of Georgia in Cooperation with States



The University of Georgia
Center for Invasive Species and Ecosystem Health

Cogongrass growth 1 month after burning


03/05/2008

Cheatgrass (*Bromus tectorum*) in the Western USA

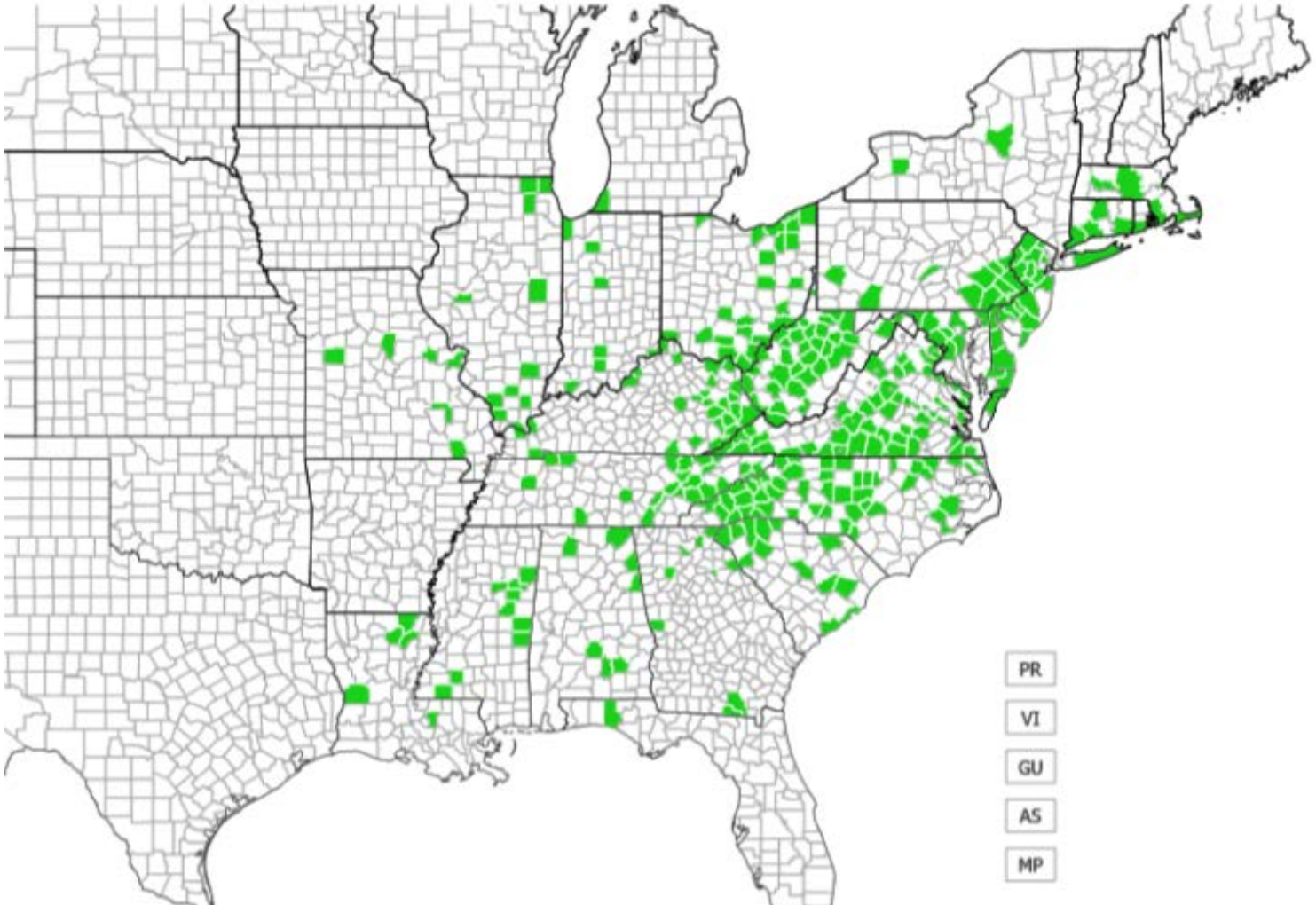
Miscanthus (*Miscanthus sinensis*)

Chinese silvergrass

Miscanthus sinensis Anderss.

