

Invasive Species



Nate Muenks
Habitat Management Coordinator



Definitions:

- **Native Species:** A species that is part of an area's original fauna or flora that is natural or indigenous to a particular area
- **Exotic Species:** non-native, term commonly used in aquatic and terrestrial systems
- **Aquatic Nuisance Species:** non-native species which threaten the diversity or abundance of native aquatic species or the ecological stability of infected waters, or commercial, Ag, aquacultural, or recreational activities dependent on such waters, impacts to humans
- **Injurious species:** non-indigenous, significant impact to environment, measurable impact to humans and the environment
- **Introduced Species:** either native or non, introduced to an area intentional or accidental, impacts to natives of the area
- **Invasive Species:** aggressive, competitive, adaptable, non-native that causes economic or environmental harm or harm to human health

Invasive Species: Background

- Second greatest threat to native species and ecosystems worldwide (habitat destruction #1)
- Concern of biological community since the 1800's
- Impacts to humans:
 - Costs in the 100's of billions annually



"Nothing less than a total convulsion of the elements will ever destroy all the European animals and vegetables which are now to be found in the Western world" - David Hume, 1779

Invasive Species: Background Continued

- Infestations generally linked to human movements and migrations, markets, consumer preference for certain goods
- Very rarely to natural movements i.e. storms



How Invasive Species Get Here

■ Accidentally

- Contaminants in seed or plant shipments
- Contained on and in ship's ballast
- In or on wildlife, livestock or people
- Moved by wind and water
- In or on lumber or firewood
- In ships, trucks, cars, boats, or airplane cargo
- Packing materials



How Invasive Species Get Here: Continued

- Intentionally brought here for:
 - Horticultural uses
 - Herbal uses
 - Personal use and enjoyment
 - Erosion control
 - Wildlife benefits
 - Industrial use
 - Agricultural uses
 - Aesthetic uses
 - Sport (hunting & fishing)



Two Major Groups of Invasive Species

- Aquatic
- Terrestrial
 - Relatively few plants are invasive
 - (~ 1%-3% of those plants that are introduced in the US become highly invasive exotic plants)

Aquatic Invasive Species Currently Found in Missouri

- Brazilian elodea
- Eurasian watermilfoil
- Purple Loosestrife
- Dotted duckweed
- Brittle Naiad
- *Daphnia lumholtzi*
(water flea)
- Zebra mussel
- Hydrilla
- Common carp
- Grass carp
- Bighead carp
- Silver carp
- White perch
- Asian clam
- Chinese mystery snail

Other Aquatic Invasive Species

Threats to Missouri

- Water hyacinth
- Didymo (rock snot)
- New Zealand mudsnail
- Rusty crayfish
- Northern snakehead
- Black carp
- Ruffe
- Round goby
- Quagga mussel
- Viral hemorrhagic septicemia (VHS)
- Whirling Disease
- Spiny and Fishhook water fleas



Zebra Mussels

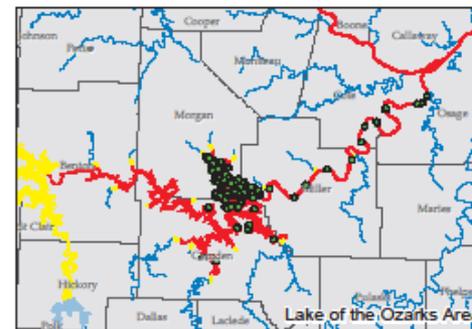
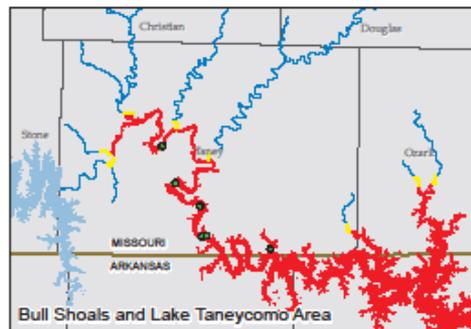
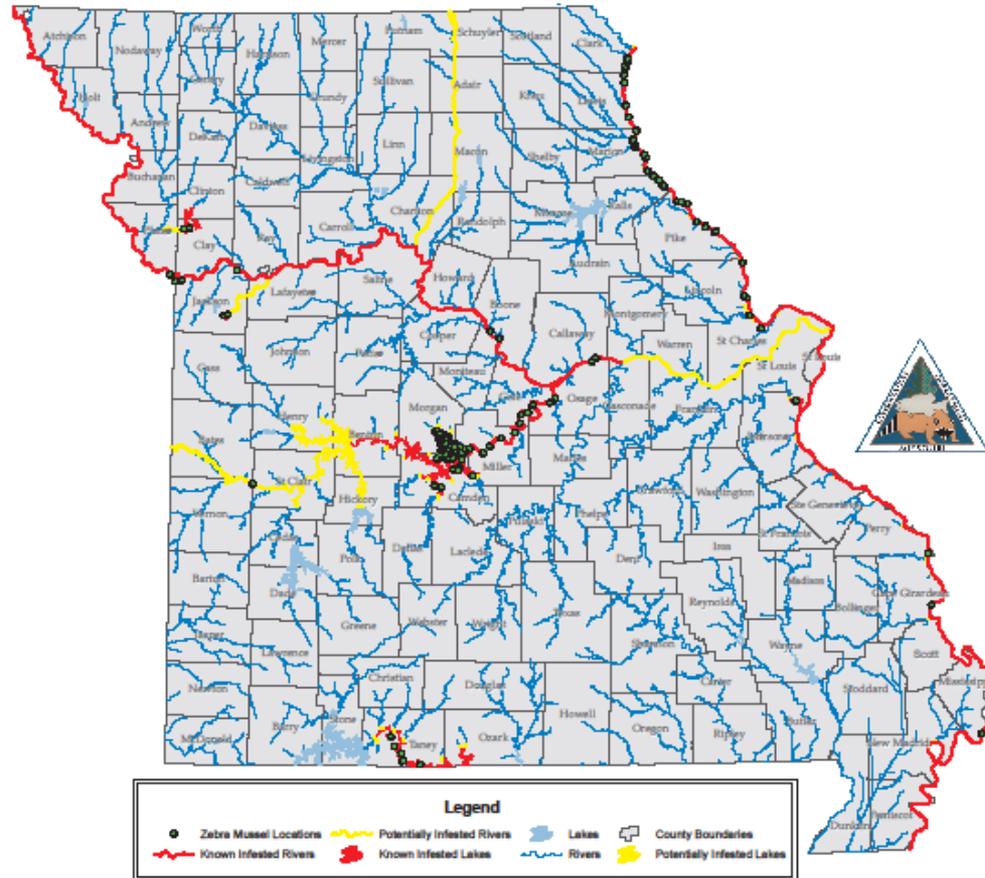


The Spread of Zebra Mussels

- Initially by barges and other commercial watercraft, aided by the creation of canals.
- Spread to upstream reservoirs mainly by recreational watercraft.



ZEBRA MUSSEL DISTRIBUTION IN MISSOURI



Preventing the Spread

- Clean
- Drain
- Dry
 - 3 Days Freezing
 - 5 Days Summer
 - 18 Days Spring/Fall
- Dispose



- BOATERS**
- **Clean** - Remove all plants, animals, mud and thoroughly wash everything, especially all crevices and other hidden areas.
 - **Drain** - Eliminate all water before leaving the area, including wells, ballast, and engine cooling water.
 - **Dry** - Allow sufficient time for your boat to completely dry before launching in other waters.
 - **Dispose** - Put unused bait in a trash can.



