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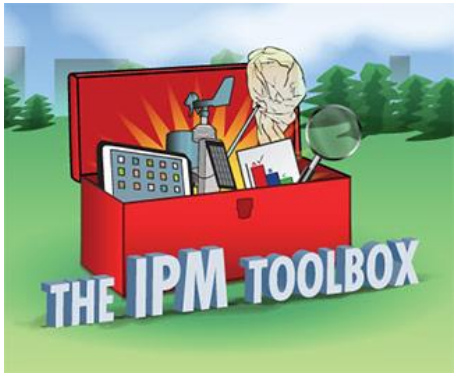
# New Tools for Identifying and Prioritizing Range Shifting Invasive Plants




USDA United States Department of Agriculture National Institute of Food and Agriculture

**If you have a species or state that you'd like us to consider for the live demo, please type it in the Q & A box.**

# Webinar Details

- Welcome
- A recording of this webinar will be available within a week at

http://www.neipmc.org/go/ipmtoolbox

# We Welcome Your Questions

- Please submit a question **at any time** using the Q&A feature

- If you'd like to ask a question anonymously, please indicate that at the beginning of your query.

# Webinar Presenters

Jenica Allen

Bethany Bradley

Northeast RISCC Management

Regional Invasive Species & Climate Change

# Today's Agenda

- Invasive Species and Climate Change
- Invasive Plant Range Shift Maps
- Invasive Range Shifter Listing Tool
- Prioritizing Lists with Impacts Assessments

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# Some Questions For You

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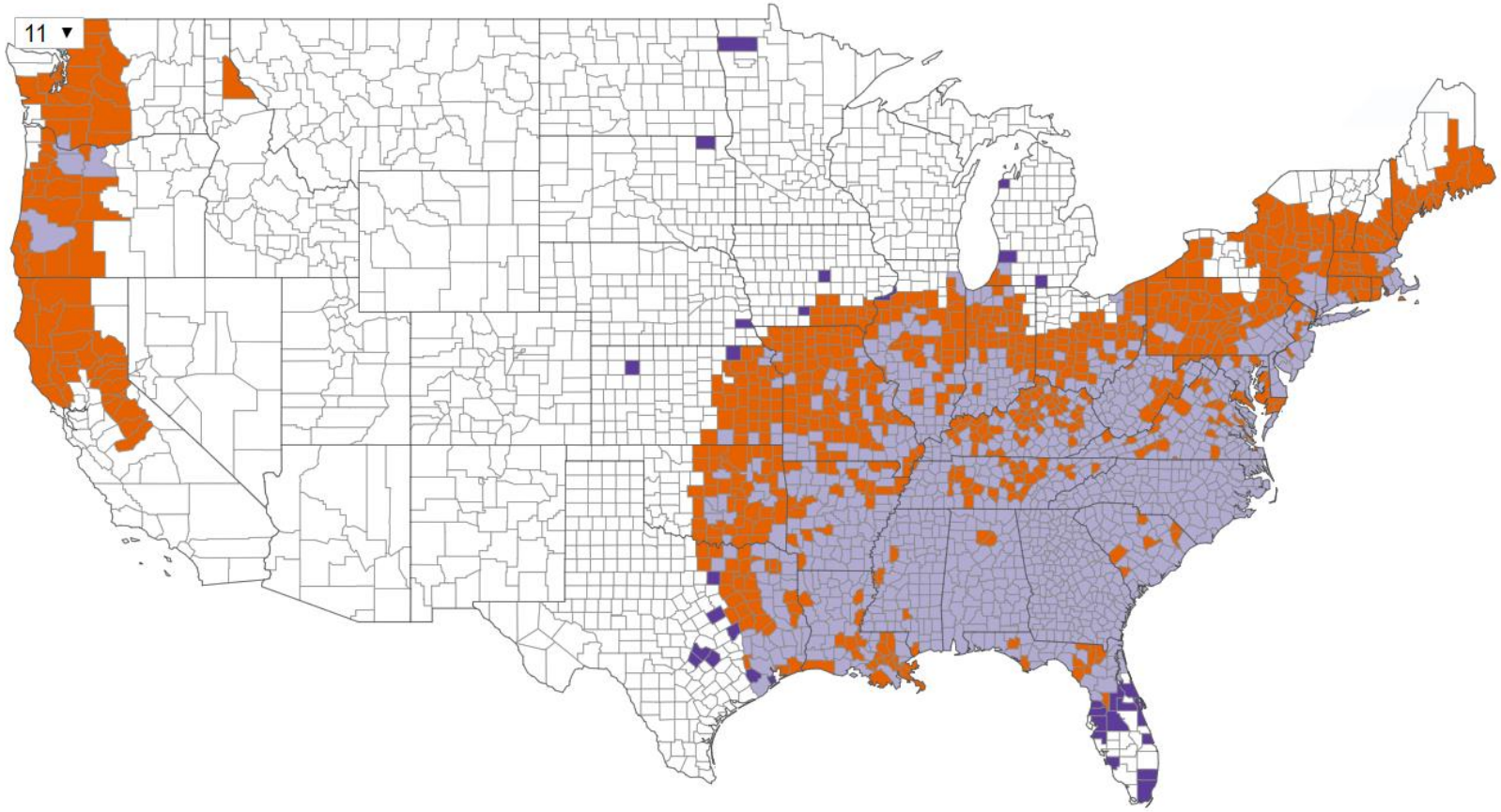
# New tools for identifying and prioritizing range-shifting invasive plants




