



**21st Century Tools
for Tackling
Invasive Plants:
Identify, Prioritize,
Mobilize!**

Elizabeth Farnsworth

New England Wild Flower Society

Focus on **success** stories!



Christopher Mattrick

My own **invasive** story: *Phragmites*



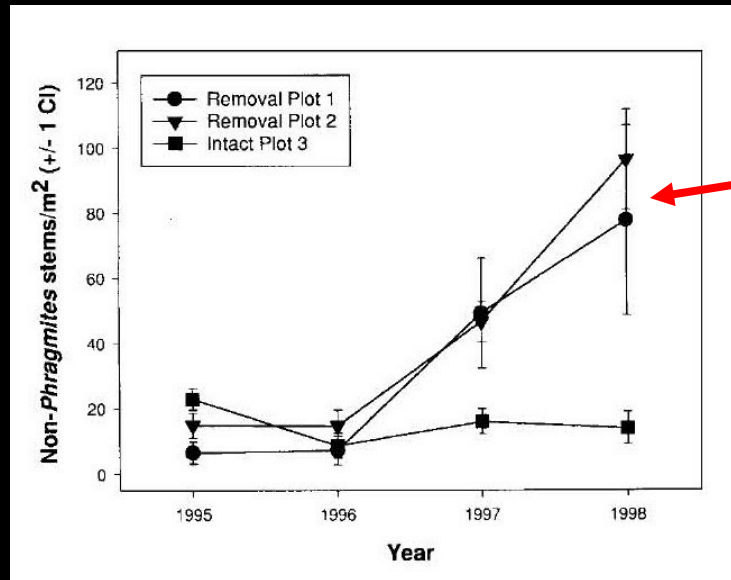
Laura Meyerson, Alyssa Mahoney

**What are the effects on tidal wetland
community structure when
Phragmites is removed?**



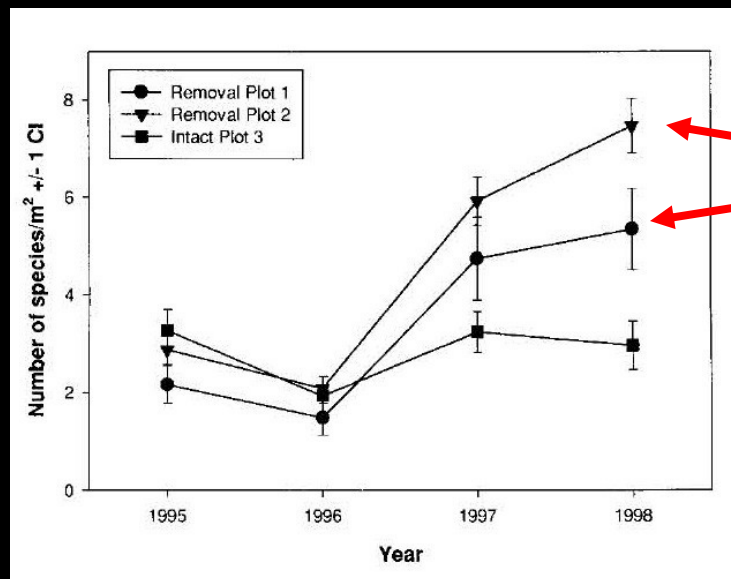
Recovery of wetland vegetation

Density



Removal plots

Species richness



Removal plots

YAY!



What species come in?

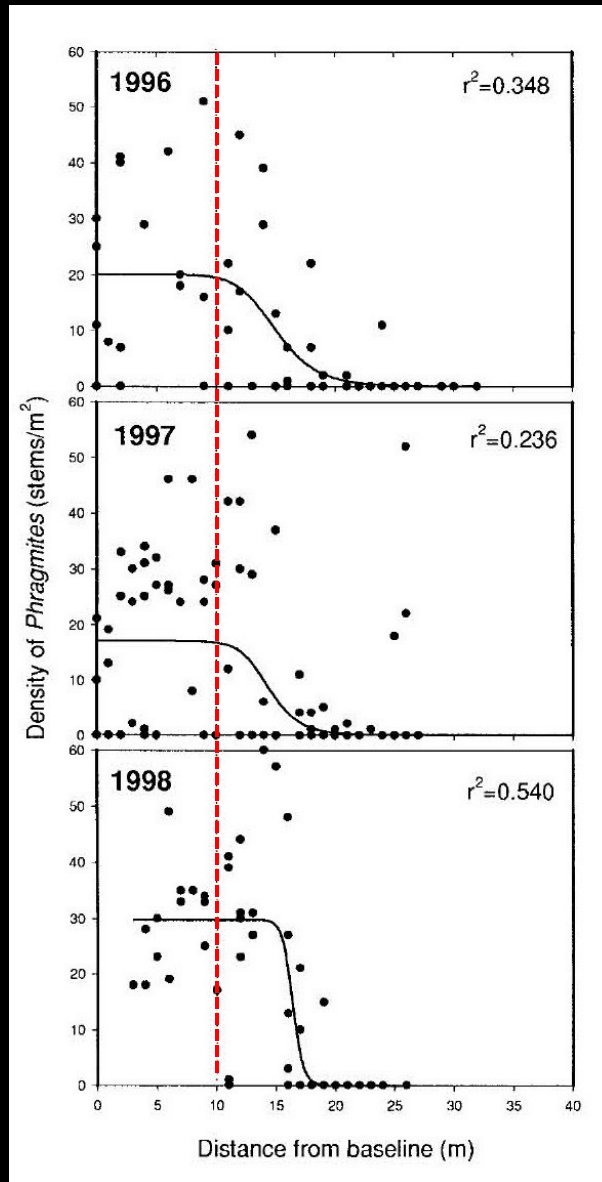


Year 2
Wild rice!
Yay!



Year 3
Cattails!
Hmmm!

Does the *Phragmites* come back?



Is it **hopeless**???



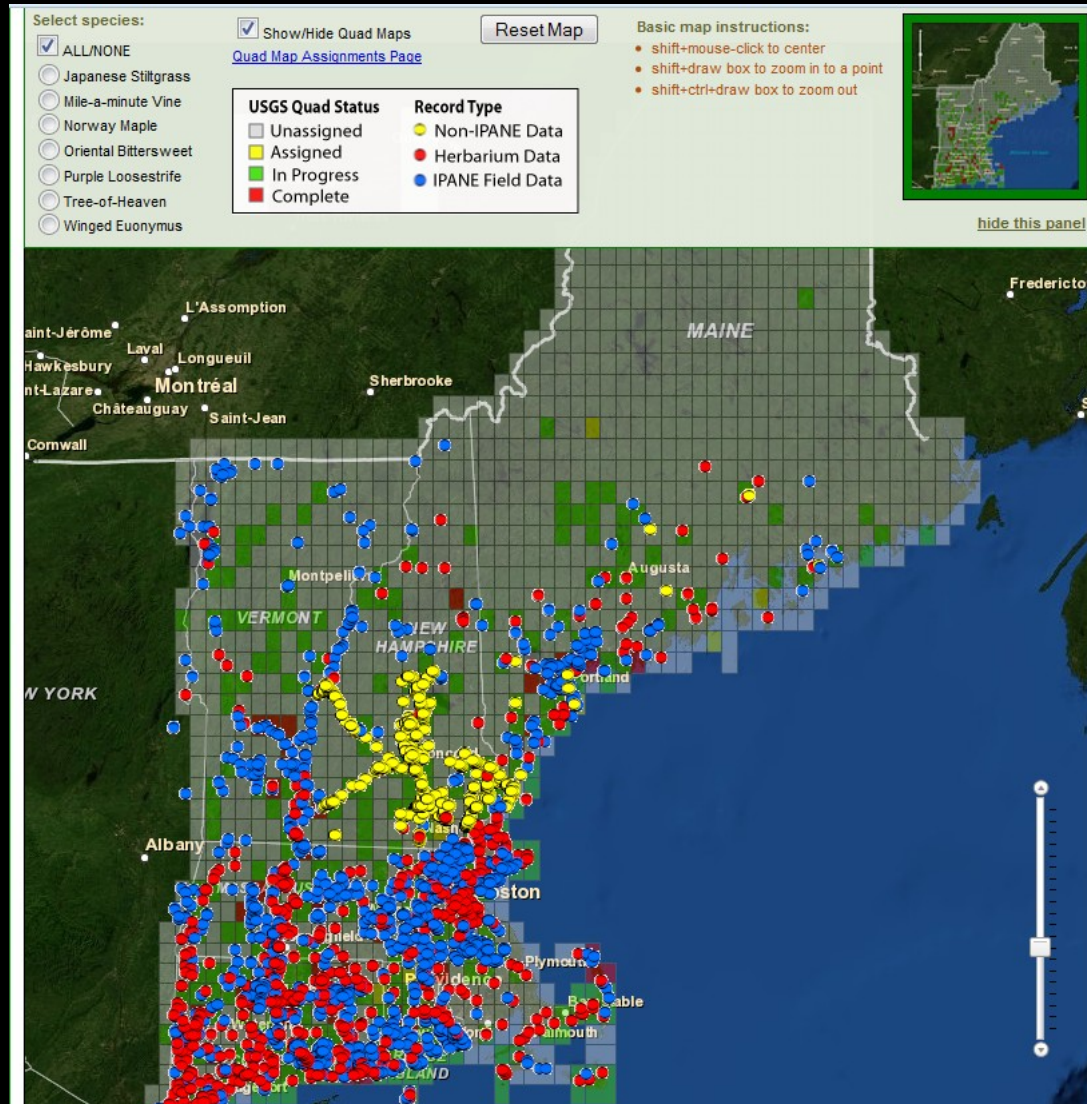
We HAVE made **progress** in:

- **Identifying** most invasive species
- **Targeting** new potential invasives
- **Improving** the science
- **Educating** the public
- **Restoring** sites with volunteers