http://www.eddmaps.org/southeast/distribution/

Distribution Maps: State / County / Southeast / Points on Google Maps




Lauren Quinn, Bugwood.org
5434709

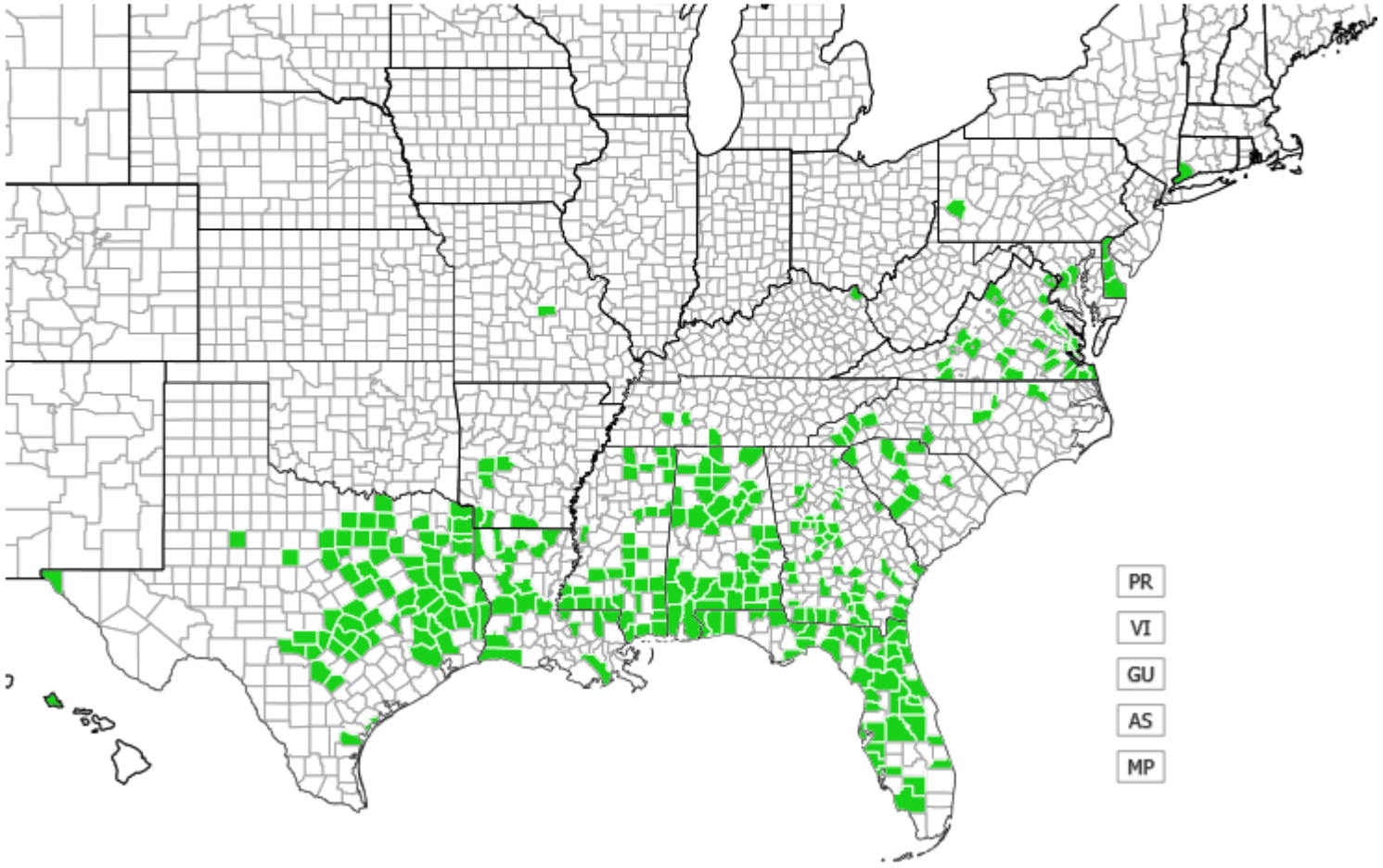
Golden bamboo and other invasive bamboos
Phyllostachys aurea and others