Jenica Allen
Mount Holyoke College

Bethany Bradley
University of Massachusetts Amherst

EDDMapS team: Joe LaForest, Chuck Bargeron, Sai Desari

EDDMapS
Early Detection & Distribution Mapping System

Jeff Garnas, Brittany Laginhas, Mei Rockwell-Postel

Northeast RISCC Management
Regional Invasive Species & Climate Change

NE CASC
Northeast Climate Adaptation Science Center

Project funded by the Northeastern IPM Center through Grant #2014-70006-22484 and supported by Southern IPM Center through Grant #2018-70006-28884 from the USDA National Institute of Food and Agriculture, Crop Protection and Pest Management, Regional Coordination Program.

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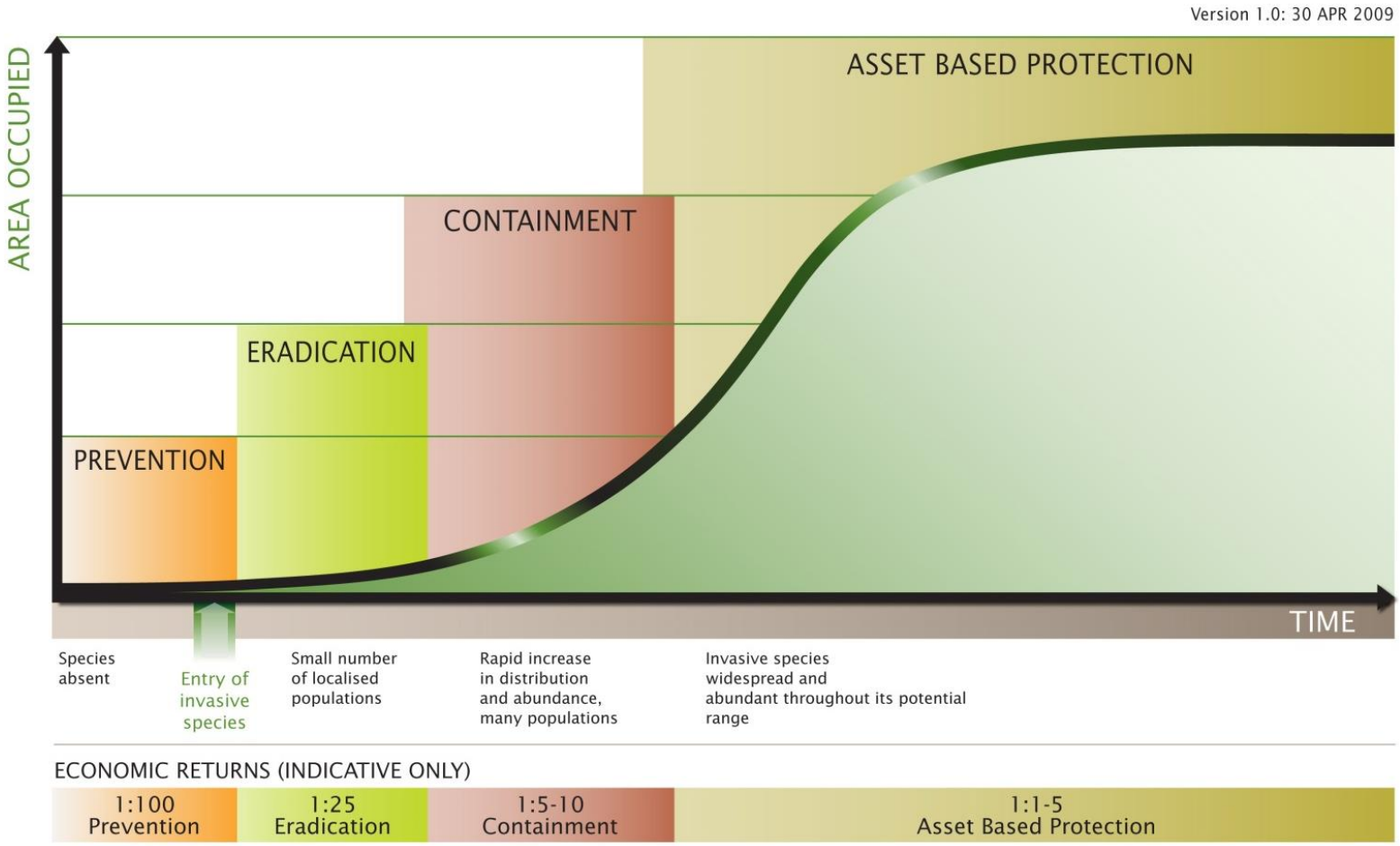
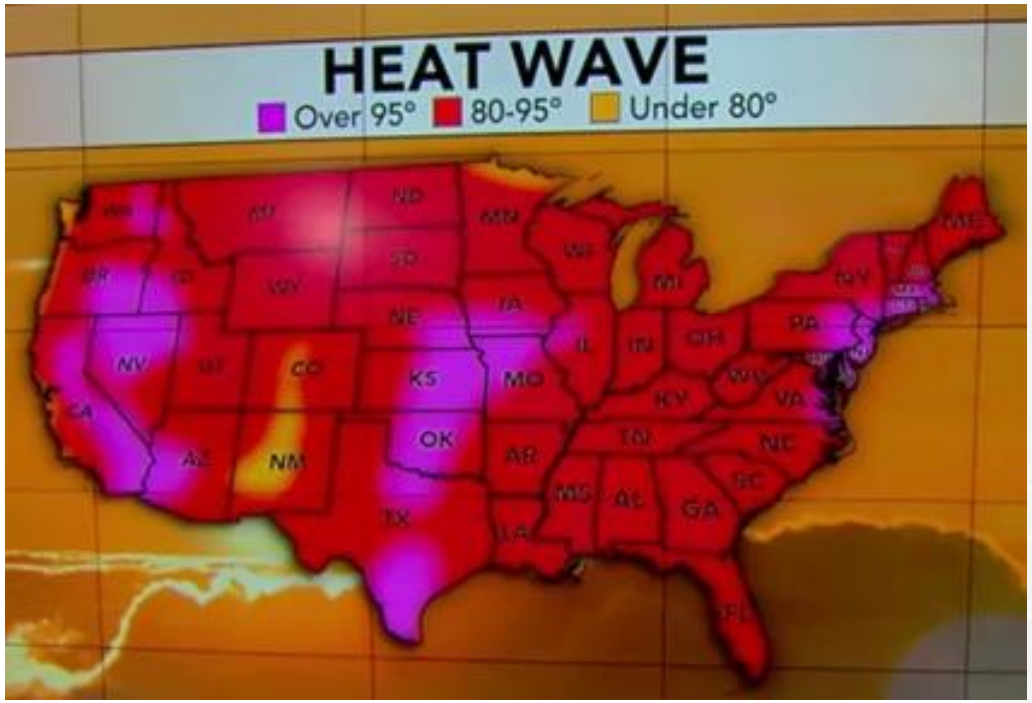
# Invasives + Climate Change