Identifying most invasive species

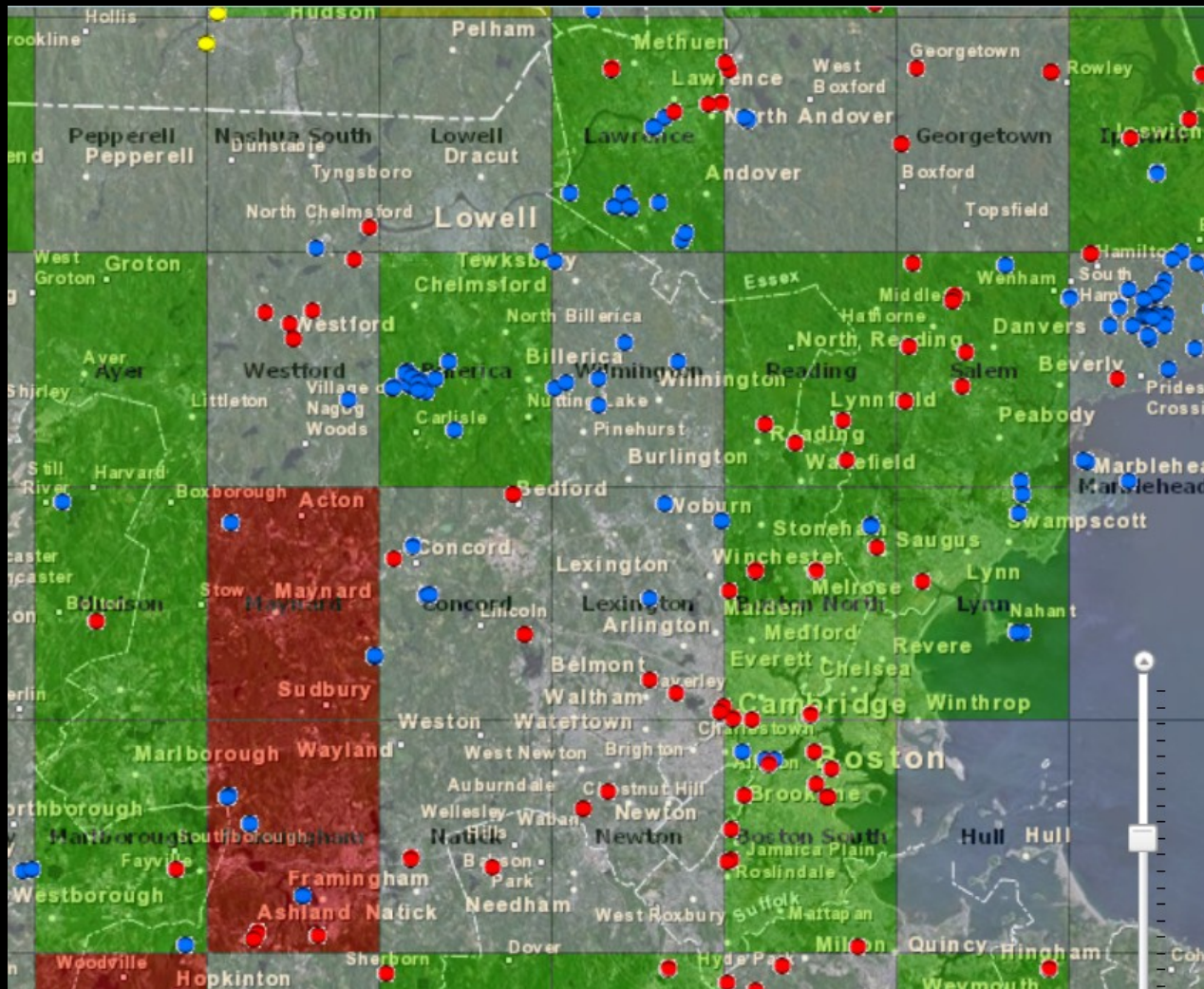
Regional atlases



IPANE
mapping
tool

Identifying most invasive species

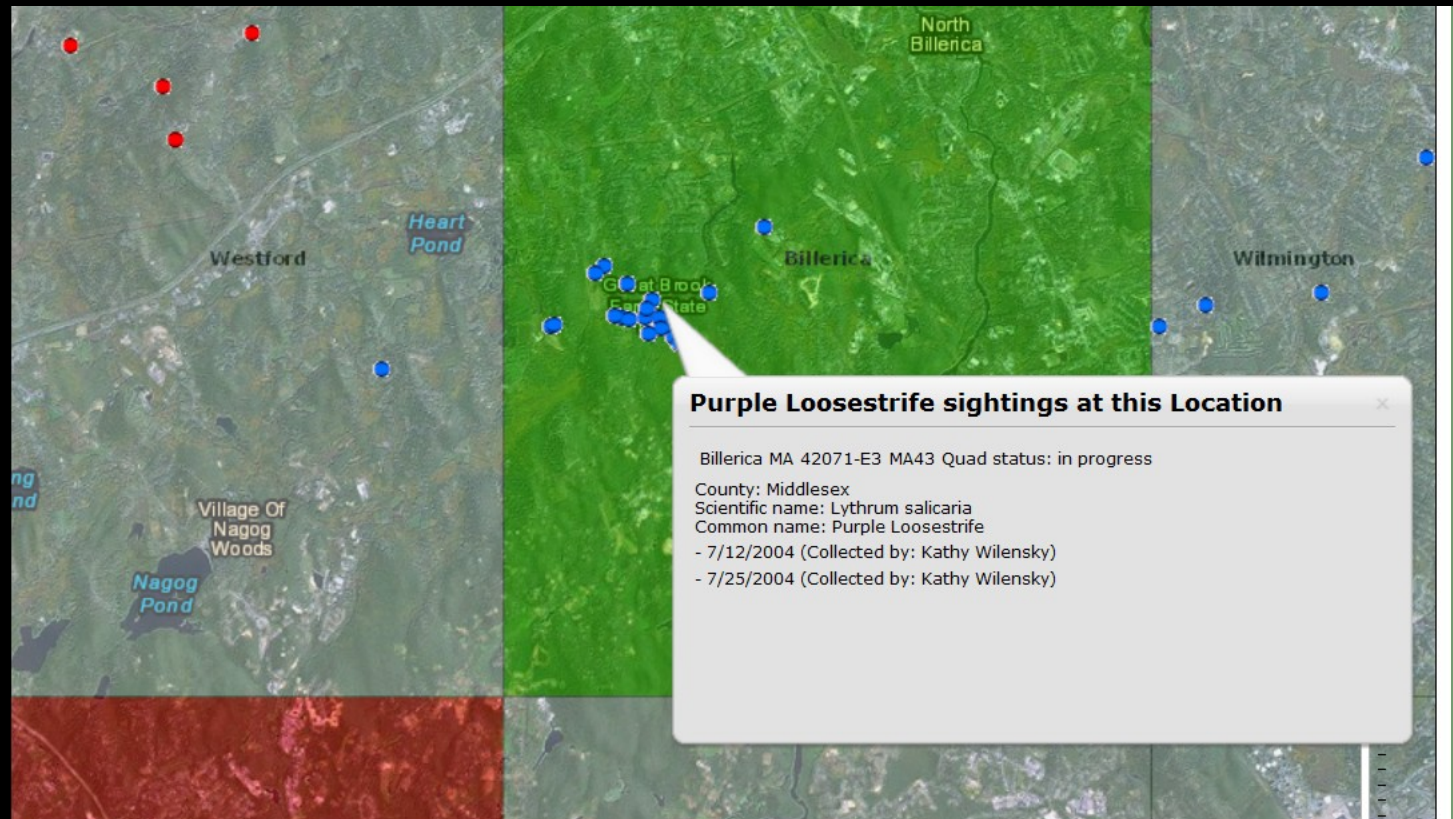
Purple loosestrife



- Field data
- Herbarium data

Identifying most invasive species

Regional atlases



Lythrum salicaria

Identifying most invasive species

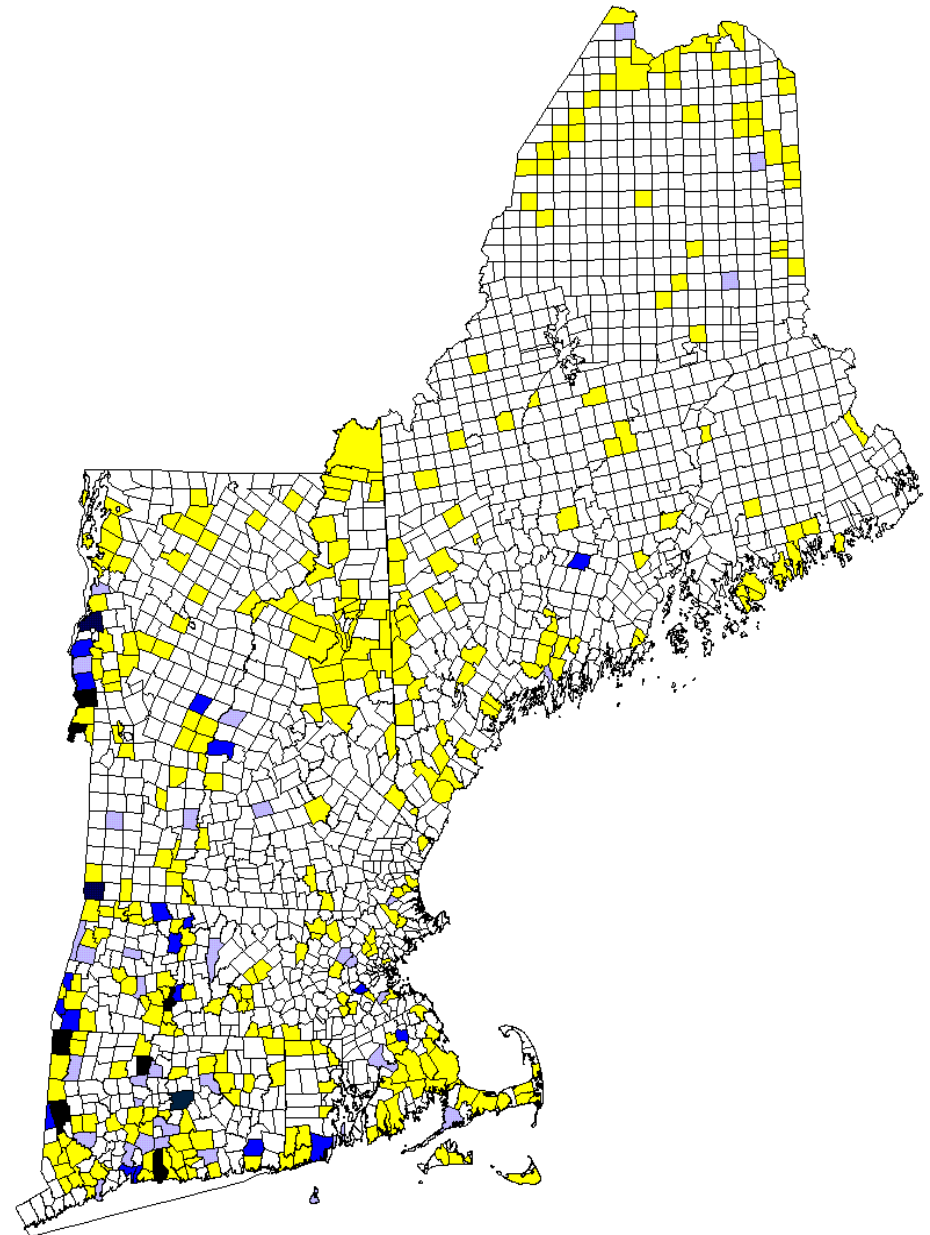
Impact indices

Table 3 Invasiveness-impact scores (I_i) for the 61 alien and 2 cryptogenic* species observed in streamside vegetation of the John Day River basin

Invasiveness-impact category Species name	I_i score	State noxious weed	NatureServe Impact rank	Cal-IPC rank
Extreme invasiveness-impact				
<i>Euphorbia esula</i> L.	97	OR, ID, WA	High	High
<i>Bromus tectorum</i> L.	68		High	High
<i>Cirsium arvense</i> (L.) Scop.	61	OR, ID, WA	High	Moderate
<i>Melilotus officinalis</i> (L.) Lam.	61		Medium	
<i>Centaurea solstitialis</i> L.	52	OR, ID, WA	High	High
Aggressive invasiveness-impact				
<i>Linaria dalmatica</i> (L.) P. Mill.	47	OR, ID, WA		
<i>Phalaris arundinacea</i> L.*	44	WA	High	
<i>Holcus lanatus</i> L.	42		High	
<i>Leucanthemum vulgare</i> Lam.	42	ID, WA	Medium	Moderate
<i>Schedonorus phoenix</i> (Scop.) Holub	42		High	Moderate
<i>Phleum pratense</i> L.	42		Medium	
<i>Cirsium vulgare</i> (Savi) Ten.	41	OR, WA	Medium	Moderate
<i>Centaurea</i> L.	39			
<i>Cynoglossum officinale</i> L.	36	OR, ID, WA	Medium	Moderate
Strong invasiveness-impact				
<i>Poa compressa</i> L.	33		Unknown	
<i>Poa pratensis</i> L.	33		Medium	Low

Map data

- Clusters of **invasive** species at **rare** plant sites
- Major rivers
- Invasion frequency is correlated with rare species richness



Targeting new potential invasives

Characteristics of invasives

Small seeds

Plastic life histories

Multiple habitats

Non-biotic pollination

Taxonomic novelty

New ecosystem functions

Polyploidy

Small genomes

Pyšek et al. 2009. *Diversity & Distributions* 15: 891-903

Schmidt et al. 2012. *Ecological Applications* 22: 1512–1525

te Beest et al. 2011. *Annals of Botany* (doi:10.1093/aob/mcr277)