golden bamboo

Phyllostachys aurea Carr. ex A.& C. Rivière

http://www.eddmaps.org/southeast/distribution/

Distribution Maps: State / County / Southeast / Points on Google Maps



Nancy Dagley, USDI National Park Service, Bugwood.org

5344057

James H. Miller & Ted Bodner, Southern Weed Science Society, Bugwood.org

Chris Evans, Illinois Wildlife Action Plan, Bugwood.org

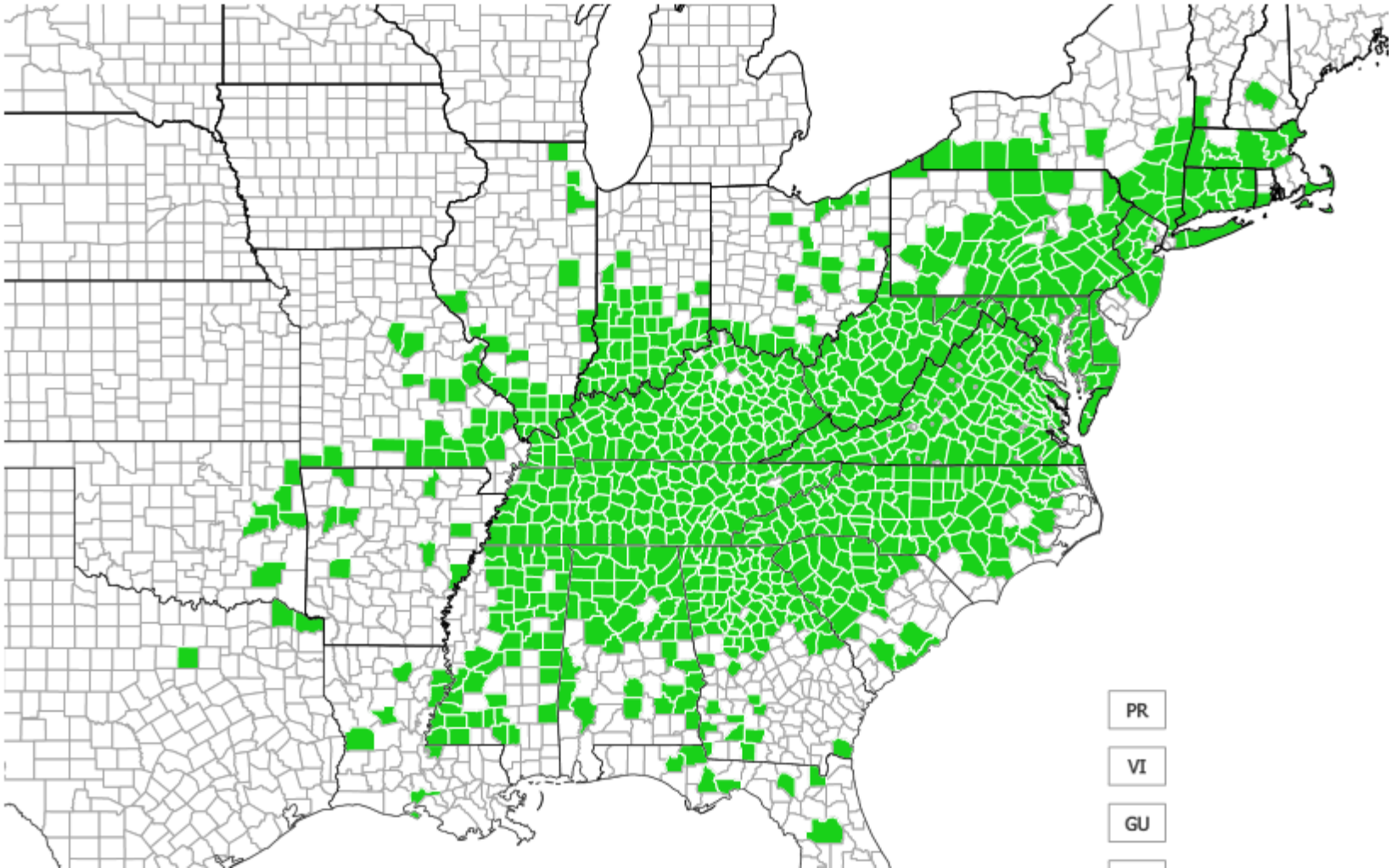
Japanese stiltgrass

USDA

Microstegium vimineum (Trin.) A. Camus

http://www.eddmaps.org/southeast/distribution/

Distribution Maps: State / County / Southeast / Points on Google Maps



Giant reed (*Arundo donax*)