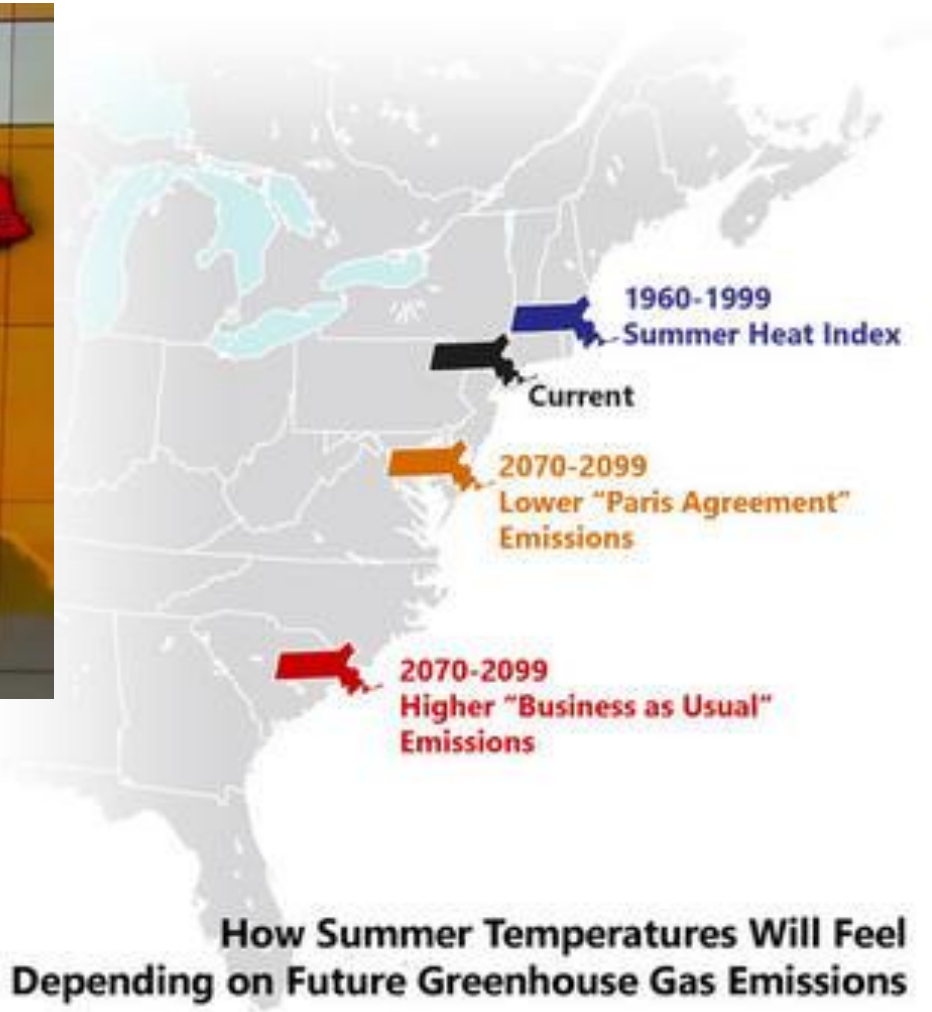
We've got enough on our plate dealing with invasive species alone!