Public Education & Information

- Public Outreach and Education
- Zebra Mussel Inspection and Decontamination Training



STOP THE SPREAD OF ZEBRA MUSSELS
Clean Watercraft
After Each Use



www.mdc.mo.gov

Public Education & Information

BIGHEAD AND SILVER CARP WATCH

Bighead and silver carp are invasive fish spreading within the Mississippi River and Great Lakes regions causing harm to native fish and wildlife.



Bighead & Silver Carp Characteristics

- Low-set eye; large upturned mouth without barbels
- Scaleless head; body scales very small
- Adults may be more than 60 lbs. in weight and 4 ft. in length
- May jump out of water when disturbed by boat motors
- Juveniles difficult to distinguish from local baitfish species such as gizzard shad (see photos)

What You Can Do

- Learn to identify bighead and silver carp.
- Never release** live fish from one body of water into another.
- Report** new sightings—note exact location; freeze specimen in a sealed plastic bag; and call the Illinois-Indiana Sea Grant Program (847-872-8677), the Illinois DNR (309-968-7531), or the Indiana DNR (317-232-4080).



It is **ILLEGAL** to use bighead or silver carp as **LIVE** bait in Missouri.

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- Silver carp may jump out of water when disturbed by boat motors

For more information contact the Missouri Department of Conservation (MDC) Invasive Species Coordinator at 573-522-4115, ext. 3371 or your regional MDC office.



Invasive insects

- Gypsy moth



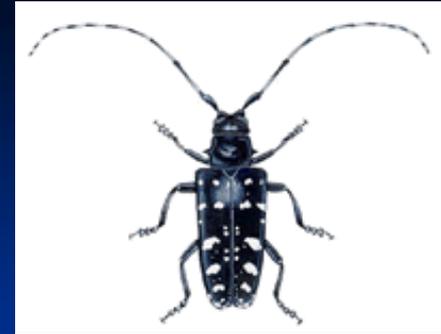
- Walnut twig beetle



- Emerald ash borer



- Asian longhorned beetle



- Pine shoot beetle



- Japanese beetles



- Loblolly pine sawfly

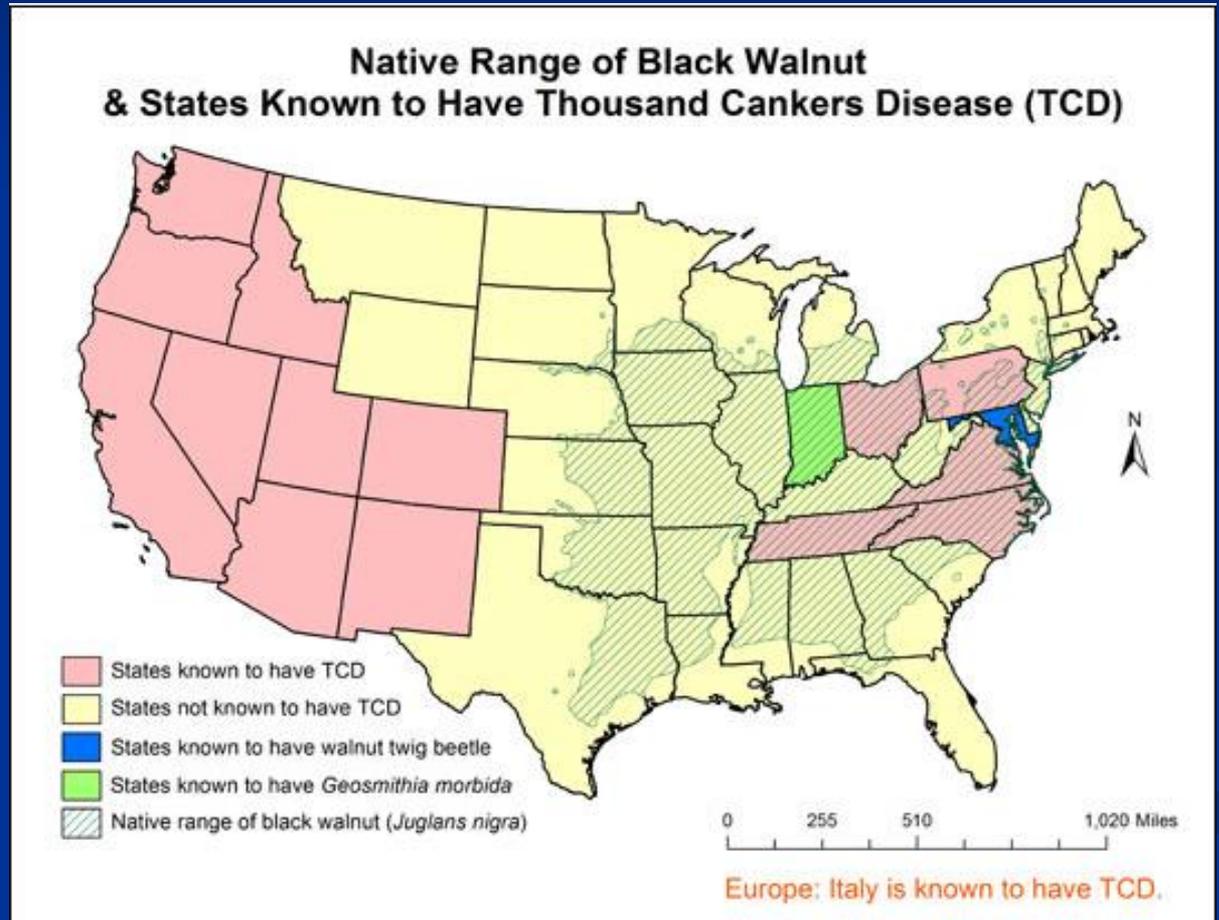


Thousand Canker's Disease in Walnut

A Severe Threat to Black Walnut in Eastern U.S.