Phalaris arundinacea

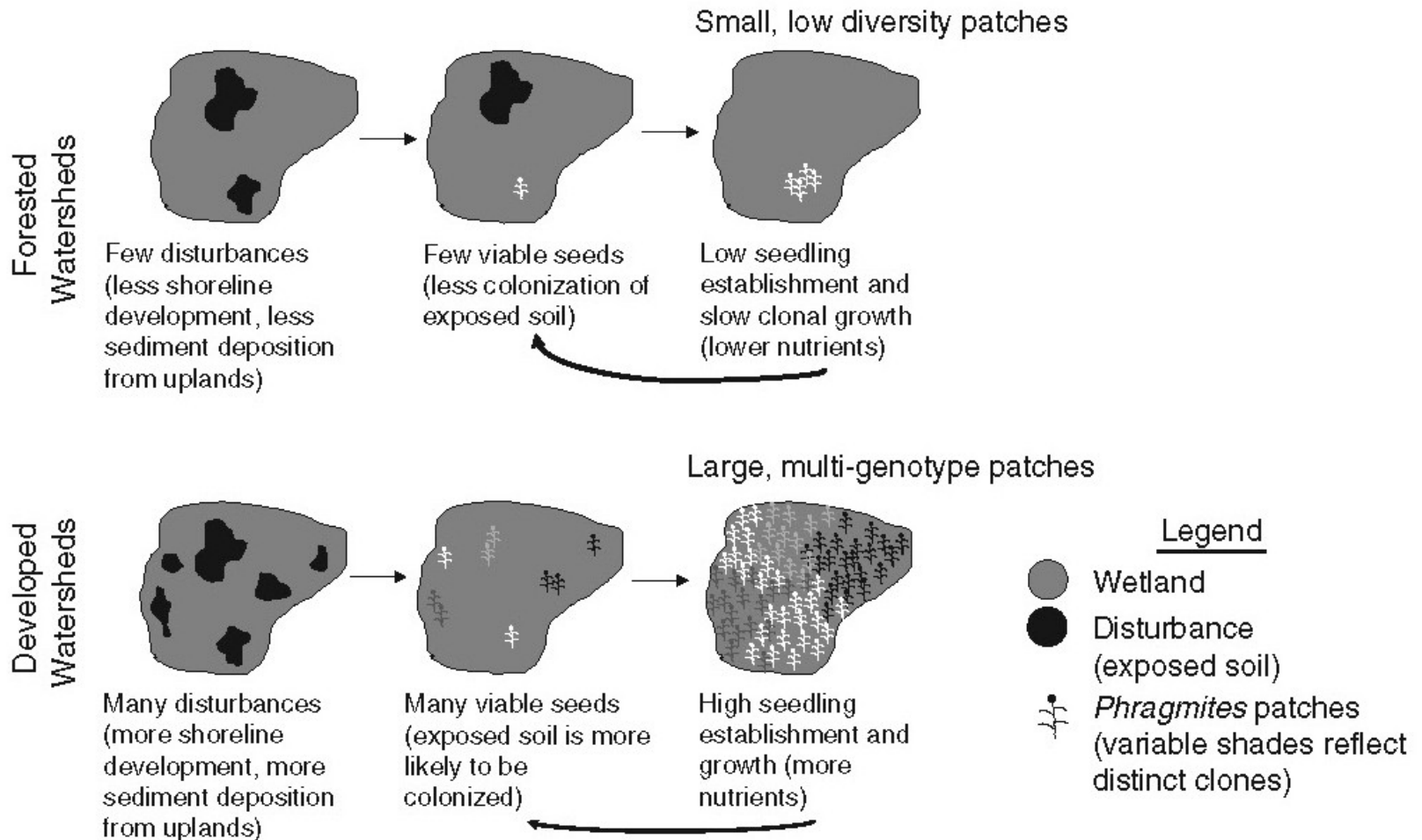


Reduced genome size

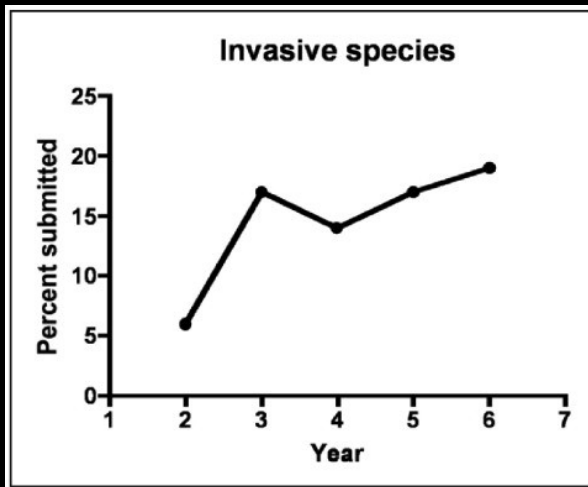
Lavergne et al. 2010. *Annals of Botany* 105: 109–116

Lavergne and Molofsky. 2007. *PNAS* 105: 3883–3888

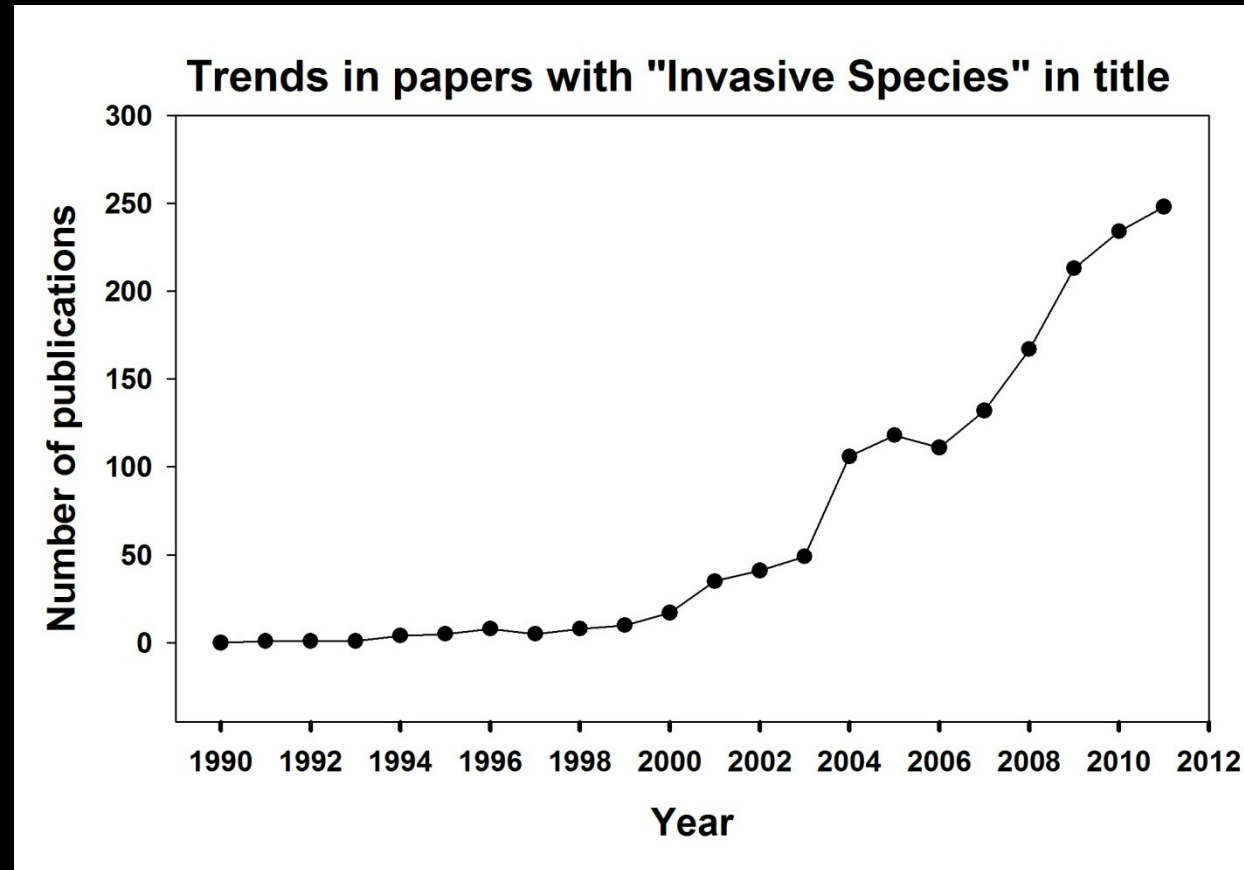
Phragmites spread by seed & disturbance



Improving the science



Natural Areas Journal
2002-2006



Science Citation Index

Improving the science

Rapid evolution

Allelopathy

Demographic models

Community assembly & invasibility

Ecosystem ecology

Plant-soil interactions

Biotic homogenization

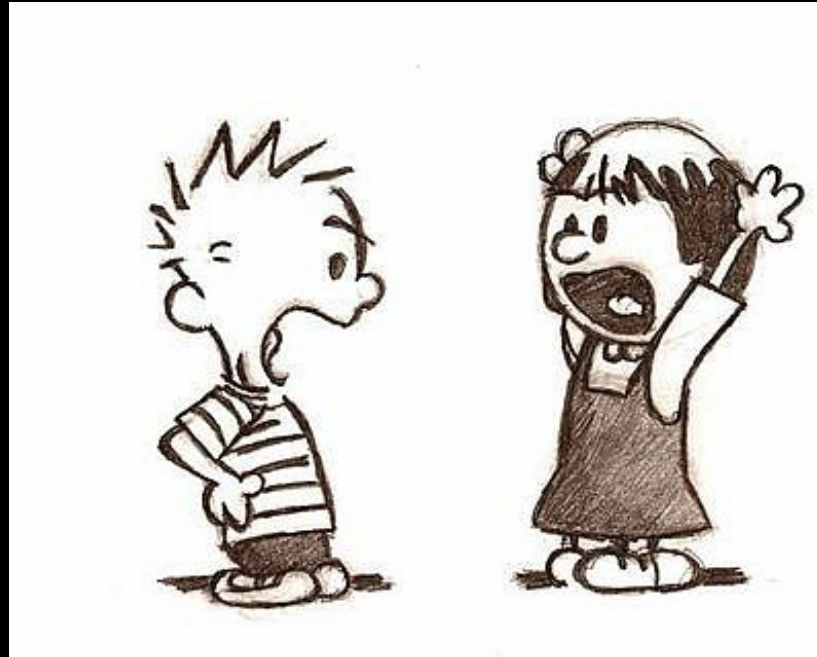
Responses to climate change

Calloway & Maron. 2006. *TRENDS in Ecology and Evolution* 21:369-74

Lockwood et al. 2007. *Invasion Ecology*. Blackwell Publishing, USA

Davis, M. 2009. *Invasion Biology*. Oxford Press, UK

Improving the science



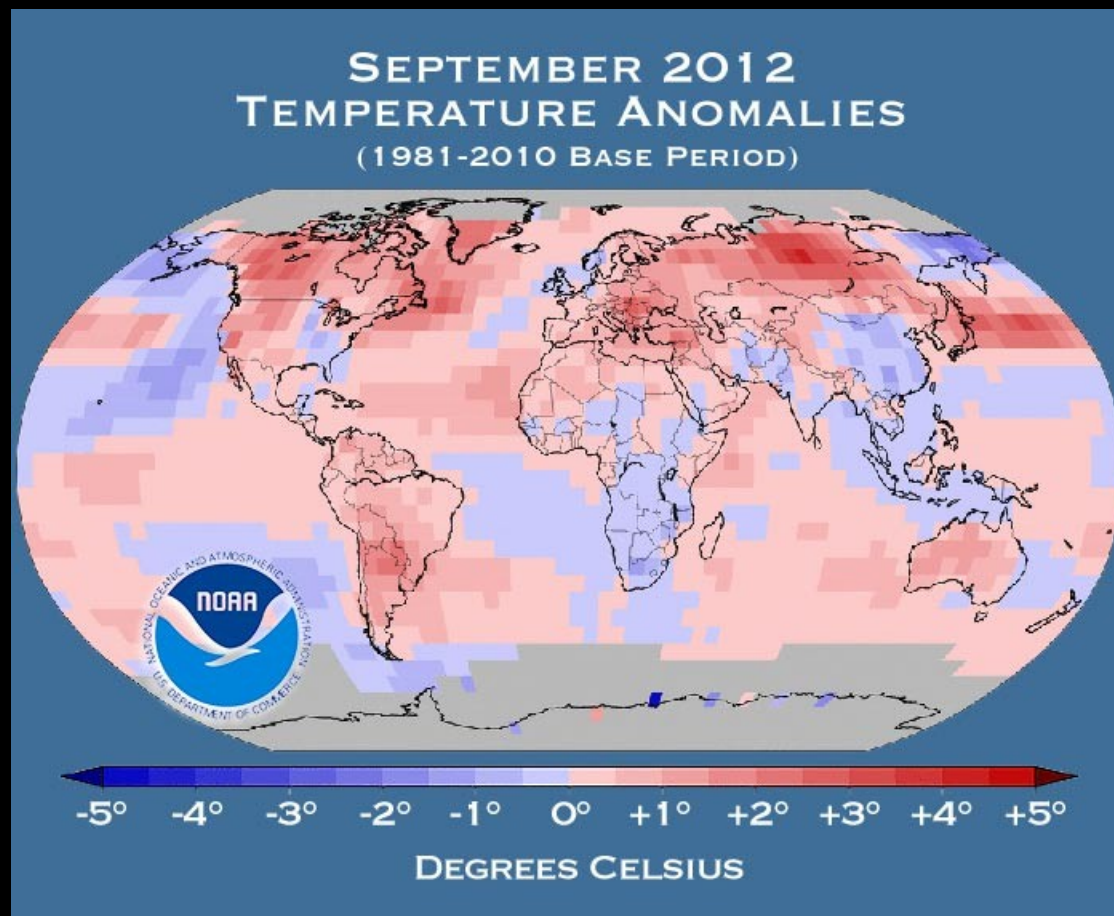
Less of a “controversy” than we think.