But…

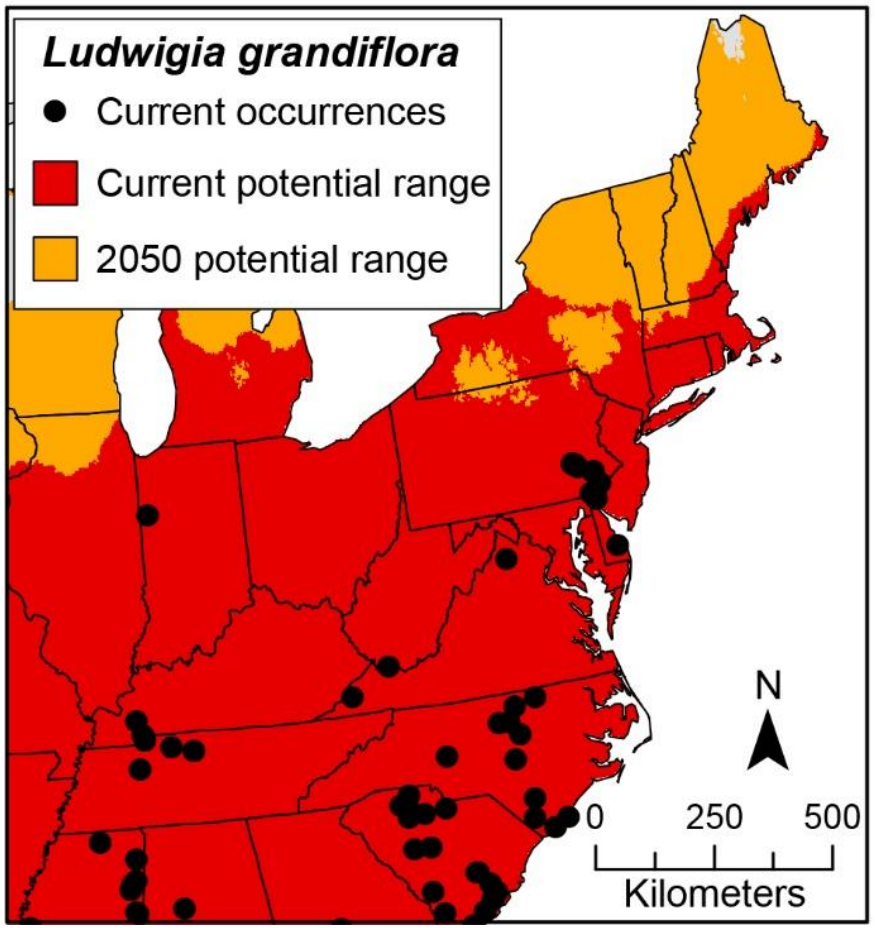


# Changing climate, new ecosystems



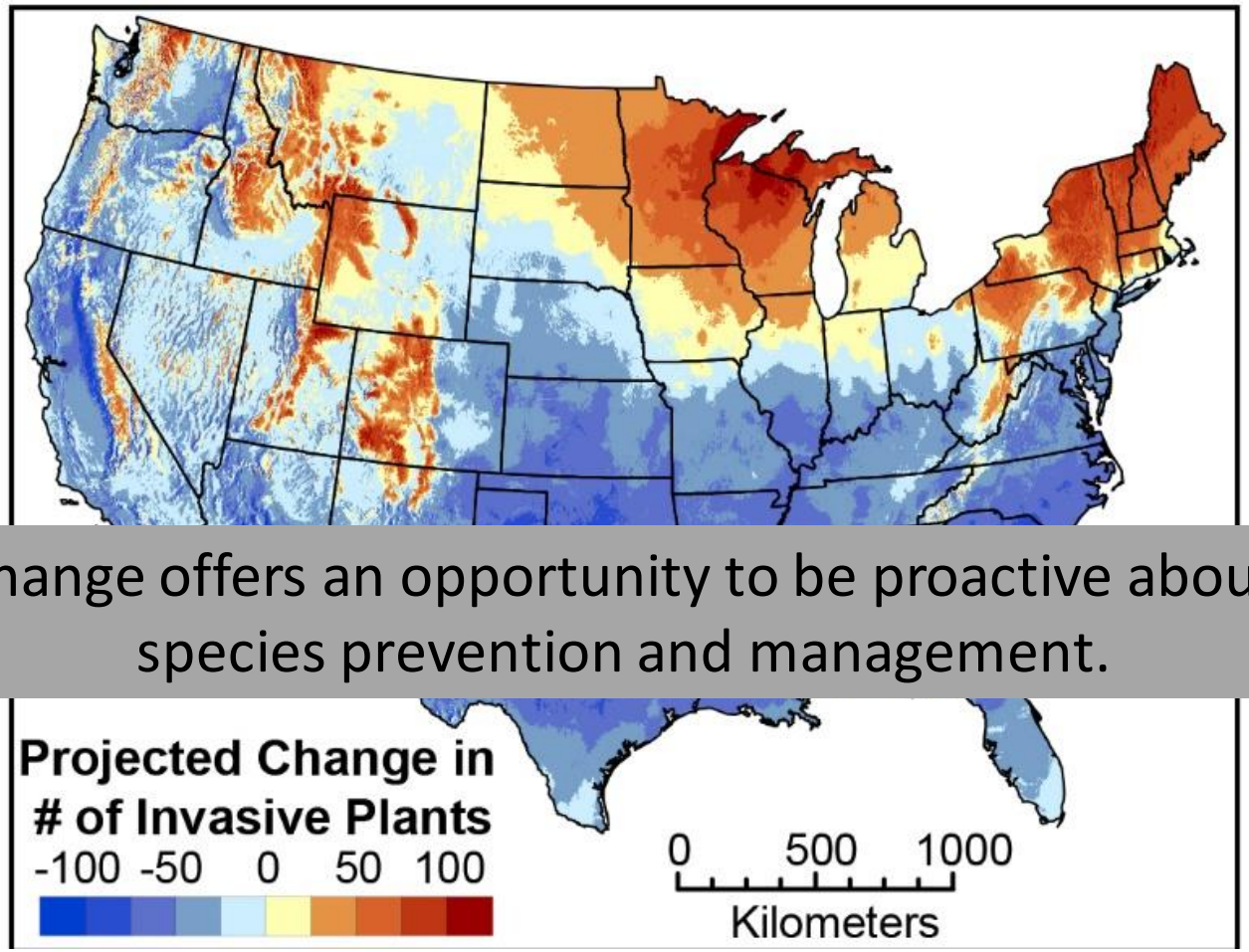
# (Invasive) species respond by shifting their ranges




Allen & Bradley, 2016

*Photo: Alain Dutartre*

# Range shifts can occur for many species




Climate change offers an opportunity to be proactive about invasive species prevention and management.