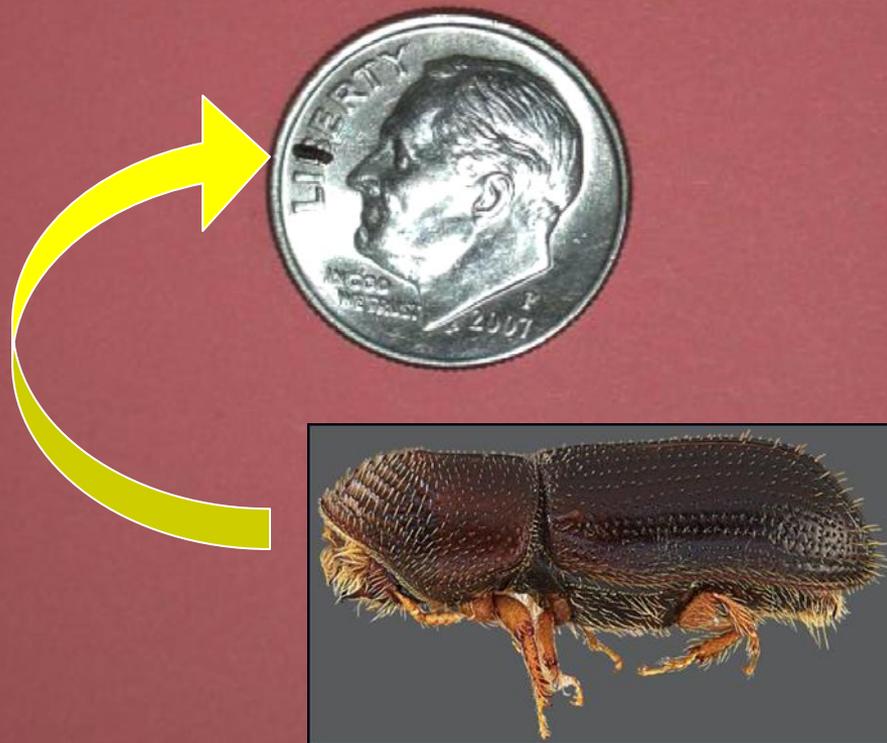


Cankers from
Geosmithia 'morbida'
fungus

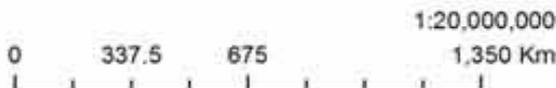
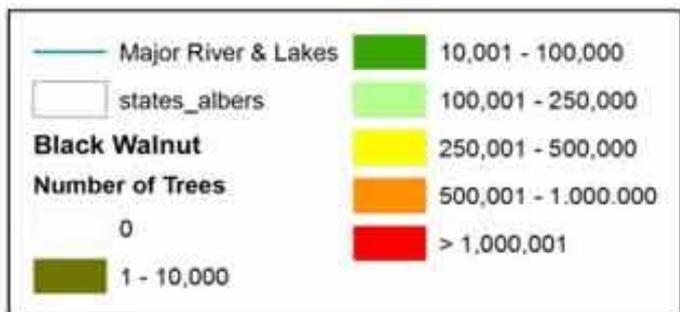
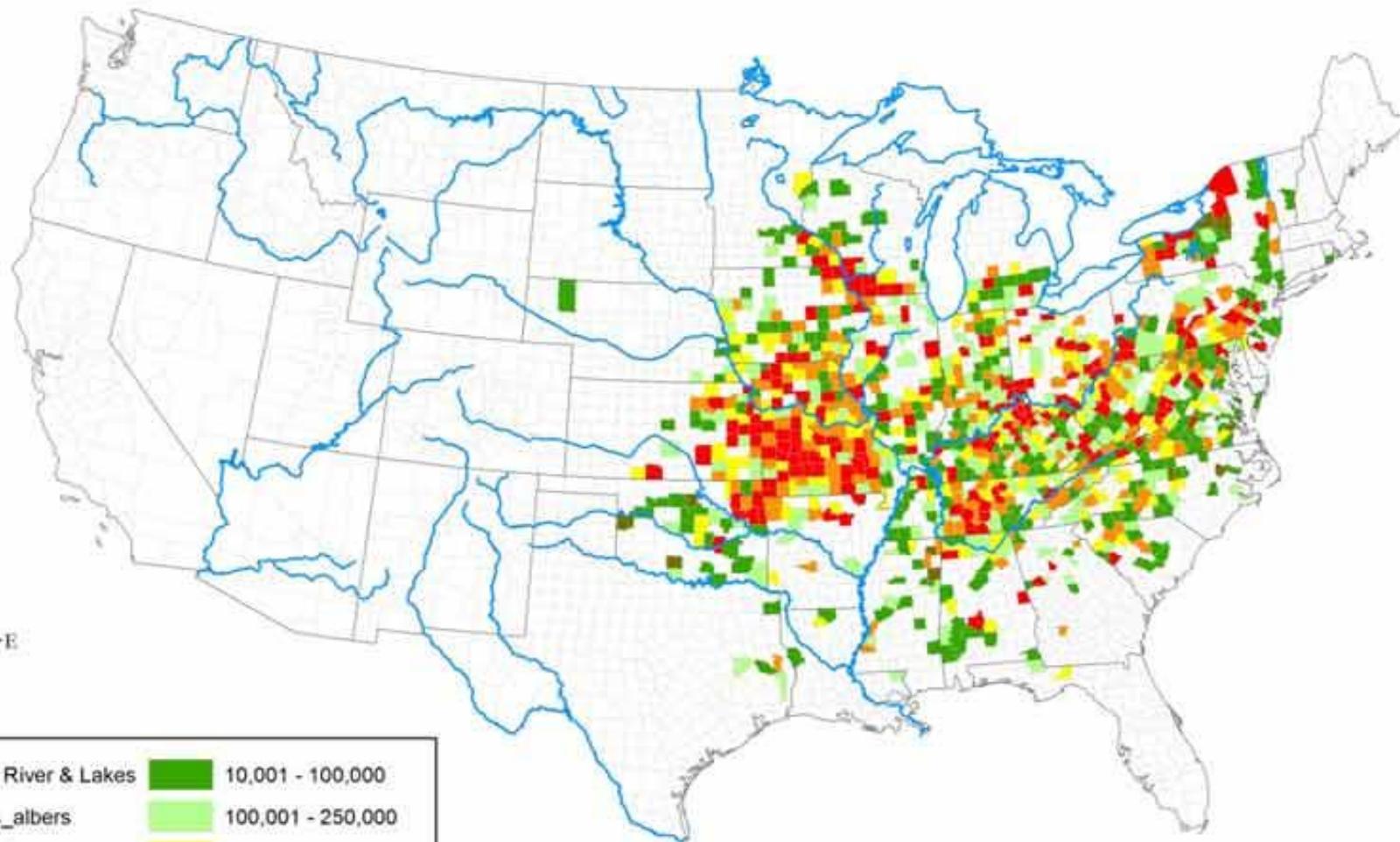


Thousand Canker's Disease in Walnut

The walnut twig beetle carries the *Geosmithia morbida* fungus that causes TCD



Number of Black Walnut (*Juglans nigra*) Trees in the Continental United States



Source: USDA FS FIA
Created By: Yu Takeuchi
USDA APHIS PPQ CPHST
Date: August 25, 2009
Projection: USA COntiguous Albers Equal Area

GREEN MISSOURI INSECTS: Identifying the Emerald Ash Borer

**Emerald
Ash Borer**



**Bark
Gnawing
Beetle**



*Buprestis
rufipes*



**Green
June Beetle**



**Caterpillar
Hunter**



**Japanese
Beetle**



**Tiger
Beetle**



**Green
Stinkbug**



**Dogbane
Beetle**



**Metallic
Wasp**



*Photo by Paul Andre,
MO Dept. of Agriculture*

Emerald Ash Borer: Key Signs



1/8-inch D-shaped
exit holes



S-shaped galleries
just under the bark



United States
Department of
Agriculture

Cooperative Emerald Ash Borer Project

Approximate range of ash species in the Contiguous U.S.
with EAB positives and Federal quarantines

March 2, 2015

Joe Heller ©2007
GREENBAY PRESS-GAZ.