Invasion Biology: Paradigms Glossed. Anne Arbutnot, 2012.

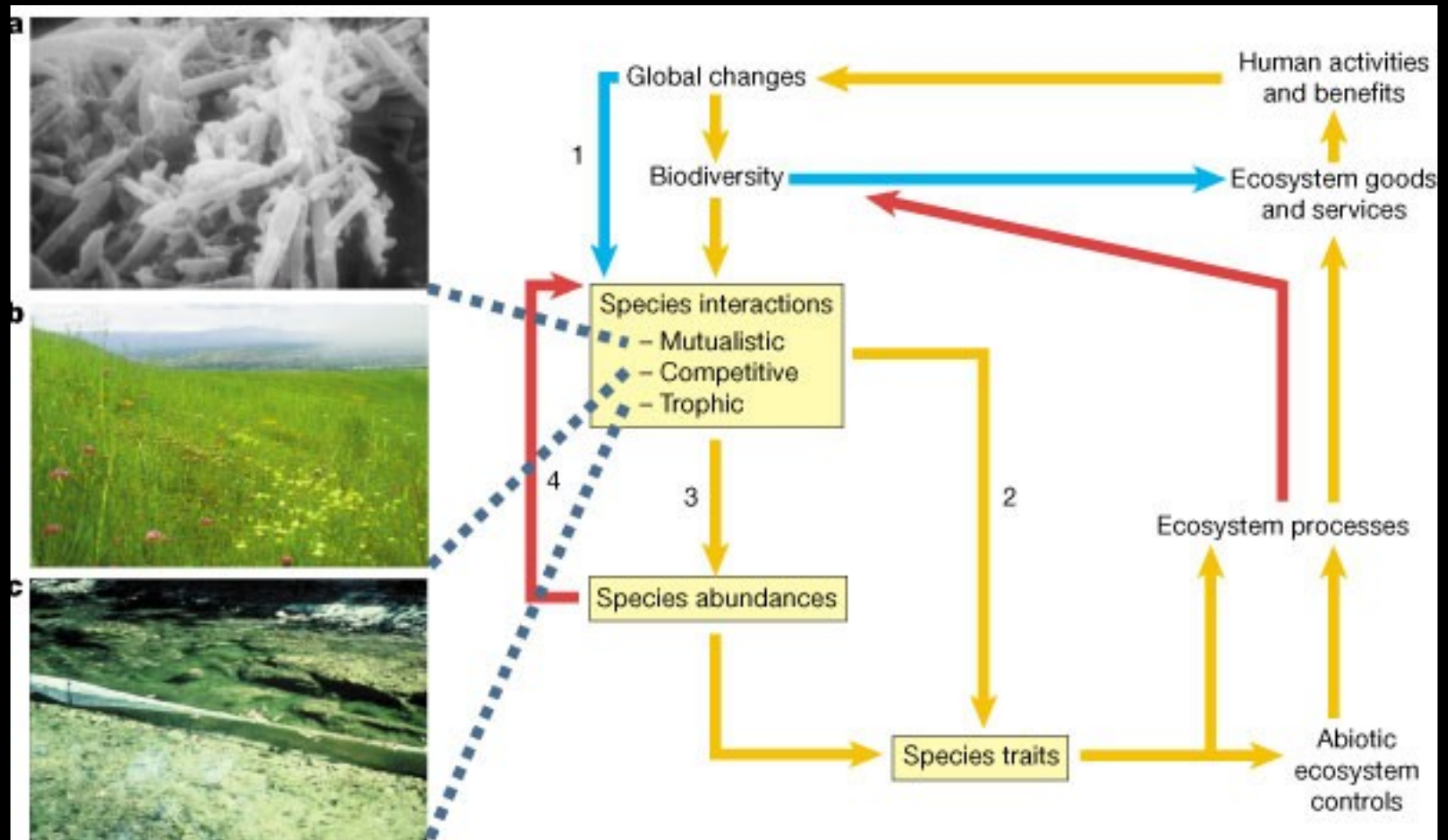
Improving the science

Multi-trophic interactions

Responses to climate change

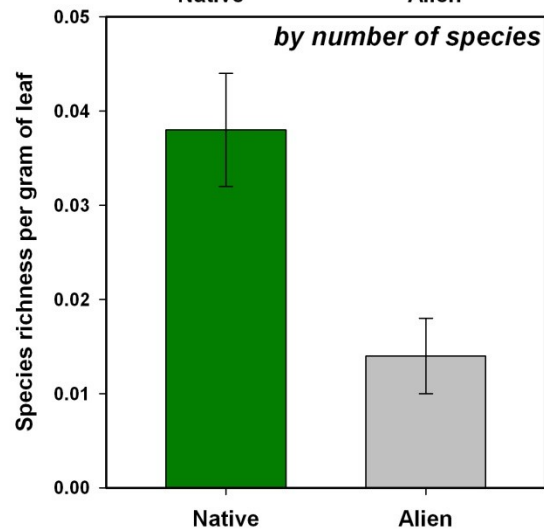
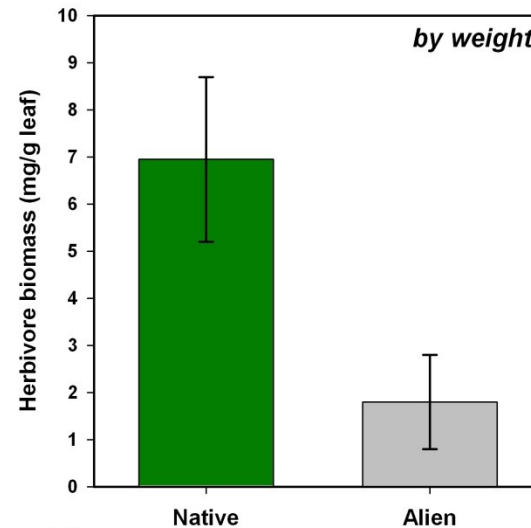


Multi-trophic interactions



Herbivores

Native plant species support more herbivores



Tallamy, D. 2007. *Bringing Nature Home*. Timber Press, OR.

Global Warming: Bottom-up



Microstegium vimineum

↑ N, pH



Kourtev et al. 1999. *Biological Invasions* 1: 237–245
Heneghan et al. 2007. *Pedobiologia* 50: 543-551

Deer: Top-down

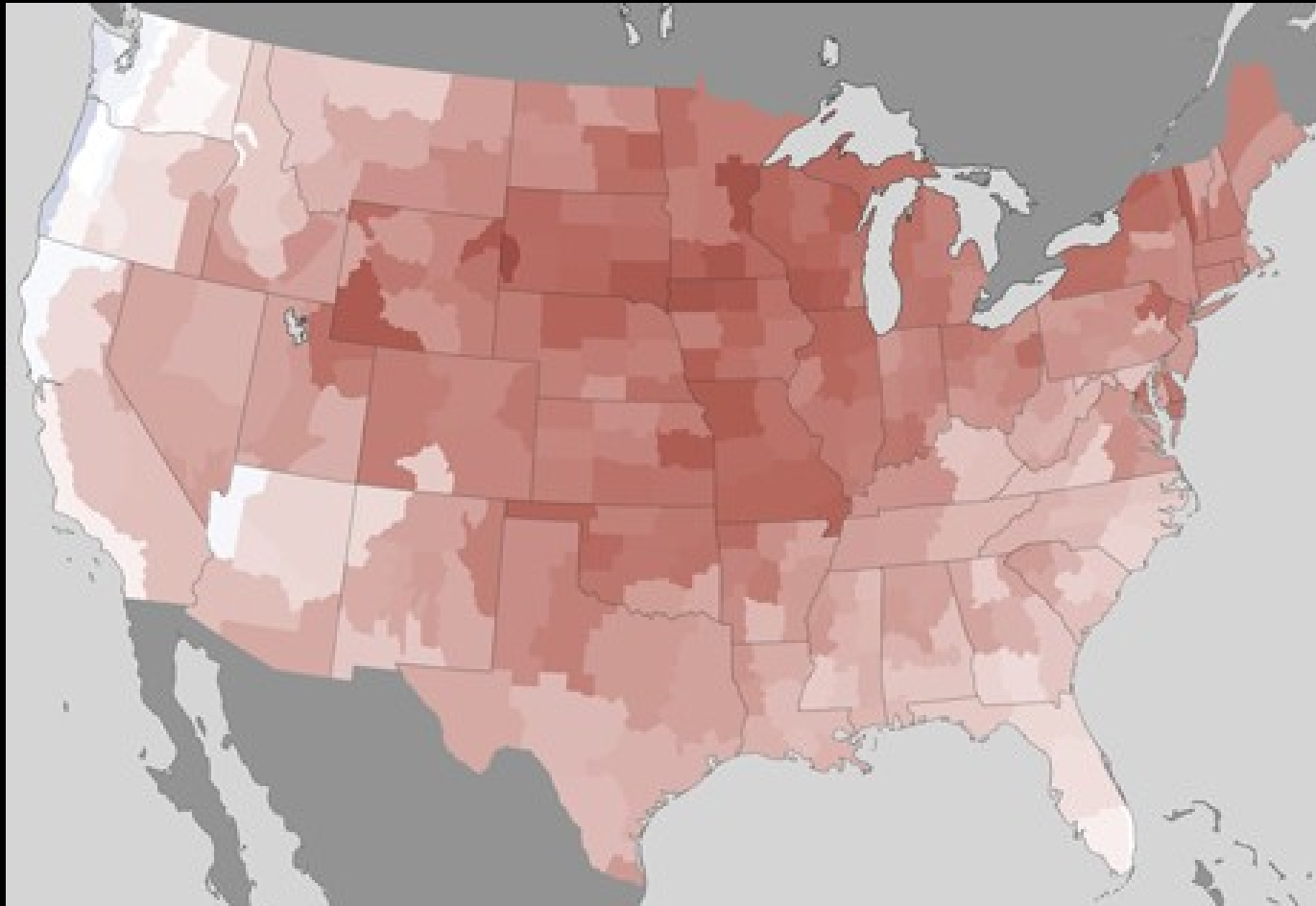


Seed dispersal
Removal of competing vegetation

Williams & Ward. 2006. *Natural Areas Journal* 26: 383-390.