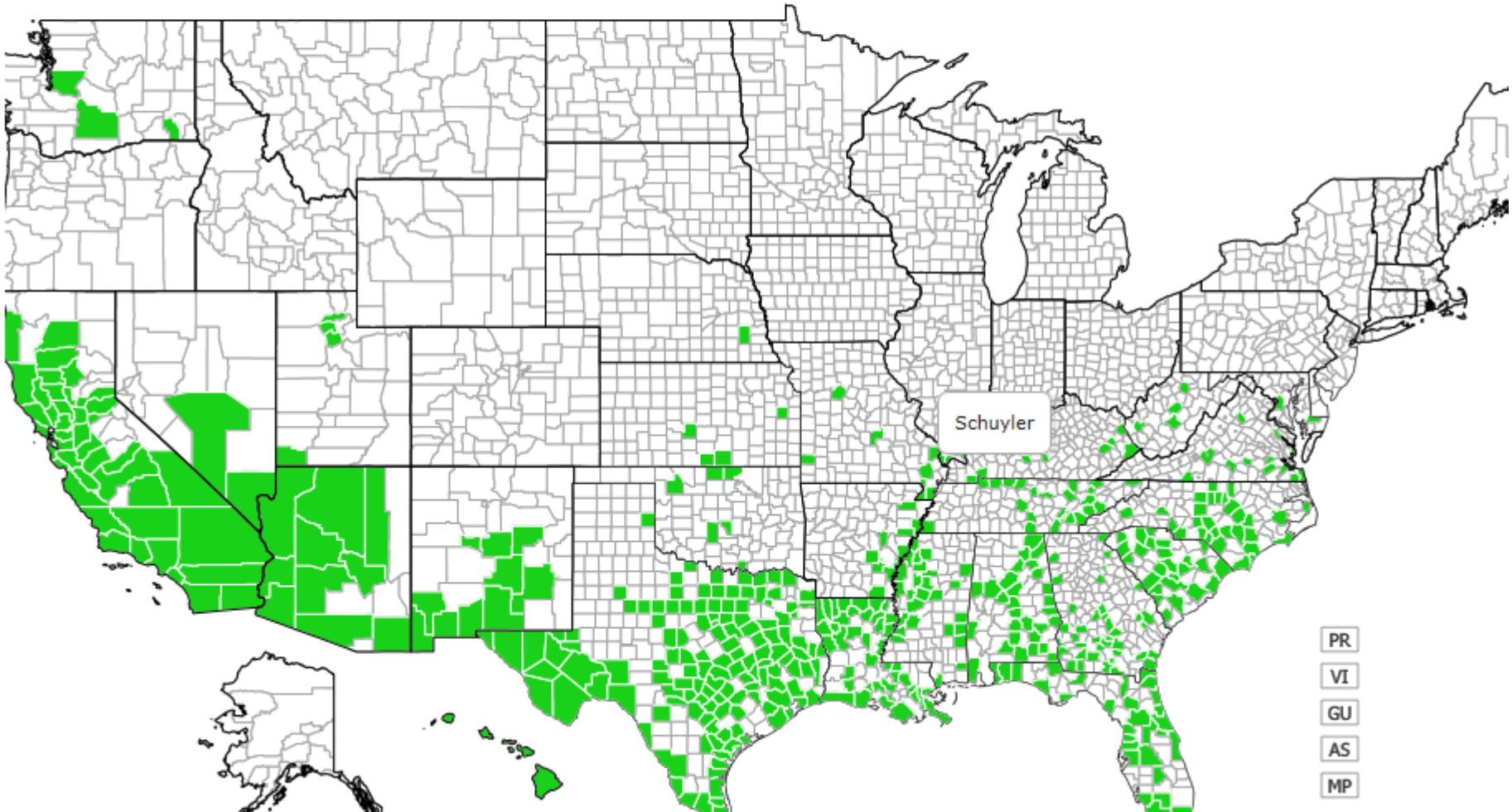
giant reed

USDA PLANTS Symbol:
Invasive Pl

Arundo donax L.

http://www.eddmaps.org/southeast/distribution/

Distribution Maps: State / County / Southeast / Points on Google Maps



Giant reed on the Rio Grande River in TX

www.pullkillplant.org

Common reed (*Phragmites australis*)

Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

5487177

Leslie J. Mehrhoff, University of Connecticut, Bugwood.org


Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
5487109

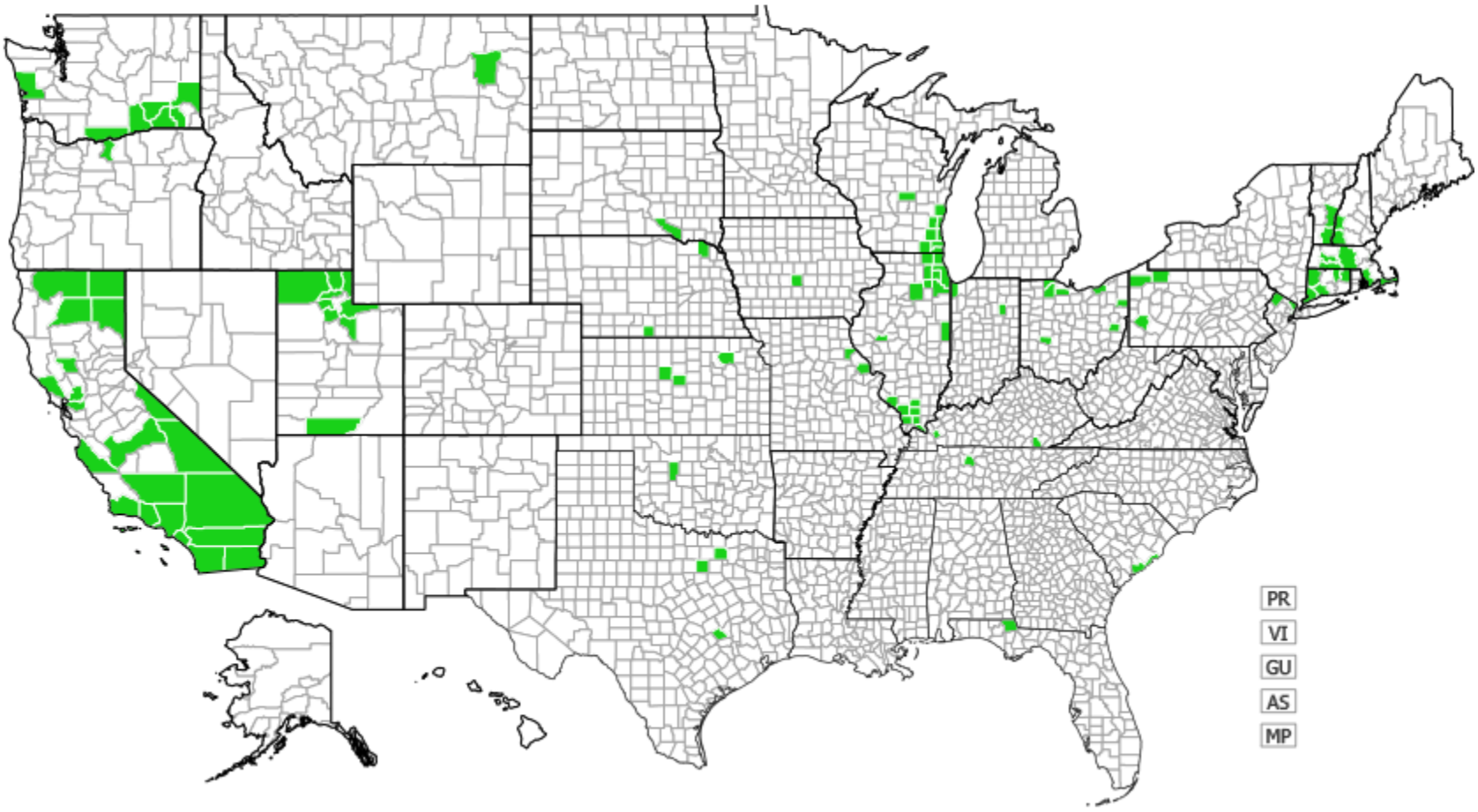
common reed

USDA PLANTS Symb
Invasive I

Phragmites australis (Cavanilles) Trinius ex Steudel

http://www.eddmaps.org/southeast/distribution/

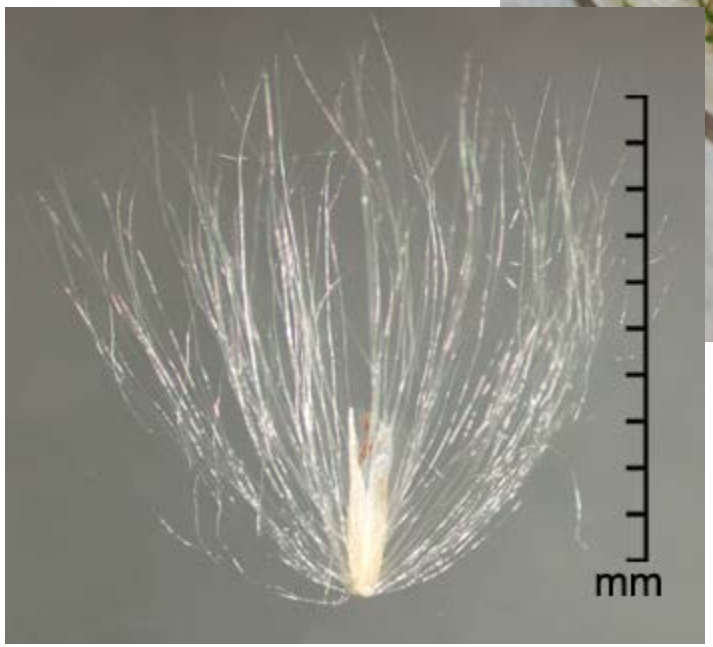
Distribution Maps: State / County / Southeast / Points on Google Maps



Reproductive biology and ecology continually thwarts us from finding that silver bullet for invasive plant eradication

Species	Life cycle	Pollination/Breeding system	Seed Production	Primary Natural Dispersal	Seedbank longevity (yr)
Japanese stiltgrass	Annual	Self pollination (cleistogamous) and cross pollination (chasmogamous)	Widespread and abundant	Water	<1, 3-5
Common reed	Perennial	Cross pollination, some self pollination, possibly apomictic	Uncommon, occasionally abundant	Wind and water	Short-lived
Miscanthus	Perennial	Cross pollination (generally self- incompatible), possibly apomictic	Locally variable	Wind	At least one year
Cogongrass	Perennial	Cross pollination (self-incompatible)	Locally variable and Increasing	Wind	<1 yr
Arundo	Perennial	N/A	None in NA	N/A	---
Golden Bamboo	Perennial	Unknown (likely outcrossing)	Extremely rare	Likely Granivore	Likely short lived

Cogongrass



Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Steve Hurst, USDA NRCS PLANTS Database, Bugwood.org