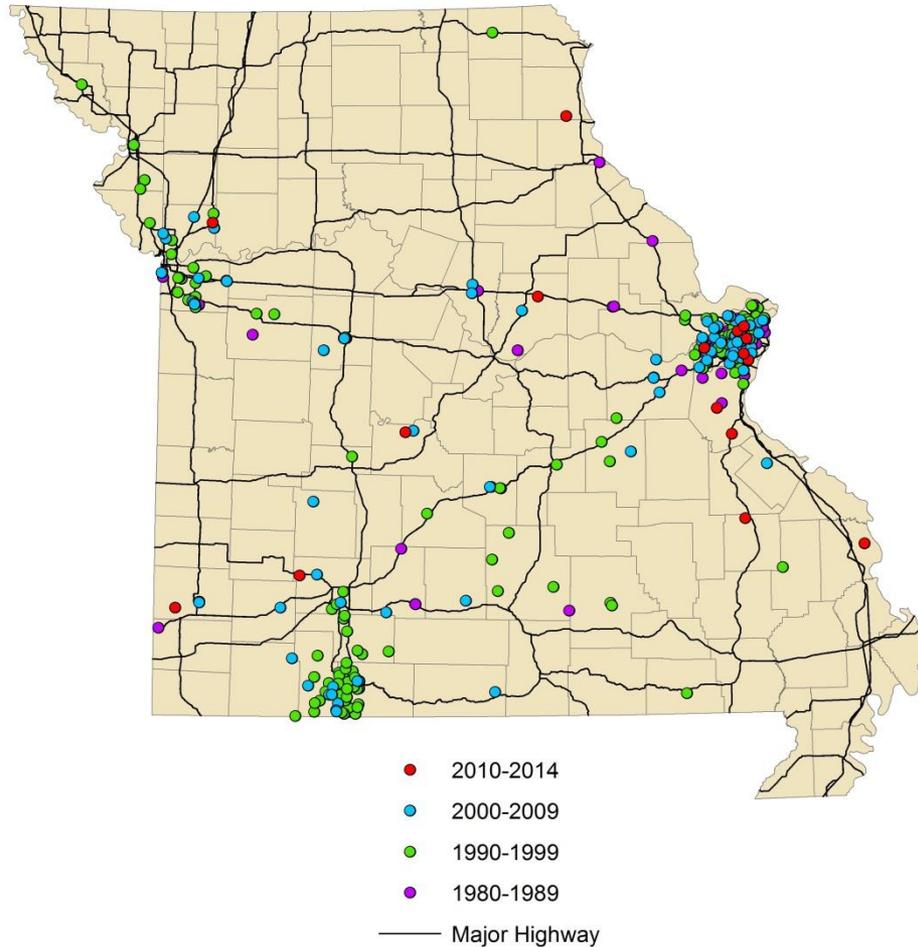
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Gypsy Mo

Missouri Gypsy Moth Survey
Positive Trap History
1980-2014



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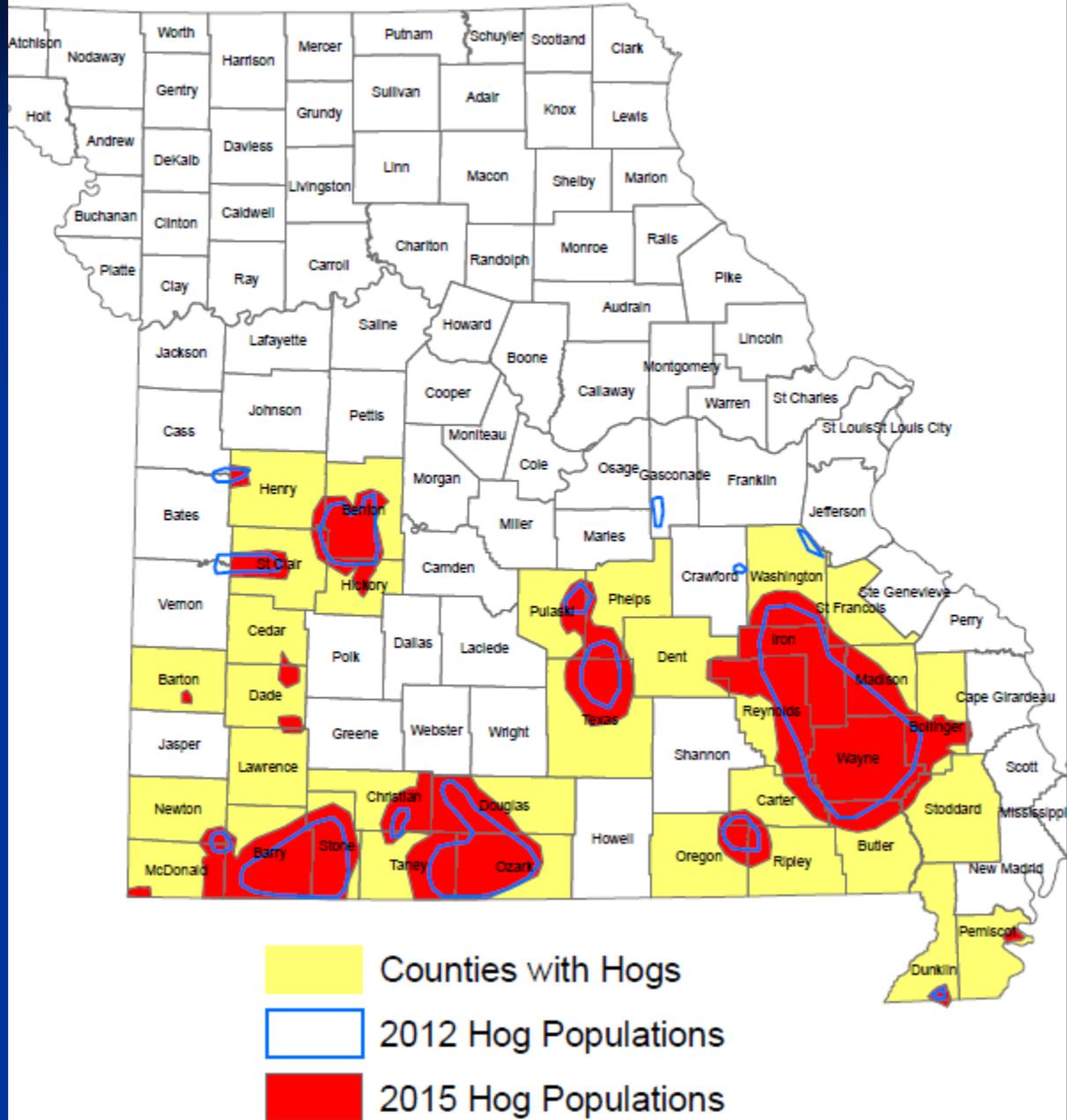
Mammals



■ Feral or Wild Hogs

- Wildlife code- illegal
- Disease issues with livestock, pets & people
- Rooting, wallowing, and Feeding damage
- Predation on native plants and wildlife
- Direct competition with native wildlife
- Water contamination