Responses to climate change

2012 The hottest year on record in United States



National Climate Data Center, 2013

Responses to climate change in Concord, MA

**Invasives track seasonal temperature variation
better than natives**

Invasives shifted flowering time:

11 days earlier than natives and

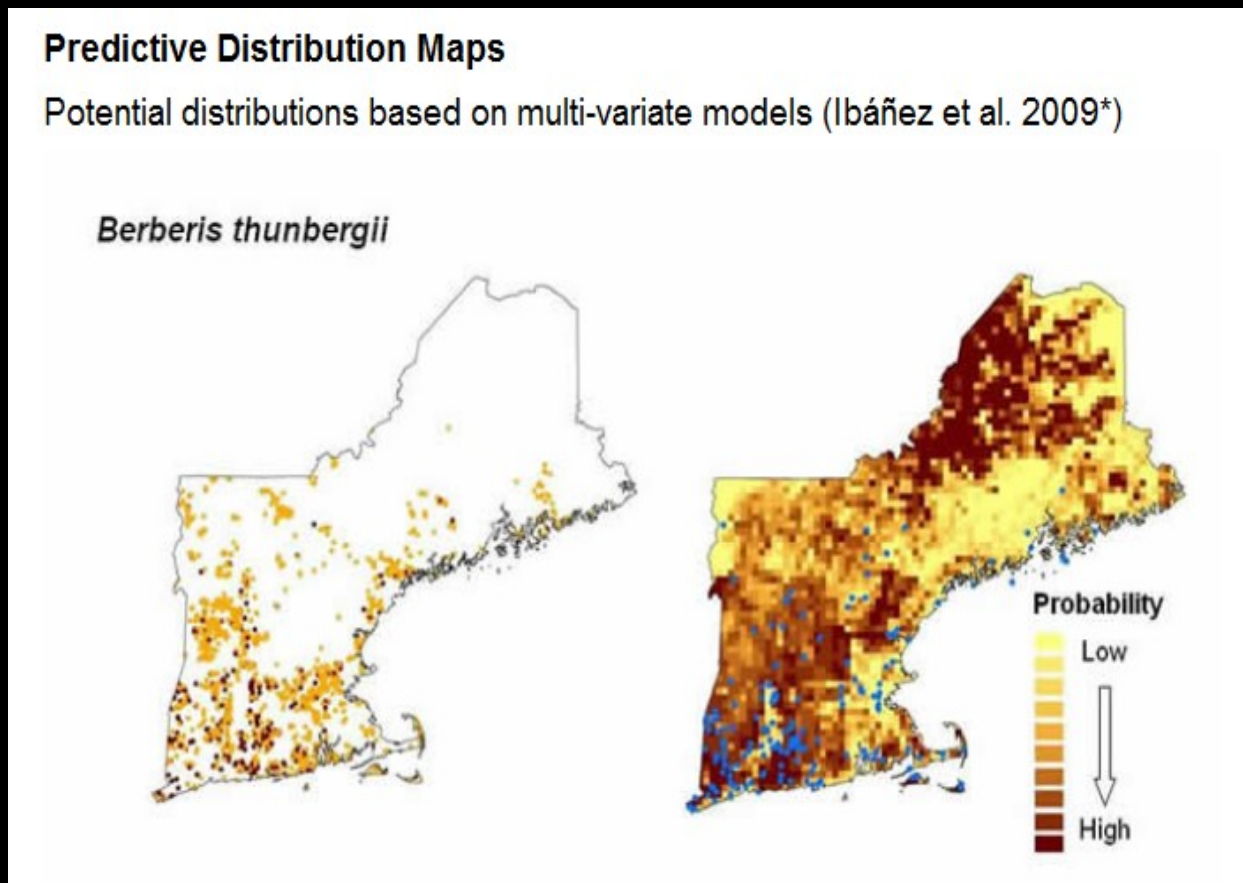
9 days earlier than non-native non-invasives

Management advantage?



Responses to climate change

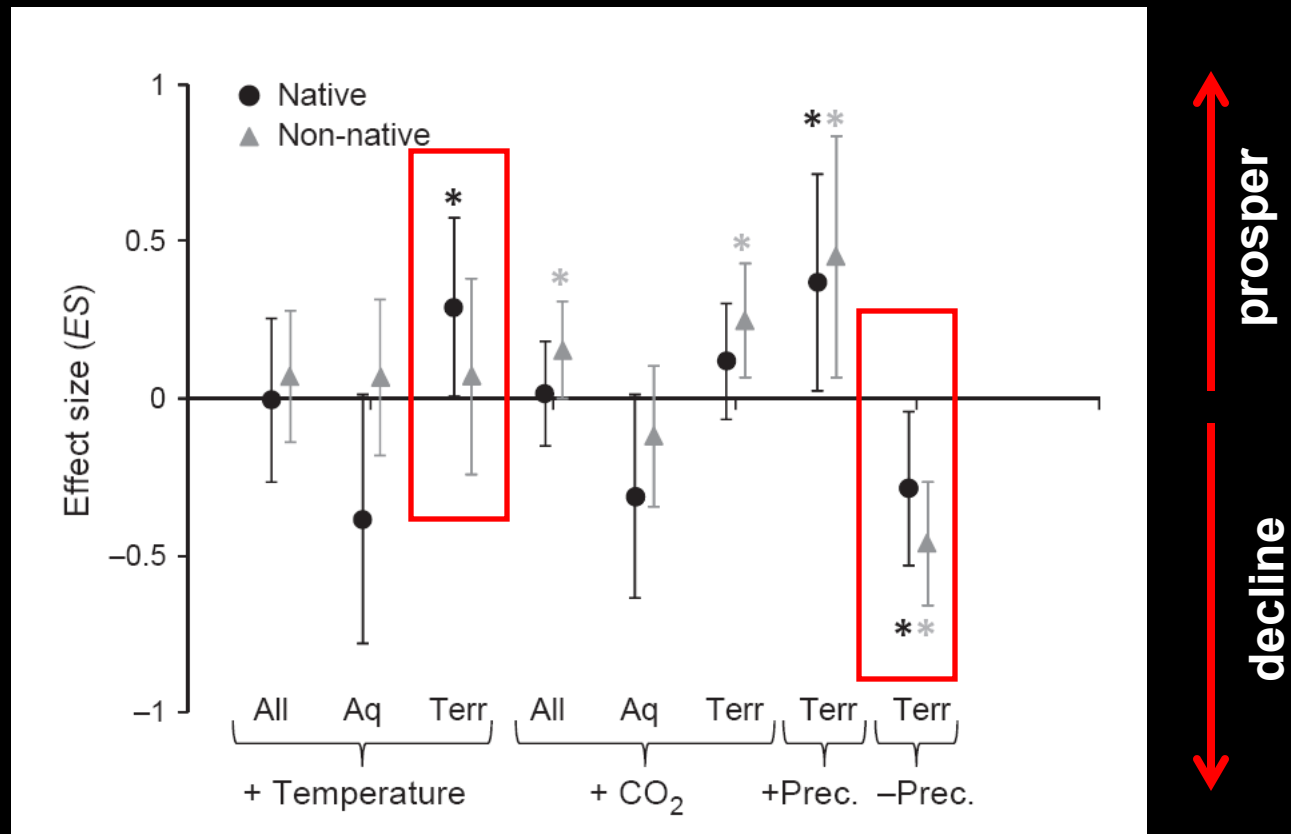
Models of present, potential and future species' ranges



Ibáñez, I., et al. 2009. *Ecological Applications* 19: 359-375.

Responses to climate change

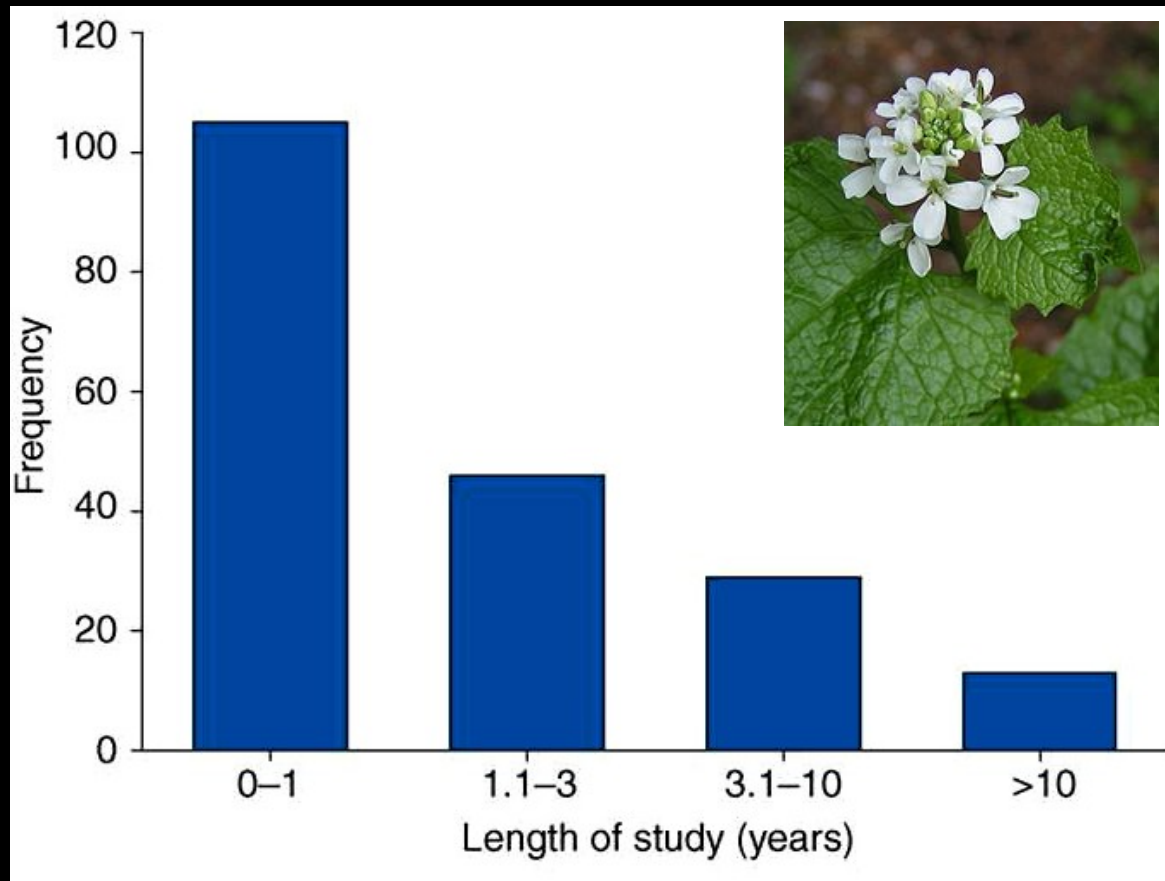
Are all invasives “poised to prosper?”



Sorte, C., et al. 2012. *Ecology Letters* doi: 10.1111/ele.12017.

Need for long-term study


That's what pointy-headed academics are for...



Strayer, D., et al. 2006. *TRENDS in Ecology & Evolution* 21: 645-651.

But who has time/\$ for science???

Free scientific information!!!