Species	Rhizomes	Rhizome depth (ft)	Rhizome spread (ft/yr)	Stolons	Rooting at nodes
Japanese stiltgrass	None	---	---	Described as Present?	Yes
Common reed	Extensive	0.3-30	1.33-6	Extensive	
Miscanthus	Compact, branching	0.3-0.6	0.2	None	No
Cogongrass	Extensive	0.3-3.0	~6-9	None	No
Arundo	Extensive	1.0, but may be buried 3-10	Unknown	None	Yes
Golden Bamboo	Extensive	0.3-1.0	~10	none	No

Common reed rhizomes

http://blog.riveruniversity.com/phragmites-a-closer-look/

© lauriecampbell.com


Common reed stolons
Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
UGA5273074

Miscanthus first year root/rhizome mass

Dennis Pennington, glbrc.communications

Cogongrass rhizomes

Giant reed rhizomes

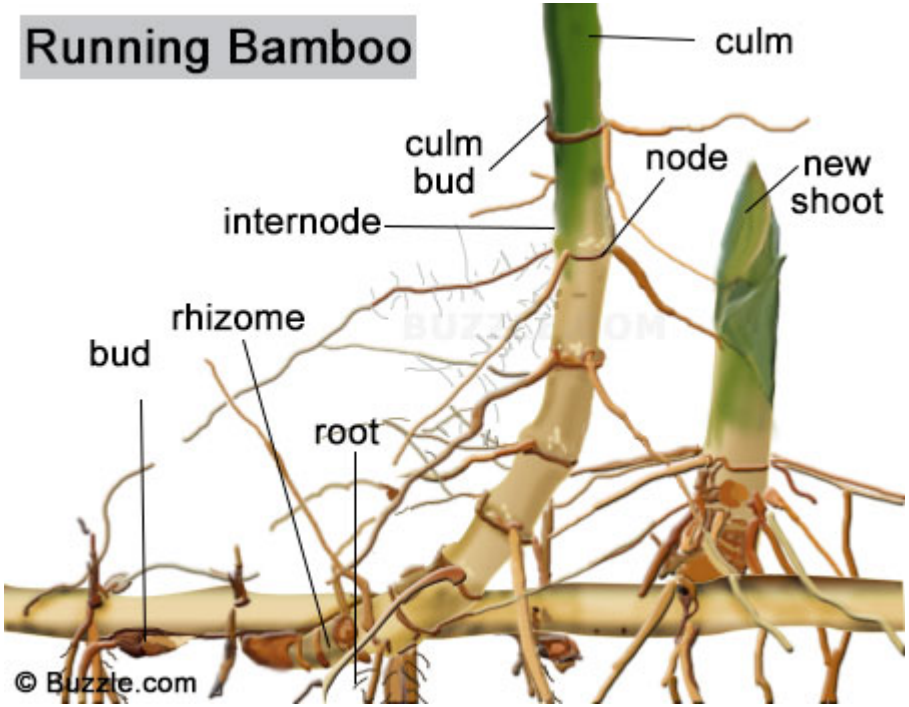
http://www.gri.msstate.edu/ipams/species.php?CName=Giant%20reed

Mark Meckes, http://www.bamboocraft.net

Giant reed sprouting from cut rhizomes and fallen canes

http://smslrwma.org/invasives/Arundo/images/ADPict1BIG.JPG

Bamboo rhizomes and growth habit



http://www.buzzle.com/articles/types-of-bamboo.html

http://seattlebamboo.com/plastic.html


Bamboo “shooting”
from running rhizomes

Management options

- Cultural
- Physical
- Biological
- Chemical

Cultural: Prevention

"An ounce of prevention is worth a million dollars of weed control"

Species	Mowing	Burning	Grazing	Hand pulling mature stands	Digging
Japanese stiltgrass	Pre-flower timing most effective	Ineffective in spring and fall	Highly undesirable to grazers	Mid to late summer before seed production	Not needed
Common reed	Summer mow for 3 years reported to control	----------Not effective as a standalone tool----------	Suppression with much additional damage	Nearly impossible except for brand new infestations (new shoots from rhizome pieces)	---Maximize rhizome removal for effectiveness--- Heavy machinery for more than a small area.
Miscanthus	2x/growing season for two years		Reported to work using cattle in Japan		
Cogongrass	Ineffective, may stimulate flowering		Highly undesirable to grazers		
Arundo	At flowering, requires multiple cuttings for several years		Very little info available, goats and sheep will eat it		
Golden Bamboo	Suppresses expansion from patches when done 2-3x/year		Leaves grazed by cattle sheep, and goats		