Feral Hogs in Missouri

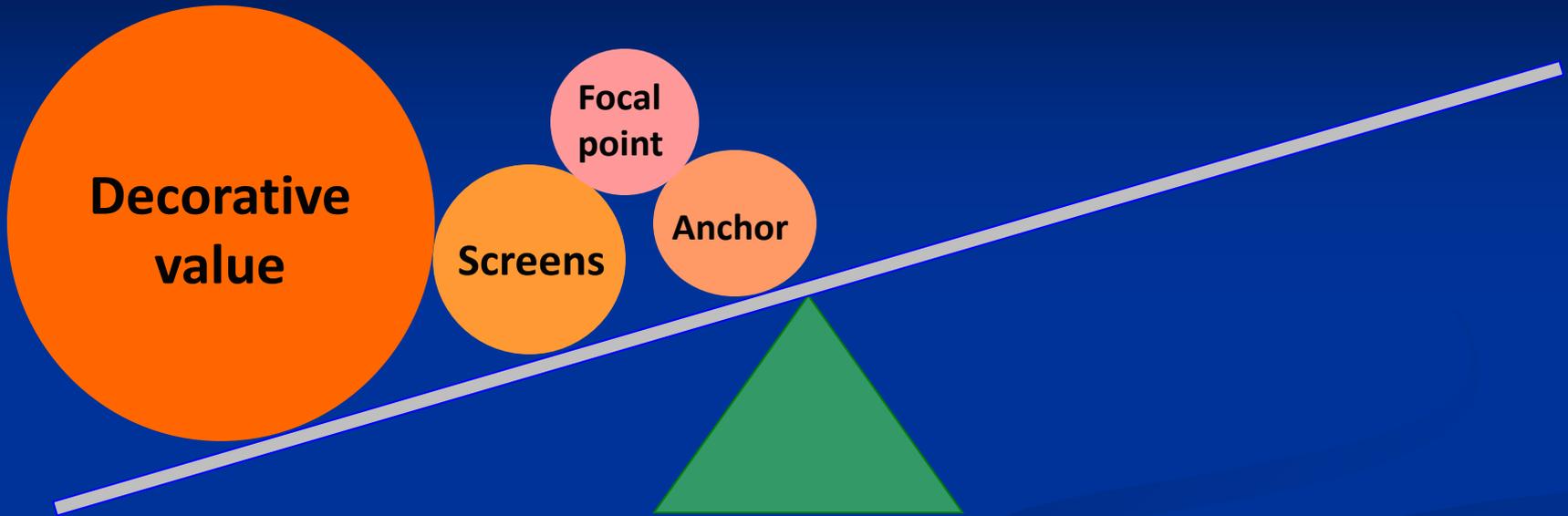


Plants

- Many invasive plants are here and established.
- Many are here and not yet established.
- Many are still coming!