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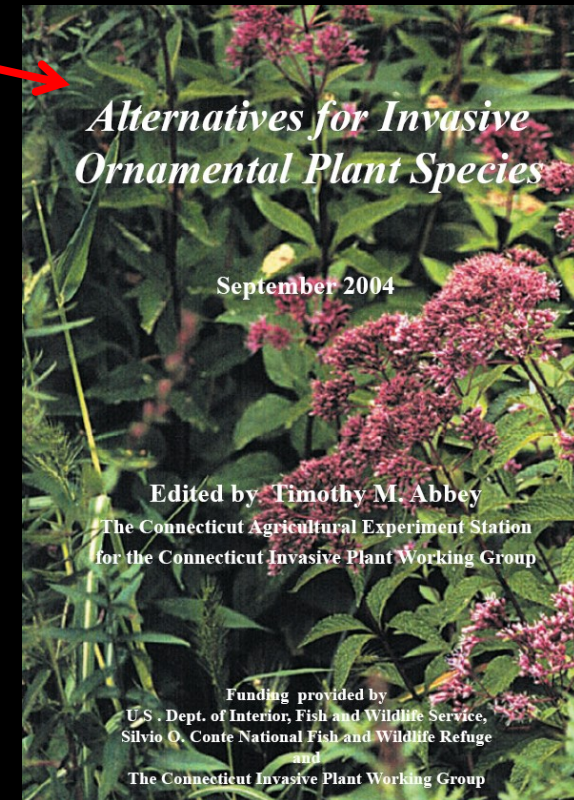
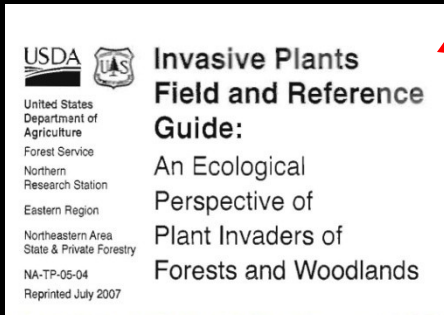



The screenshot shows the PLoS Reader app interface. At the top, it displays the time (12:10 PM) and battery level (60%). Below the navigation bar, there are two main sections. The left section shows a list of articles with titles like 'Dynamic Assignment and Maintenance of Positional Identity in the Ventral Neural Tube by the Mo...', 'Distorted Views of Biodiversity: Spatial and Temporal Bias in Species Occurrence Data', and 'A Feed-Forward Circuit Linking Wingless, Fat-Dachsous Signaling, and the Warts-Hippo Pathway to...'. The right section shows a detailed view of the article 'A Feed-Forward Circuit Linking Wingless, Fat-Dachsous Signaling, and the Warts-Hippo Pathway to...' by Myriam Zecca et al. The article text is visible, including an abstract and a section titled 'Introduction'. The interface is clean and designed for readability on a tablet device.

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Plant of the Day: PRUNUS VIRGINIANA *choke cherry*


Choke cherry may get its name from its astringent and rather unappetizing fruits. The flowers are borne on drooping racemes at the ends of branches, appearing with the leaves in late May and June. Its broad, egg-shaped leaves distinguish it from its look-alike, pin cherry ...

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Narrow to group



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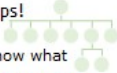
You are here: [Simple Key](#)

Which group best describes your plant?

Want help getting started?
If you're not sure what to do from here, take a look at this [Help page](#) for instructions.


[GET HELP](#)

Shortcut to Groups!



If you already know what group your plant is in, start with the clickable plant map to find your plant more quickly.


[VIEW MAP](#)



Woody plants
Trees, shrubs, sub-shrubs, and lianas

- KEY CHARACTERISTICS
Stems have secondary thickening (i.e., bark)
- EXCEPTIONS
Some small, low-lying shrubs can be mistaken for herbaceous plants.
- [VIEW A SHORT VIDEO ABOUT THIS GROUP](#)


[MY PLANT IS IN THIS GROUP](#)



Aquatic plants
Plants with most of their parts submerged under water

- KEY CHARACTERISTICS
Specialized leaves and tissues that can withstand flooding
- EXCEPTIONS
Some upland plants can be flooded temporarily but are not specialized for living under water
- [VIEW A SHORT VIDEO ABOUT THIS GROUP](#)

[MY PLANT IS IN THIS GROUP](#)



Grass-like plants

Narrow to subgroup



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You are here: Simple Key > Orchids and related plants

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GET HELP

Shortcut to Groups!

If you already know what group your plant is in, start with the clickable plant map to find your plant more quickly.

VIEW MAP

Is your plant in one of these subgroups?



Orchids

Plants in the family Orchidaceae

KEY CHARACTERISTICS

Orchids have highly specialized flowers with colors and structures that attract (and sometimes fool) insect pollinators. Sacs, called pollinia, contain the pollen grains. It is easiest to tell orchids apart by their flowers, so it helps to observe a mature, flowering plant. The leaves have parallel veins and are often oval (narrow in a few species). Sometimes the veins are prominent enough to make the leaf look pleated (i.e., *Cypripedium* species). Notice whether the leaves all grow at the base of the plant, or whether some grow on the stem. Some orchids produce leaves with green-and-white or spotted color patterns. The seeds are tiny and dispersed by wind. Young embryos get a head-start by drawing nutrients from associated fungi (mycorrhizae).

EXCEPTIONS

Orchid leaves can be confused with lily leaves, but orchid flowers -- with a large, modified lip -- are very different from all other monocots.

MY PLANT IS IN THIS SUBGROUP



Irises, lilies, and other "monocots"

Lilies, irises, aroids and others

KEY CHARACTERISTICS

"Monocots" are a broad category of plants that include grasses, sedges, and orchids (all plants whose embryos have only one leaf). Here, we separate out these other categories and just include the remaining species. The leaves have Look

Answer some questions

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You are here: Simple Key > Orchids and related plants > Orchids

Orchids

25 matching species

Photos List

Show photos of: flowers

Pick a question from this scrollable list:

- Habitat?
- New England state?
- Leaf arrangement?
- Number of leaves on stem?
- Form of lower petal?
- Lower petal outline?
- Main color of lower petal?
- Nectar spur?

GET MORE QUESTIONS

Add a few more questions for narrowing your matching species.

Already know the family or genus?

Family:

Genus:

Start Over:

Arethusa bulbosa
dragon's-mouth

Calopogon tuberosus
tuberous grass-pink

Corallorhiza maculata
spotted coral-root

Corallorhiza trifida
early coral-root

Cypripedium acaule
pink lady's-slipper

Cypripedium parviflorum
yellow lady's-slipper

Cypripedium reginae
showy lady's-slipper

Epipactis helleborine
broad-leaved helleborine

2359.herokuapp.com/_pocots/orchid-monocots/calopogon/tuberosus/

Answer some questions

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Orchids

25 matching species

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- New England state?
- Leaf arrangement?**
- Number of leaves on stem?
- Form of lower petal?
- Lower petal outline?
- Main color of lower petal?
- Nectar spur?

GET MORE QUESTIONS

Add a few more questions for narrowing your matching species.

Already know the family or genus?

Family: Clear

Genus: Clear


Start Over: CLEAR ALL

How are the leaves arranged along the stem?

The leaf arrangement may change higher up on the stem. Look at the leaf arrangement near the midpoint between the base of the stem and the base of the inflorescence.

- don't know
- alternate: there is one leaf per node along the stem (14)
- opposite: there are two leaves per node along the stem (1)
- the leaves are growing only at the base of the plant (basal) (9)
- there are no apparent leaves except on the reproductive stems (2)
- doesn't apply (0)
- whorled: there are three or more leaves per node along the stem (2)

APPLY SELECTION



Drawings of characters

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Orchids

25 matching species

Photos List

Pick a question from this scrollable list:

- Habitat?
- New England state?
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- Main color of lower petal?
- Nectar spur?

GET MORE QUESTIONS

Add a few more questions for narrowing your matching species.

Already know the family or genus?

Family: Clear

Genus: Clear


Start Over: **CLEAR ALL**

How are the leaves arranged along the stem?

The leaf arrangement may change higher up on the stem. Look at the leaf arrangement between the base of the stem and the base of the inflorescence.

- don't know
- alternate: there is one leaf per node along the stem (14)
- opposite: there are two leaves per node along the stem (1)
- the leaves are growing only at the base of the plant (basal) (9)
- there are no apparent leaves except on the reproductive stems (2)
- doesn't apply (0)
- whorled: there are three or more leaves per node along the stem (2)

APPLY SELECTION



Glossary – All terms defined

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You are here: **flower array; arrangement of flowers on a stem**

Pick a question from this scrollable list:

- Inflorescence type?**
- Main color of lower petal?
- Form of lower petal?
- Lower petal length?
- Lower petal outline?
- Spots on lower petal?
- Leaf arrangement?
- Nectar spur?

GET MORE QUESTIONS

Add a few more questions for narrowing your matching species.

Already know the family or genus?



Family:

Genus:

Start Over:

What type of inflorescence does the plant produce?

An inflorescence is an array of flowers on a single stem. Be sure to look at a mature specimen with fully open flowers.

don't know   doesn't apply (0)

the inflorescence has only one flower or a pair of flowers on it (6)

the inflorescence is a raceme (a long unbranched stem with stalked flowers growing along it) (11)

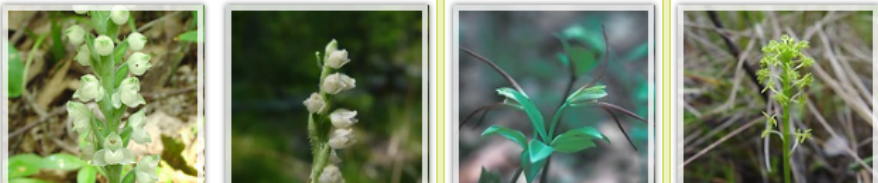
the inflorescence is a spike (a long unbranched stem with flowers along it that lack stalks) (11)

Cypripedium acaule
pink lady's-slipper

Cypripedium parviflorum
yellow lady's-slipper

Cypripedium reginae
showy lady's-slipper

Epipactis helleborine
broad-leaved helleborine



Innovations

The Whaddyagot feature

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Orchids

25 matching species

Photos **List**

What types of things can you tell about your plant?

Optional. Check one or more boxes based on things you can actually see, in order to get the next best questions to answer. Or, just press the button.

- flowers
- fruits or seeds
- growth form
- leaves

GET MORE QUESTIONS

GET MORE QUESTIONS

Add a few more questions for narrowing your matching species.

Already know the family or genus?

Family: **Clear**

Genus: **Clear**

Start Over: **CLEAR ALL**

Cypripedium acaule
pink lady's-slipper

Cypripedium parviflorum
yellow lady's-slipper

Cypripedium reginae
showy lady's-slipper

Epipactis helleborine
broad-leaved helleborine

Corallorhiza trifida
early coral-root

Innovations

Next best question feature

More questions added

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You are here: Simple Key > Orchids and related plants > Orchids

Pick a question from this scrollable list:

- Lower petal length?
- Inflorescence type?
- Spots on lower petal?
- Main color of lower petal?
- Form of lower petal?
- Lower petal outline?
- Leaf arrangement?
- Nectar spur?

GET MORE QUESTIONS

Add a few more questions for narrowing your matching species.

Already know the family or genus?

Family: Clear




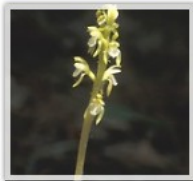








Genus: Clear

Start Over: CLEAR ALL

Orchids

25 matching species

Show photos of: flowers

 <p><i>Arethusa bulbosa</i> dragon's-mouth</p>	 <p><i>Calopogon tuberosus</i> tuberous grass-pink</p>	 <p><i>Corallorhiza maculata</i> spotted coral-root</p>	 <p><i>Corallorhiza trifida</i> early coral-root</p>
 <p><i>Cypripedium acaule</i> pink lady's-slipper</p>	 <p><i>Cypripedium parviflorum</i> yellow lady's-slipper</p>	 <p><i>Cypripedium reginae</i> showy lady's-slipper</p>	 <p><i>Epipactis helleborine</i> broad-leaved helleborine</p>
			

Taxon Information Page



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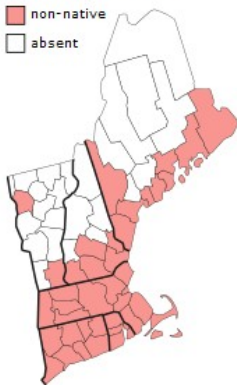
Search...



New England Distribution

Adapted from BONAP data

- non-native
- absent



North America Distribution

Adapted from BONAP data



Enlarge

Native to North America?

No

Sometimes Confused With

Celastrus occidentalis

You are here: [Simple Key](#) > [Woody plants](#) > [Broad-leaved woody plants](#) > *Celastrus orbiculatus*

Celastrus orbiculatus Thunb.

Asian bittersweet, Asiatic bittersweet



Facts About

Asian bittersweet was introduced from its native East Asia in 1860 and now grows in much of the eastern United States. This aggressive [vine](#) tolerates both high sun and deep shade, and can quickly overtop and [girdle](#) trees. This [species](#) has long been regarded as an attractive ornamental. Its abundant clusters of yellow seeds surrounded by a [fleshy red aril](#) are often used to make festive wreaths and flower arrangements. Seeds are spread when the plants are later thrown away. Birds also relish the fruits and disperse the seeds far and wide.