Species	Biological controls available:	Damage observed by:	Future Prospects?
Japanese stiltgrass (MV)	None available	*Bipolaris*, Orthopteran, Hemipteran insects	Possible
Common reed (PA)	None available	Numerous introduced and some native species	Possible
Miscanthus (MS)	None available	Nematodes	Not likely, especially with bioenergy
Cogongrass (IC)	None available	Few pathogens	Not likely
Arundo (AD)	*Tetramesa romana (2009) (Stem boring wasp)*	*Cryptonevra* sp. (Shoot fly); *Melanaphis donacis (Aphid)*	Possible, but bionenergy conflicts likely
Golden Bamboo (PhyA)	None available	Reports lacking	Not likely

Herbicides

- Very useful in many situations
- A lack of selectivity is still a problem in many areas
- The herbicide label is the law: read and follow it!
- Technical support from companies varies widely

Herbicides widely used for invasive grass control

Active ingredient	Trade names	Foliar Spot treatment (%v/v)	Foliar Broadcast
Glyphosate	Roundup Pro, Accord Concentrate, Rodeo, generics	1.5% (PA, AD) 2% (MV) 4% (AD, IC) 5-10% (PhyA)	1.5-2.5 pt/A (MV) 4-7.5 pt/A (PA, IC) 4-5 qt/A (AD)
Imazapyr	Arsenal, Chopper, Polaris, Habitat Arsenal AC	2% (PhyA, IC) 1% (PhyA, IC, PA)	3-4 pt/A (AD) 4-6 pt/A (IC, PA) 24 oz/A (IC) 2-3 pt/A (PA)
Hexazinone	Velpar L	2 Gal/A in a soil applied grid pattern (PhyA)	---
Imazapic	Plateau, generics		4 oz/A (MV)
Imazapic + glyphosate	Journey		10.7-16 oz/A (MV)

Graminicides (Selective grass killers)
The skinny on the “FOPS” and the “DIMS”

- Selectively control many grass species
- Labels with non-crop areas have frequent utility
- Primarily useful for *Microstegium* control
  - Seedling to preflower
- Generally very weak on large rhizomatous perennials
  - Short term vegetative control
  - Fail to effectively kill rhizomes

Active ingredient	Trade names
Fenoxaprop-P	Acclaim Extra
Fluazifop	Fusilade
Clethodim	Select
Sethoxydim	Vantage, Poast
Others	

What about spray additives?

- Additional products added to spray tank to improve absorption are generally required with most herbicides
  - NIS = nonionic surfactant (0.25-0.5 %v/v)
  - MSO = methylated seed oil (1% v/v)
  - COC = crop oil concentrate (1% v/v)
- Herbicide label dictates the best additive to use
- Other additives may also be useful
  - Hard water conditioners, pH stabilizers, colorants, emulsifiers, drift control agents

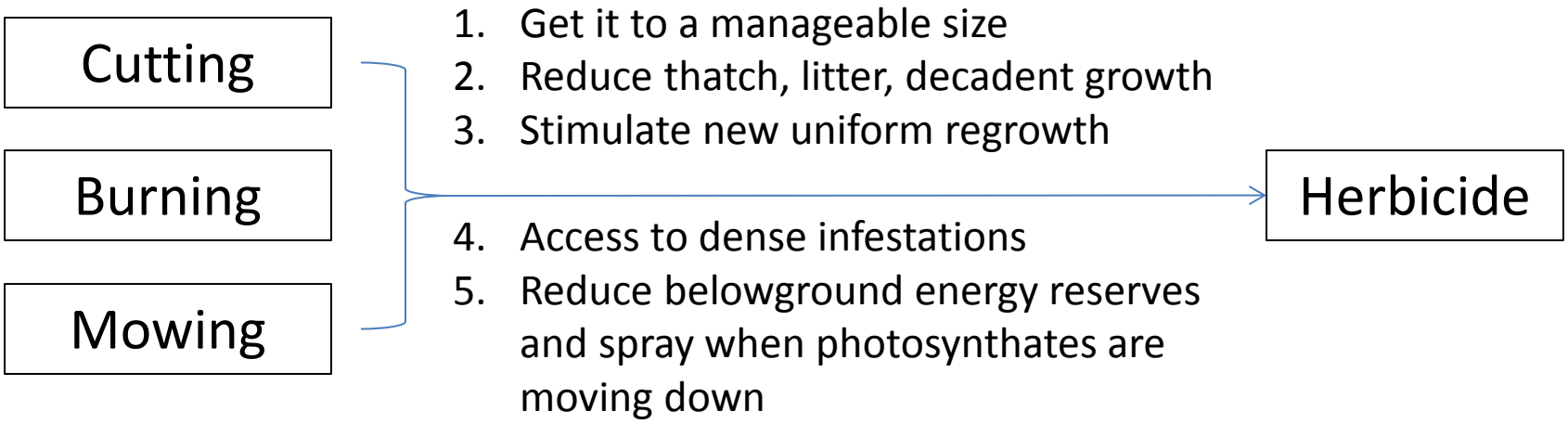
Is there an optimal timing for herbicide treatment?