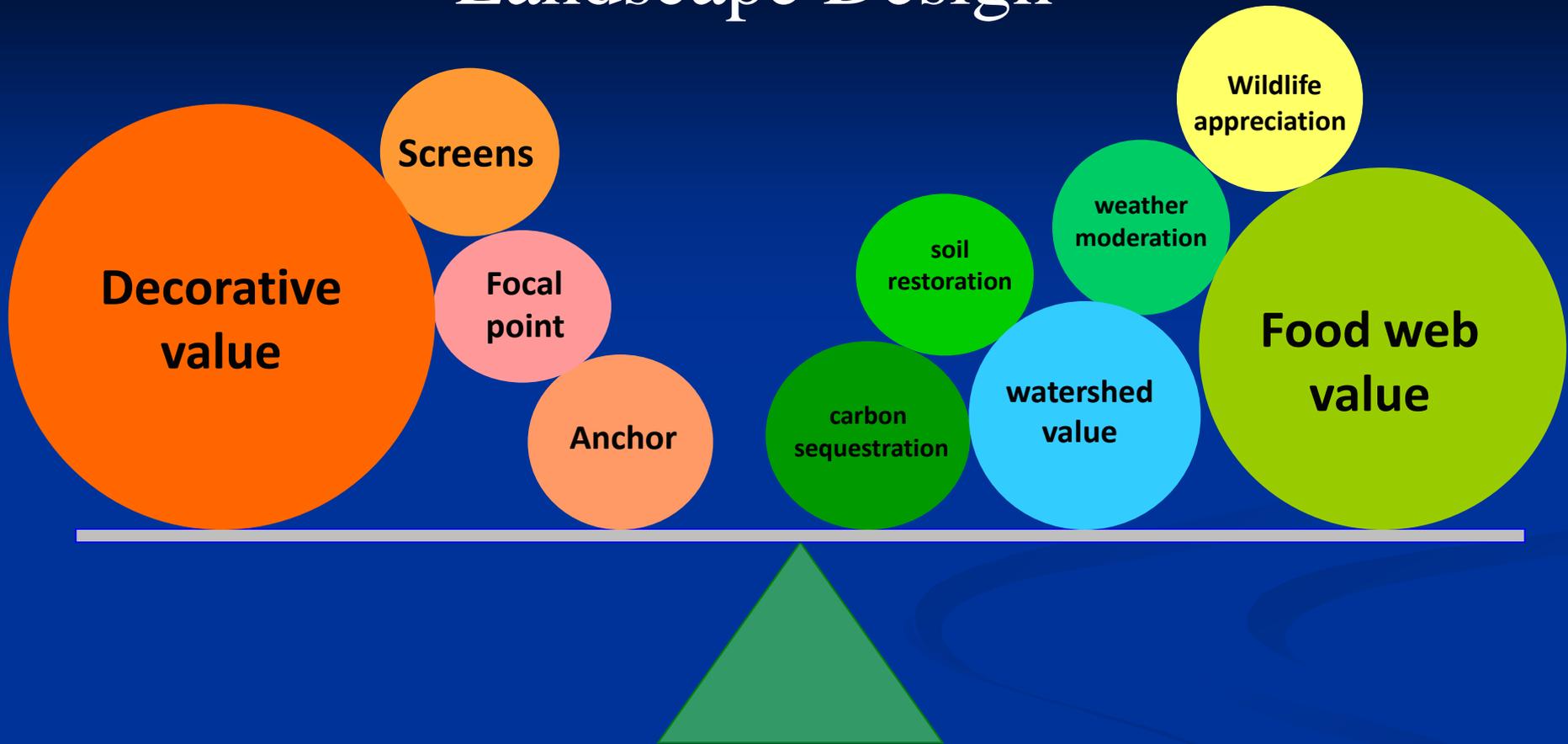


Landscape Design



Past criteria for choosing plants for our
landscapes

Landscape Design



Future criteria for choosing plants for our
landscapes

Exotic Plant Policy

PROBLEM EXOTIC PLANTS AND ALTERNATIVE SPECIES

Common Name	Scientific Name	Permissible Uses	Potential Alternatives
Amur honeysuckle	<i>Lonicera maackii</i>	none	deciduous holly, crabapple, plums, shrub dogwoods
Amur maple	<i>Acer ginnala</i>	none	red maple
autumn olive	<i>Elaeagnus umbellata</i>	none	hawthorns, plums, ninebark, hazelnut, aromatic sumac, shrub dogwoods
Caucasian/Eurasian bluestem	<i>Bothriochloa spp.</i>	none	native warm-season grasses
Chinese bittersweet	<i>Celastrus orbiculatus</i>	none	American bittersweet, Virginia creeper
cinnamon vine	<i>Dioscorea batatas</i>	none	Virginia creeper
common buckthorn	<i>Rhamnus cathartica</i>	none	Carolina buckthorn, shrub dogwood
crown vetch	<i>Securigera varia</i>	none	native warm-season grasses, timothy, smooth brome, orchard grass, Kentucky bluegrass, Canada wild rye, Virginia wild rye, purpletop
European cranberry bush	<i>Viburnum opulus</i>	none	rusty black haw, black haw, shrub dogwoods
garlic mustard	<i>Alliaria petiolata</i>	none	none
Japanese knotweed	<i>Polygonum cuspidatum</i>	none	ninebark
Japanese honeysuckle	<i>Lonicera japonica</i>	none	native honeysuckles; Virginia creeper
kudzu	<i>Pueraria lobata</i>	none	none
Morrow honeysuckle	<i>Lonicera morrowii</i>	none	deciduous holly, crabapple, plums
perfumed cherry	<i>Prunus mahaleb</i>	none	native plums
privet	<i>Ligustrum spp.</i>	none	hazelnut, fragrant sumac
Reed canary grass	<i>Phalaris arundinacea</i>	none	eastern gama grass, Virginia wild rye, prairie cordgrass
sawtooth oak	<i>Quercus acutissima</i>	none	native oaks
sericea lespedeza	<i>Lespedeza cuneata</i>	none	native warm-season grasses, native lespedezas, timothy, smooth brome, orchard grass, Kentucky bluegrass
spotted knapweed	<i>Centaurea maculosa</i>	none	none
tall fescue	<i>Festuca arundinacea</i>	critical area erosion control Note: Even on many sites requiring rapid erosion control (streambank stabilization, strip-mine reclamation, filter strips), alternative species are effective and also benefit wildlife.	native warm-season grasses, timothy, smooth brome, orchard grass, Kentucky bluegrass, purple top, Canada wild rye, Virginia wild rye, buffalo grass
teasel, cut-leaved and common	<i>Dipsacus laciniatus</i> <i>Dipsacus fullonum</i>	none	none
tree of heaven	<i>Ailanthus altissima</i>	none	cottonwood, pines, cedar
wintercreeper	<i>Euonymus fortunei</i>	none	Virginia creeper

Landscape - Ornamental – Nursery Plants

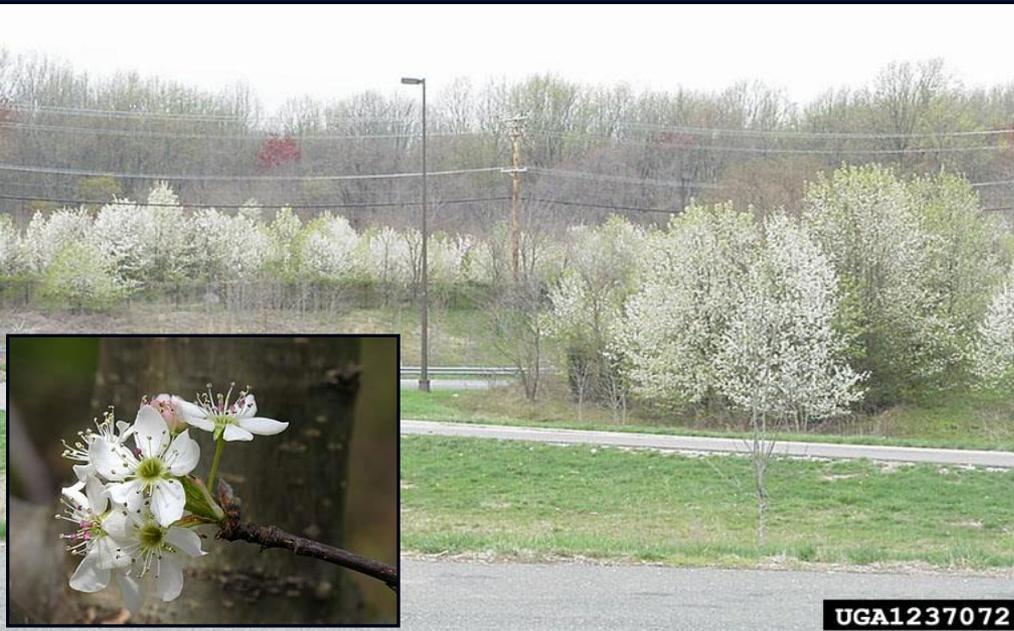


Burning Bush
(*Euonymus alatus*)

- Competes with forest understory.
- Seeds dispersed long distances by birds
- Treatment: Pulling, cut stump, foliar spray



Callery Pear (*Pyrus calleryana*)



- Native to China and Taiwan
- Thought to be sterile, but recently they've been spreading (alarmingly), crowding and outcompeting natives
- Treatment: Pulling, cut stump, foliar spray

Wintercreeper

Invasive species

Background, Life History

Wintercreeper (*Euonymus fortunei*) is a perennial evergreen vine. It was first introduced into the United States from China in 1907 as an ornamental ground cover plant. Nurseries still commonly sell it. Wintercreeper can spread from plantings into natural areas and relatively undisturbed woodlands and forests. Wintercreeper was chosen for cultivation because it grows rapidly, even under harsh conditions. Found in a variety of habitats, wintercreeper can tolerate full sun, heavy shade and moist soil conditions.

Wintercreeper can form an extensive ground cover of up to three feet in height. It spreads vegetatively along vines in contact with the ground by producing small roots called rootlets. The rootlets can develop into new plants. Aerial rootlets allow wintercreeper to climb rocks and trees, reaching heights of 40 to 70 feet. Birds, small mammals and water also disperse wintercreeper seeds.

The opposite leaves are oval, slightly toothed, glossy and less than an inch long. The leathery dark green leaves have silvery-white veins. The young stems are green, with branches becoming light gray, and covered with tiny warts with age.

The flowers occur in clusters, with a long flower stalk, and develop from May to July. Individual flowers are yellow-green and have five petals. Plants usually only flower when climbing and almost never when trailing along the ground. Fruits are spherical and smooth, with a pinkish-red capsule containing orange seeds. Fruits mature from September to November.



Impacts

Wintercreeper is well adapted to varying light and soil conditions. It therefore threatens native plants and natural habitats in open-to-shady and moist-to-dry locations. Due to wintercreeper's aggressiveness, it can form a dense ground cover that reduces or eliminates native groundcover species in woodlands and forests. As it outcompetes native plants for space and sunlight, it also hinders them by depleting nutrients and moisture in the soil. The dense ground cover can also restrict tree seedling establishment. Climbing wintercreeper can smother and kill shrubs and small trees.