Habitat

Anthropogenic (man-made or disturbed habitats), forest edges, forests, meadows and fields, shrublands or thickets

Dichotomous Keys

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Dichotomous Keys to Groups

- Go back, start with family or genus

Want help getting started? [GET HELP](#)

Jump to a Group

Photos: Group 1 of 9

1A. Plants typically reproducing by spores, seeds and fruits not produced; gametophyte independent of sporophyte; ferns and fern-like plants. [SEE FAMILIES IN 1A](#) [GROUP 1](#)

1B. Plants typically reproducing by seeds, the seeds borne within a fruit or not; gametophyte dependent on sporophyte; seed plants. [SEE FAMILIES IN 1B](#) [CHOOSE THIS LEAD](#)



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Dichotomous Keys to Groups

- Go back, start with family or genus

Want help getting started? [GET HELP](#)

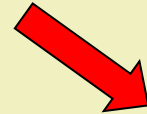
Jump to a Group

Photos: Group 1 of 9

1B. Plants typically reproducing by seeds, the seeds borne within a fruit or not; gametophyte dependent on sporophyte; seed plants. [SEE FAMILIES IN 1B](#) [GO BACK](#) Revisit this choice

2A. Plants not producing by true flowers; seeds commonly borne in strobili on the surface of a scale (embedded in a fleshy aril in Taxus, never enclosed in an ovary; styles and stigmas absent; trees and shrubs narrow, scale- or needle like, usually persistent; leaves. [SEE FAMILIES IN 2A](#) [GROUP 2](#)

2B. Plants usually producing true flowers, seeds enclosed in an ovary; stigma(s) and usually style(s) present, elevated above the ovary; woody or herbaceous plants, with various types of leaves. [SEE FAMILIES IN 2B](#) [CHOOSE THIS LEAD](#)



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Dichotomous Keys to Groups

- Go back, start with family or genus

Want help getting started? [GET HELP](#)

Jump to a Group

Photos: Group 1 of 9

1B. Plants typically reproducing by seeds, the seeds borne within a fruit or not; gametophyte dependent on sporophyte; seed plants. [SEE FAMILIES IN 1B](#) [GO BACK](#) Revisit this choice

2B. Plants usually producing true flowers, seeds enclosed in an ovary; stigma(s) and usually style(s) present, elevated above the ovary; woody or herbaceous plants, with various types of leaves. [SEE FAMILIES IN 2B](#) [GO BACK](#) Revisit this choice

3A. Leaf blades unusually parallel-veined (or the plants thaloid in some Araceae); seeds with 1 cotyledon; perianth typically 3- or 6-merous; vascular bundles scattered throughout the stem; secondary growth absent. [SEE FAMILIES IN 3A](#) [GROUP 3](#)

3B. Leaf blades usually pinnately veined; seeds with 2 cotyledons, perianth typically 4-, 5-, or more-merous; vascular bundles arranged around a central pith; secondary growth absent or present. [SEE FAMILIES IN 3B](#) [CHOOSE THIS LEAD](#)

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NEW ENGLAND WILD FLOWER SOCIETY

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My Profile

Edit Profile

ZachSmythe
"Your saying here"
Joined 03/28/2011

Upload Photo

Geo Region	Cape Cod
Total Species	76
Total Locations	267
Lists	6
Tribes	1

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Nymphaea odorata

Share sightings

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Sightings Locator

Show recent plant sightings for


Enter plant name

How to Use
Enter a plant name and we'll show on the map where its been seen recently.

Don't see a plant you think should be there?
You will see all recent sightings that others have marked for public display, or for viewing by a Tribe that you belong to.

Rare and endangered plants will not be displayed.


[View full page >](#)



Ask the Botanist

"Ace" Acer

Our Ace Botanist is here to help you identify a plant, suggest locations for seeing provide you with expert scientific guidance on all things in the New England plant. Registered users can ask questions, all visitors can see the answers.




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Sightings Locator

Show recent plant sightings for

Sighting Details



Latin Name	<i>Camboba caroliniana</i>
Common Name	Carolina Fanwort
Location	Burlington, VT
Lat/Long	44.473, 73.155
Date	June 27, 2012 8:14AM
Sighted by	Greenman Contact
Notes	Oh no! Invasive plant now being seen in Lake Champlain. Located near Johnson's Marina.



Sign up, create checklists

Helping kids ID invasives



Jim Sirch

Restoration with volunteers

Can it work?

Pepperweed (*Lepidium latifolium*) in Salisbury and Newburyport



80% controlled with multi-agency and volunteer participation

Mile-a-minute vine (*Persicaria perfoliata*) in Westford, MA



College of Agriculture and Natural Resources

Department of Plant Science and Landscape Architecture

CIPWG HOME

Home

About mile-a-minute

Species Identification

Similar Species Guide

State Contacts

Distribution Information

MAM Resources

Biological Control

Control Options

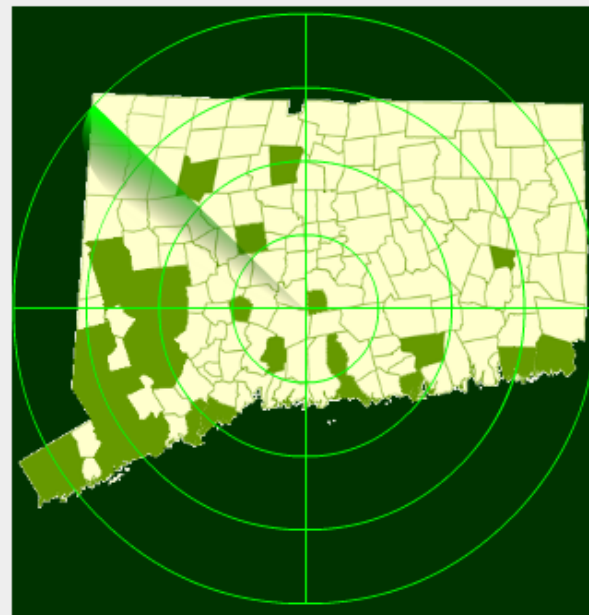
News Archive

*For the Press

Other Invasive Species

-Online Reporting Form-

Welcome to the CT mile-a-minute vine website!



Mile-a-minute detected in towns marked in green

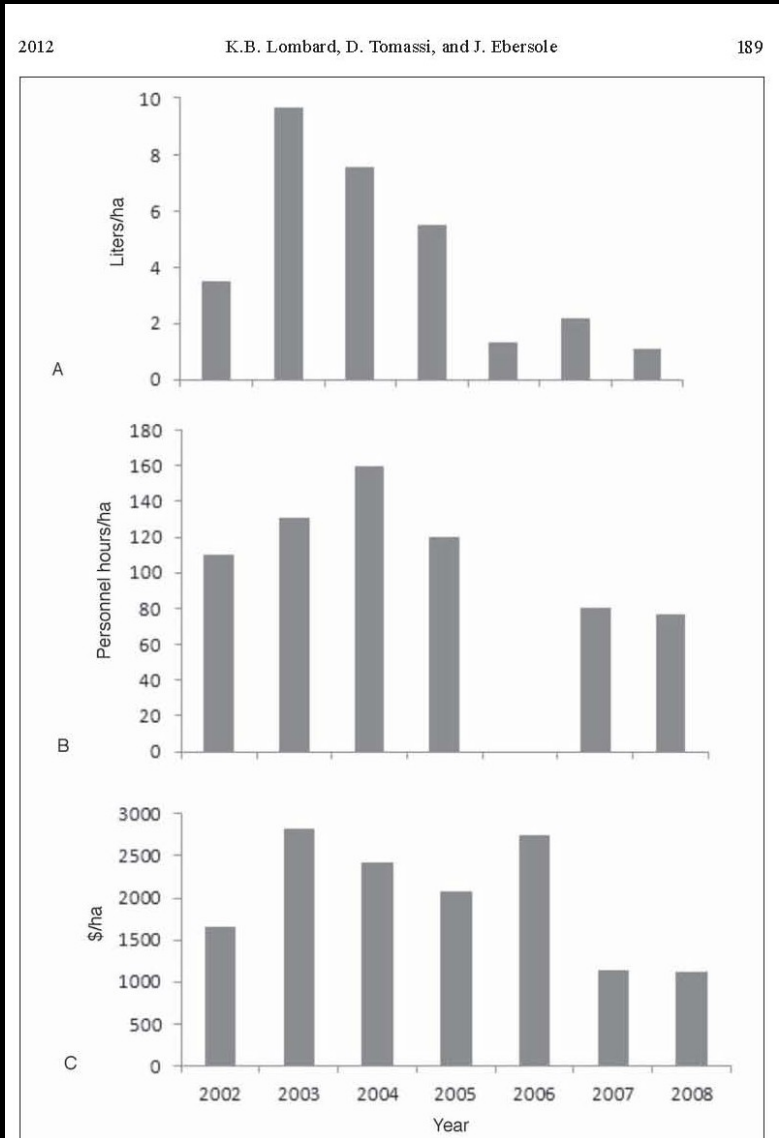
Volunteers recruit volunteers, significant reduction in 3 years