- Late summer/fall has been widely shown to be the most effective window for herbicide treatment of aggressive perennials
- Problems with waiting
  - Grow too big to treat with ground equipment
  - Too much acreage to treat in that window
  - Need crews working for longer spray season
  - Weather, weather, weather

Times to avoid spraying

- Drought
  - If grass leaves are rolled, do not spray
- When rainfall is upon you
  - Rainfast period varies by herbicide but it is nice to have several hours before rain
- When heavy frost is expected
  - Last application 2-4 weeks ahead if possible
- When the Label say not to spray

Integrated strategies: why do them?



Ideally, doing these to allow treatable regrowth in the later summer/fall, when plants are storing energy belowground may be optimal

Do not be too hasty to mow, cut, or burn following herbicide treatment

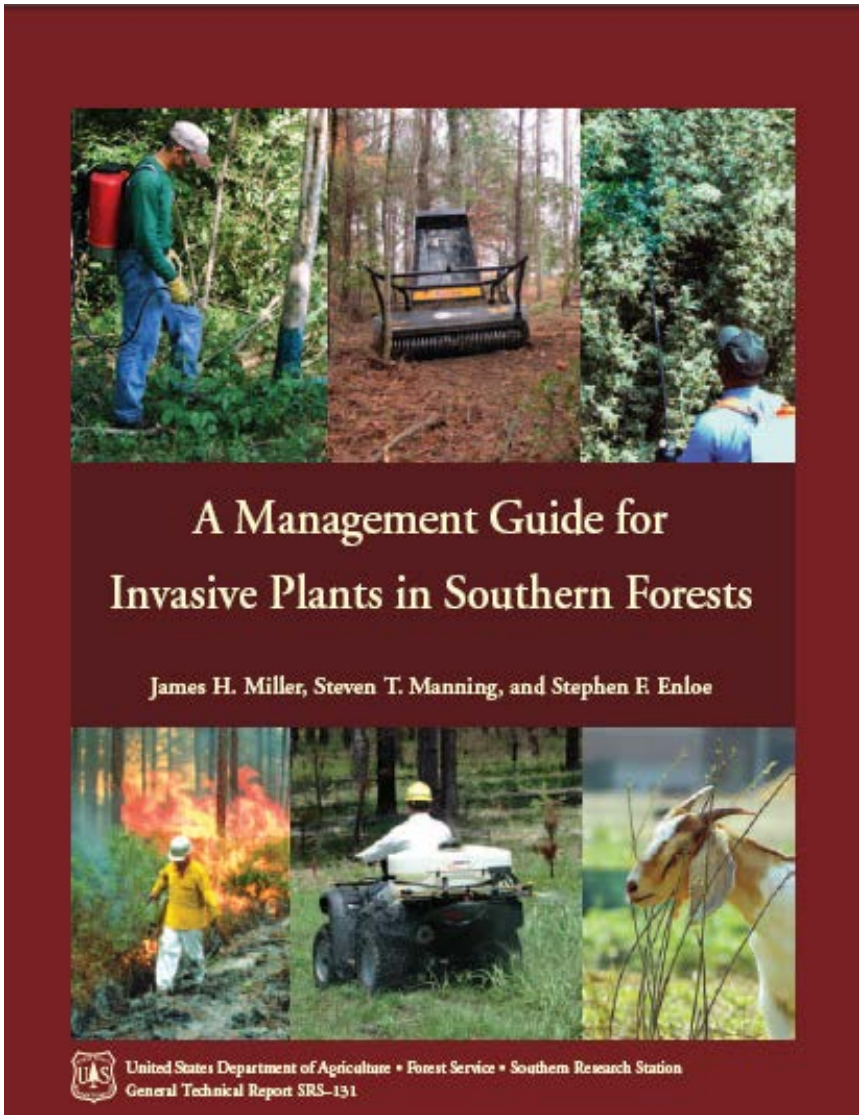
- If possible, wait for crispy shoots all the way to the ground
- You want maximum translocation downward, especially in perennials

Why doesn't a single treatment normally eradicate anything?

- Even short-lived seedbanks often have some seed that delay emergence and escape treatment
- Leaf area of shoot growth available for herbicide uptake not adequate to get enough material into belowground parts
- Dormant buds on rhizomes and lateral roots are not active transport sinks and escape treatment
- Environmental conditions at time of treatment influence outcome

Tying it all together

- Effective management is possible for all these species
- Recognize how the biology and ecology of each species influence management outcomes
  - Do not expect silver bullets
- Learn as you go
  - Adapt, modify an press on



Miller, J.H.: Manning, S.; Enloe, S.F. 2010. A management guide for invasive plants in southern forests. Gen. Tech. Rep. SRS-131. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 120 p. http://www.srs.fs.usda.gov/pubs/36915 and http://wiki.bugwood.org/Invplantmgmt

Questions?

sfe0001@auburn.edu

Thanks for participating!!!