Wintercreeper (*Euonymus fortunei*)



- Native to China
- Common cultivar, spreads rapidly and can readily climb trees, crowding and outcompeting natives
- Treatment: Pulling, cut stump, foliar spray (often not effective due to waxy leaf coating)

Autumn olive

(*Elaeagnus umbellata*)



- Native to China and Japan
- Originally used in strip mine reclamation for wildlife food and cover
- Forms dense stands, crowding and outcompeting natives
- Treatment: Cut stump method and foliar spray any regrowth

Japanese honeysuckle (*Lonicera japonica*)



- Native to Japan
- Originally used as ground cover
- Native honeysuckles are vines, but flower at the tip of the stem, develop red or orange berries and leaves are fused around the stem
- Treatment: Young vines pulled by the roots, cut stump, foliar

Bush or shrub honeysuckle

(*Lonicera morrowii*) (*Lonicera maackii*)



- Native to Japan
- Leaves develop in early spring and remain late into fall
- Native honeysuckles are vines
- Treatment: Hand pulling by the roots (young seedlings), cut stump, foliar, controlled burning

Bush Honeysuckle



Bush Honeysuckle



Same Plot



Other Landscape or Nursery Plants

Non-native Invasives

- Eurasian Privets
- Salt Cedar
- Silver Poplar
- Princess Tree
- Air Potato
- Tree of Heaven



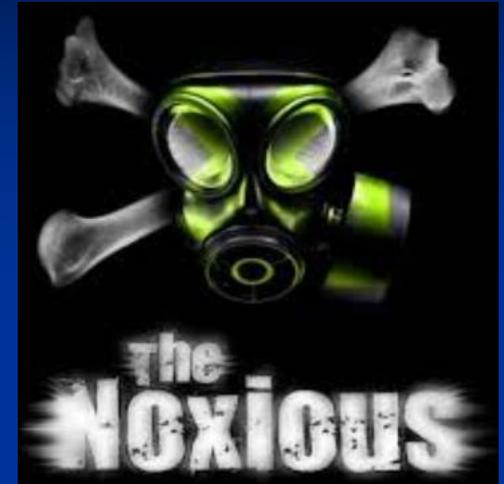
Tree of Heaven



Air Potato

Missouri Revised Statutes
Chapter 263, Section 263.450
Insect Pests and Weeds
August 28, 2007

- **Canada Thistle** (*Cirsium arvense*)
- **Common Teasel** (*Dipsacus fullonum L.*)
- **Cut-leafed Teasel** (*Dipsacus laciniatus L.*)
- **Field Bindweed** (*Convolvulus arvensis L.*)
- **Johnson Grass** (*Sorghum halepense L.*)
- **Kudzu** (*Pueraria montana var. Lobata*)
- **Marijuana** (*Cannabis Sativa L.*)
- **Multiflora Rose** (*Rosa multiflora*)
- **Musk Thistle** (*Carduus nutans*)
- **Purple Loosestrife** (*Lythrum salicaria*)
- **Scotch Thistle** (*Onopordum acanthium*)
- **Spotted Knapweed** (*Centaurea stoebe micranthos*)



Overview of Other Missouri Problem Invasive Terrestrial Plants



Thistles

- **Native = White Underside of Leaf**
- **Invasive = Both Sides of Leaf Same Color**
- **Invasive thistles can take over established areas, whereas natives won't overwhelm existing veg.**

Multiflora rose (*Rosa multiflora*)



- Native to Japan
- Originally used as erosion control, living fences and wildlife cover
- Dense thickets overwhelm and smother natives
- Treatment: Pulled by the roots, cut stump, foliar, frequent mowing and fire

Kudzu

(Pueraria lobata)



- Native to Japan
- “The plant that ate the South” - Originally used as ground cover
- Can grow a foot a day, smothering everything in its path
- Treatment: Cut stump, foliar

Common & Cut-leaved Teasel

(*Dipsacus fullonum* & *D. laciniatus*)

- Native to the Europe



- Biennial life history



- Treatment: Herbicide is effective, but if applied after bolting, cut and remove all flowering seed heads

Johnson Grass

(*Sorghum halepense*)



- Native to the Mediterranean
- Rapid growth and dispersal by seeds or rhisomes – quickly outcompetes other plants
- Treatment: Mowing, burning, herbicide (usually a combination is required)

Reed Canarygrass

(Phalaris arundinacea)



- Native to the Europe, Asia and N.A.
- Planted for forage and erosion control
- Early green up and rapid growth and dispersal by seeds or rhizomes – quickly outcompetes other plants
- Treatment: Very difficult and time consuming - Burning & herbicide (usually a combination is required)

Sericea lespedeza (*Lespedeza cuneata*)



- Native to the Asia - introduced in hopes of providing forage and erosion control – FAIL!
- Rapid growth and dispersal by numerous seeds that can remain viable for 20 years! – quickly outcompetes other plants
- Treatment: Mowing, burning, herbicide (usually a combination is required)

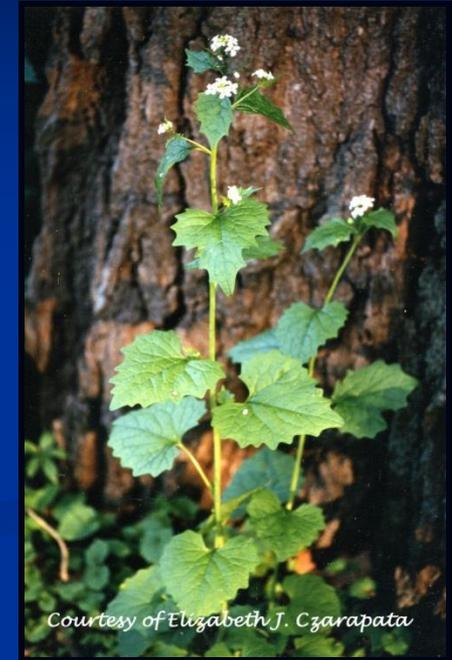
Common Reed

(Phragmites australis australis)



- Same species found worldwide
- Wetland invasive
- Growth by stolons and rhizomes and seeds – quickly chokes out and outcompetes other plants
- Treatment: Mowing, burning, herbicide (usually a repeated combination is required)

Garlic mustard (*Alliaria petiolata*)



- Native to Europe and Asia
- Spreads primarily by seeds – Forms dense colonies, invades shaded areas, allelopathic – hindering growth of other plants and tree seedlings
- Treatment: Intensive mowing, cutting or pulling, burning if enough fuel (though not good as stand alone control), herbicide (Combine)

Spotted knapweed (*Centaurea stoebe micranthos*)