Water Chestnut (*Trapa natans*) in Connecticut River tribs



Consistency and continual monitoring

Common reed (*Phragmites australis*) Barnstable, MA

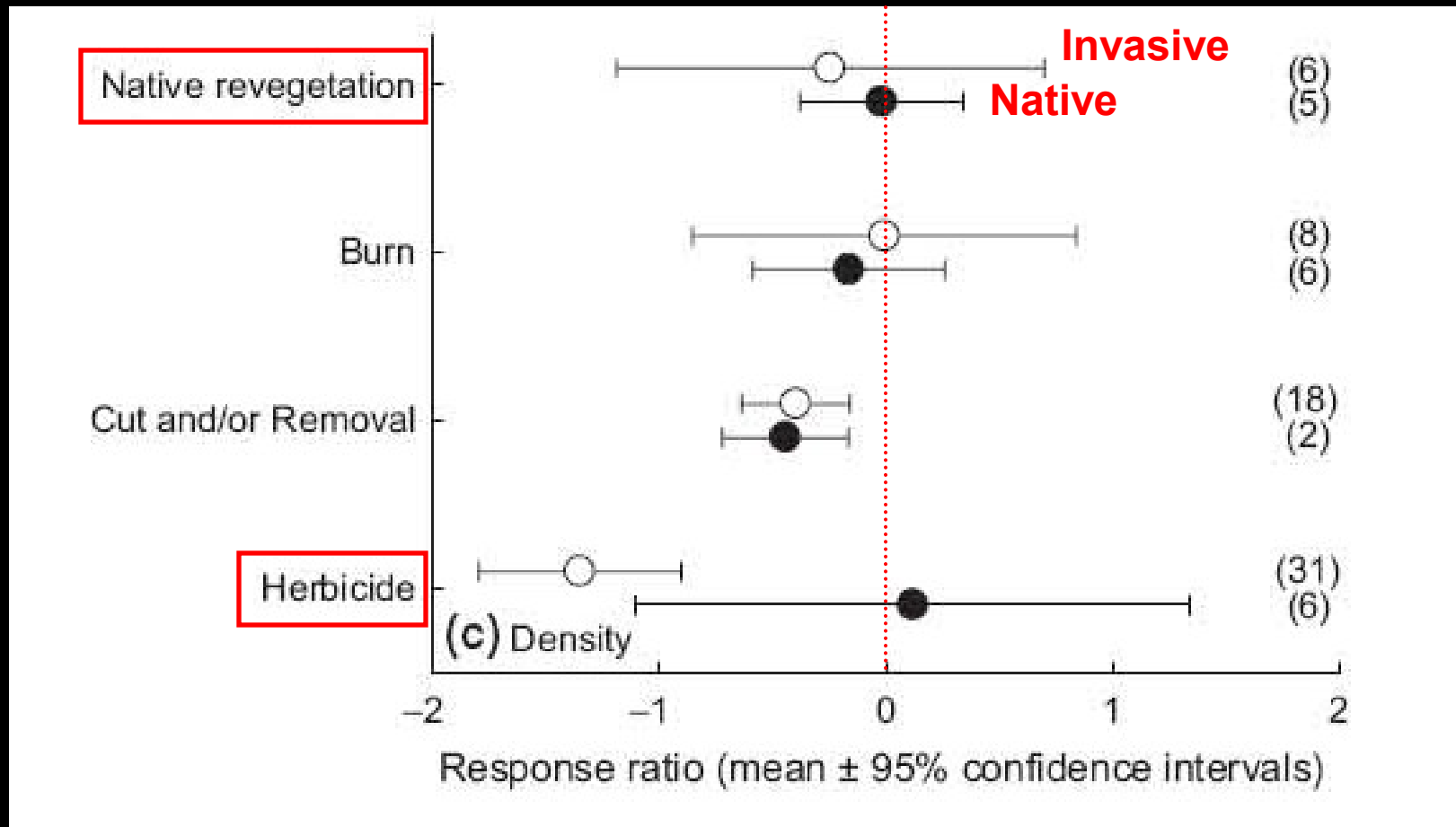


Herbicide

Person-hours

\$ per hectare

Meta-analysis of invasive control outcomes

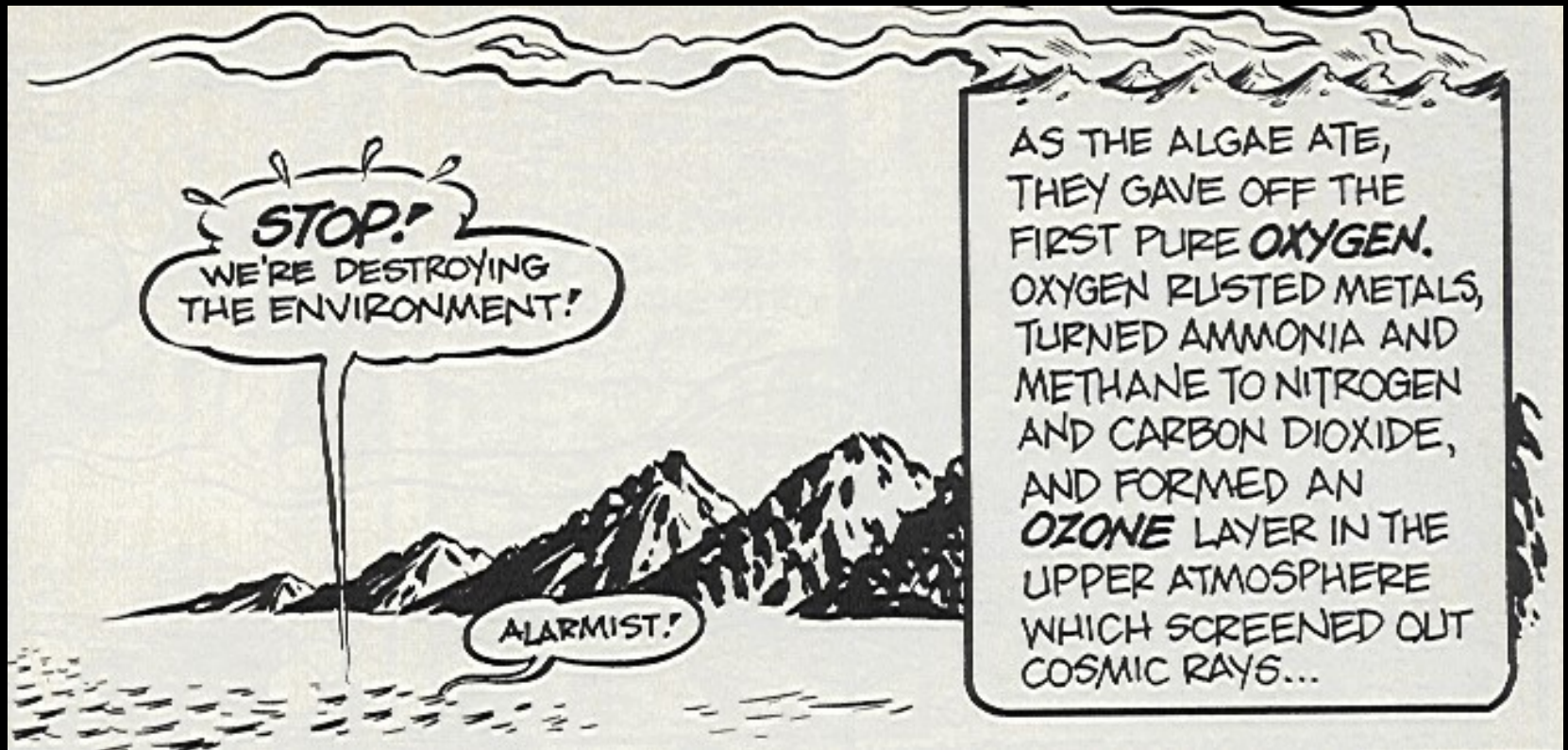


We HAVE made **progress** in:

- **Identifying** most invasive species
- **Targeting** new potential invasives
- **Improving** the science
- **Educating** the public
- **Restoring** sites with volunteers



What do we need to do?



Step back and take a deep breath...

What do we need to do?

Management = Science.

Share your science.

The screenshot displays the National Invasive Species Information Center (NISIC) website. At the top left is the USDA logo with the text "United States Department of Agriculture National Agricultural Library". To the right is the title "NATIONAL INVASIVE SPECIES INFORMATION CENTER". Below the header is a navigation menu with links: Home, About NISIC, News and Events, Council, Help, and Contact Us. A breadcrumb trail reads "You are here: Home / Resource Library / Databases / Regional". The main content area is titled "Resource Library" and features a "Databases" section. Under "Regional", there is a description: "Describes databases available online related to invasive species regionally. See **Resource Library - Databases** for general resources, other species, and expertise information." Two database entries are listed: "Alaska EDDMapS - Early Detection and Distribution Mapping System" (Host: University of Georgia's Center for Invasive Species and Ecosystem Health, Scope: The Alaska Exotic Plant Information Clearinghouse (AKEPIC) Database) and "Alaska Exotic Plants Information Clearinghouse - AKEPIC Database (formerly AKEPMP)" (Host: University of Alaska - Anchorage, Alaska Natural Heritage Program). A sidebar on the left contains a search bar and navigation options like "Browse by Geography" and "Browse by Subject". A right sidebar shows a "Resource Library" menu with items like "Agencies and Organizations", "Databases", and "Publications".

USDA United States Department of Agriculture National Agricultural Library

NATIONAL INVASIVE SPECIES INFORMATION CENTER

Home About NISIC News and Events Council Help Contact Us

You are here: Home / Resource Library / Databases / Regional

Resource Library

Databases

Regional

Describes databases available online related to invasive species regionally. See **Resource Library - Databases** for general resources, other species, and expertise information.

Database: Alaska EDDMapS - Early Detection and Distribution Mapping System
Host: University of Georgia's Center for Invasive Species and Ecosystem Health
Scope: The Alaska Exotic Plant Information Clearinghouse (AKEPIC) Database is a collaborative effort to compile information on the distribution and abundance of exotic and invasive plant species in Alaska. EDDMaps (Early Detection and Distribution Mapping System) Alaska provides a more accurate picture of the distribution of invasive species in the Alaska.

Database: Alaska Exotic Plants Information Clearinghouse - AKEPIC Database (formerly AKEPMP)
Host: University of Alaska - Anchorage, Alaska Natural Heritage Program

SHARE [social media icons]

Resource Library

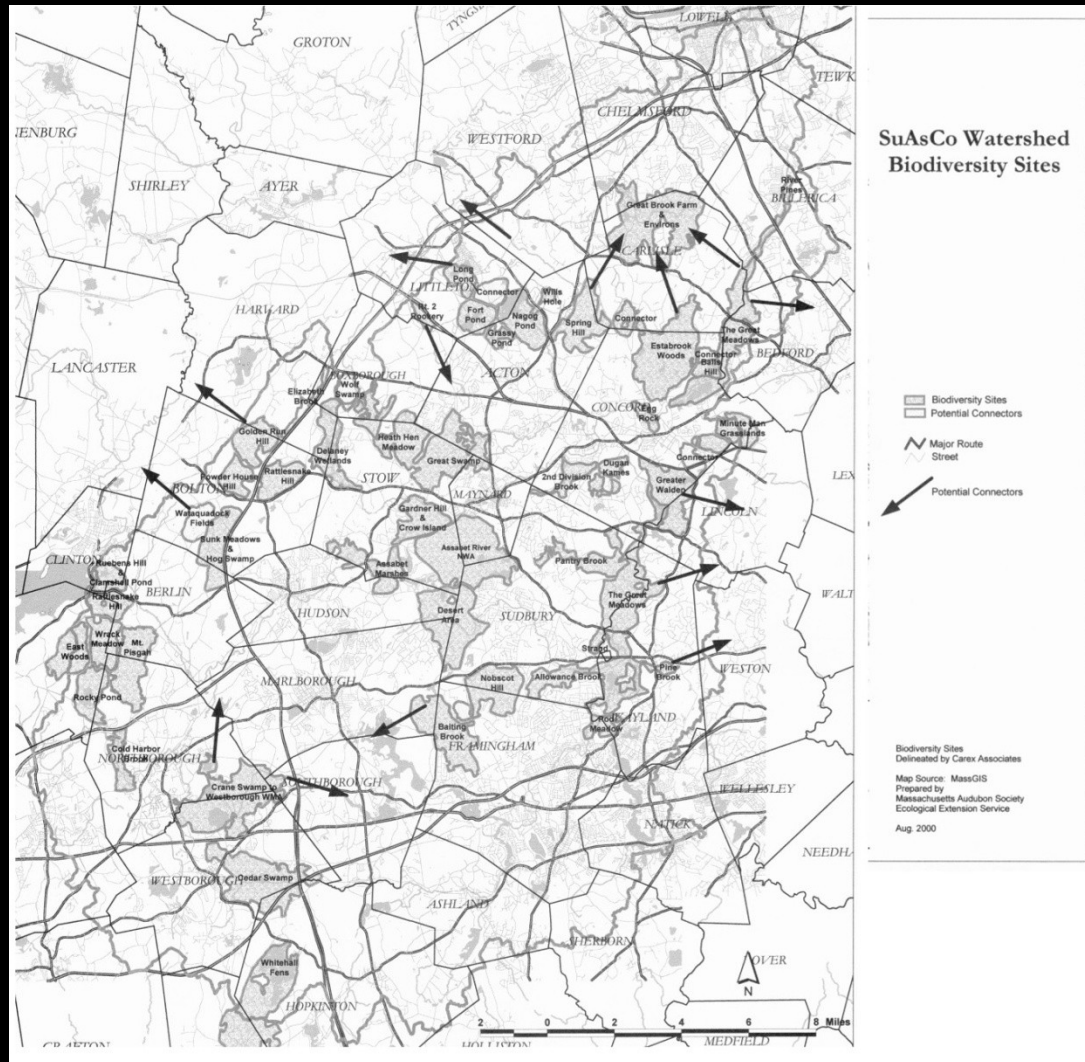
- Agencies and Organizations
- Databases**
- Discussion Groups
- Educational Resources
- Frequently Asked Questions
- Identification Resources
- Image Galleries
- Invasive Species Lists
- Publications

Media Help

To view PDF files you must have Adobe Acrobat

What do we need to do?

Systematic planning



What do we need to do?

Don't just yank stuff out.

Put plants back in.



What do we need to do?

Understand:

Unexpected impacts of management

Technical options

Feasibility

Risks

Likelihood of success

Extent of interest

What do we need to do?

Know when to walk away.

Invaded places DO provide good data.

Novel ecosystems function, too.



John Burns

What do we need to do?

Adopt a long-term view

What fostered the invasion?

Interactions change.

Plan for a changing planet.

Conserve proactively.

Think big.

Nature can drive you a little nutty...





SuAsCo

CIPWG

Cynthia Boettner

Bill Brumback

Ted Elliman

Donna Ellis

Martha Hoopes

Laura Meyerson

National Science Foundation

NE Natural Heritage Programs

Jim Sirch

Harvard University



Thanks to