Spotted Knapweed Bioagents

■ *Cyphocleonus achates*

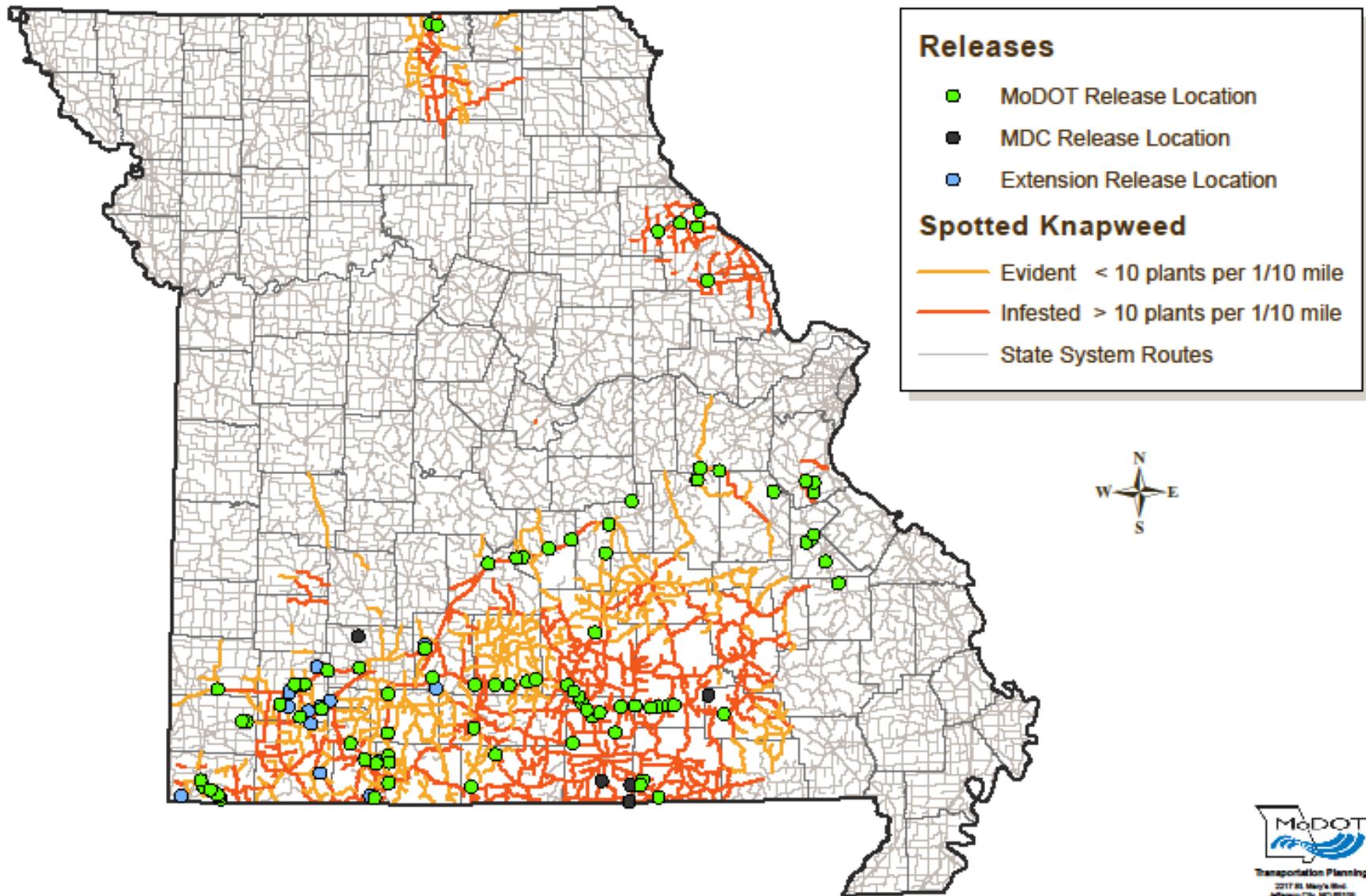
■ Root Weevil

■ *Larinus minutus* - *L. obtusus*

■ Flower/Seed Weevil



Missouri Spotted Knapweed Infestation





New Missouri Invaders

- Japanese Chaff Flower
(*Achyranthes japonica*)

- Variegated Water Clover
(*Marsilea mutica*)



- Hydrilla
(*Hydrilla verticillata*)

Potential Cellulosic Biofuels



Giant Reed
(*Arundo donax*)



Miscanthus giganteus

Tools & Resources

INVASIVE PLANT CONTROL DATABASE



WELCOME TO THE INVASIVE PLANT CONTROL DATABASE

This website contains information on how to control many invasive plants common to the Midwestern United States. Information was collected from both scientific literature and expert opinions and summarized by the Midwest Invasive Plant Network (MIPN), in partnership with the Mark Renz lab from the University of Wisconsin-Madison. Methods that are uncommon, do not provide sufficient control, or lack information for determining effectiveness on target species are omitted. For each species, information was reviewed by four individuals, including two identified as experts on control of that species. Information is searchable by several fields to improve the user's ability to find pertinent information. To view the search feature, you must first select an invasive plant. Additionally, users have the option of entering personal experiences with managing specific species (see "add new case studies" under search results). These case studies will be visible to all users once verified by MIPN staff.

We make no representations or warranties of any kind, express or implied, about the completeness, accuracy, reliability, suitability, or availability with respect to the information or products on the website. Any reliance you place on such information is therefore strictly at your own risk. References to pesticide products on this website are for your convenience and are not an endorsement or guarantee of one product over another.

[Start Search](#)

For more information, contact MIPN via e-mail: mipninfo@gmail.com

<http://mipncontroldatabase.wisc.edu>

Landscape Alternatives



Get It For iPad



Get It For iPhone

<http://apps.bugwood.org/landscape-alt.html>

Everybody loves a beautiful garden. Gardeners love plants that are adaptable, tough, and fast-growing. It's even better if that plant produces showy fruits that attract birds or is an annual that self seeds, so it doesn't need to be replanted every year. Unfortunately, many of these plant traits desirable gardeners can also increase the likelihood that a plant jumps the garden fence and invades natural areas.

Early Detection and Distribution Mapping System (EDDMapS)

Partners

U.S. Fish & Wildlife Service
U.S. Forest Service
National Park Service

Created by
The University of Georgia-
Center for Invasive Species
and Ecosystem Health.

EDDMapS - Invasive Species Mapping Made Easy - Windows Internet Explorer

http://www.eddmaps.org/index.cfm

NIISS - National Institute of I... niiss.org

EDDMapS - Invasive Sp... x

Google

Search

Suggested Sites

Water Quality, Best Manage... Global Invasive Species Dat... Conservation Employees' Cre... MDC Intranet MDC Portal Google MDC Public MyMDC http://mrii.ani.msu.edu/invasi...

EDDMapS

Early Detection & Distribution Mapping System

Welcome:
Tim Banek, Missouri Department of Conservation
Logout

- Report Sightings
- Distribution Maps
- Species Information
- Tools & Training
- My EDDMapS
- About

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

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

1,937,358 County Reports
1,074,995 Point Reports
2,426 Species / 10,832 Users

Educational Resources

- ✓ EDDMapS: Invasive Plant Mapping Handbook
- ✓ EDRR Training Workshop Handouts
- ✓ EDDMapS Florida Training Video
- ✓ EDDMapS Florida Animals Training Video
- ✓ EDDMapS Missouri River Watershed Coalition Training Video

BRING THE POWER OF EDDMAPS TO YOUR SMARTPHONE



Introducing BugwoodApps - comprehensive mobile applications that engage users with invasive species, forest health, natural resource and agricultural management

iPhone | iPad | Android

Start

Inbox - Mailbox - Tim Banek

Office Communicator

TB InvSpMapping.pptx

EDDMapS - Invasive...

4.03

Management (“Control”) Strategies for Invasive Species

- **Eradication**
- **Confinement or Containment to
Prevent Further Spread**
- **Prevention**

Current Management Options to Consider:

- Mechanical/Manual Control
- Chemical Control
- Biological Control
- Prevention - Maintenance
- Cultural Control
 - Cultural control strategies use specific techniques to manipulate the environment to improve the growing conditions for desirable species while reducing weed populations.

Summary

- Invasive species are a real and growing threat to Missouri's native plants and animals
- A threat to state and local economies
- Difficult to deal with once established
- This is an important issue that will continue to take a cooperative effort to make any “measurable” progress.
- Prevention through education is one of our best tactics to reduce this threat to MO natural resources, tourism, agriculture, and commercial interests



Good Communication is Critical!

Questions?



<http://mdc.mo.gov/discover-nature/field-guide/invasive-species>

Nate Muenks

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Missouri Department of Conservation

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