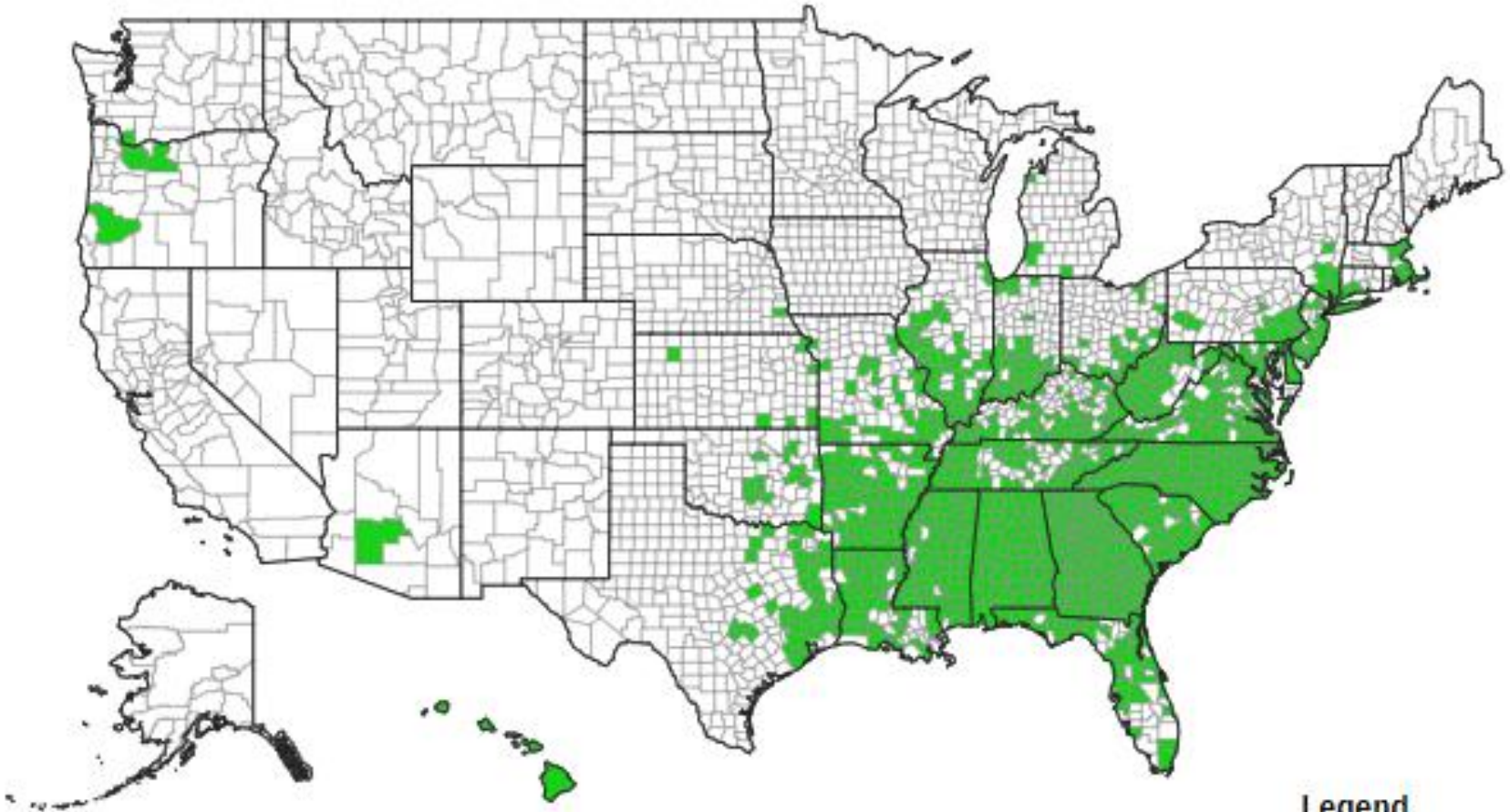
Allen & Bradley, 2016

# Current Distribution

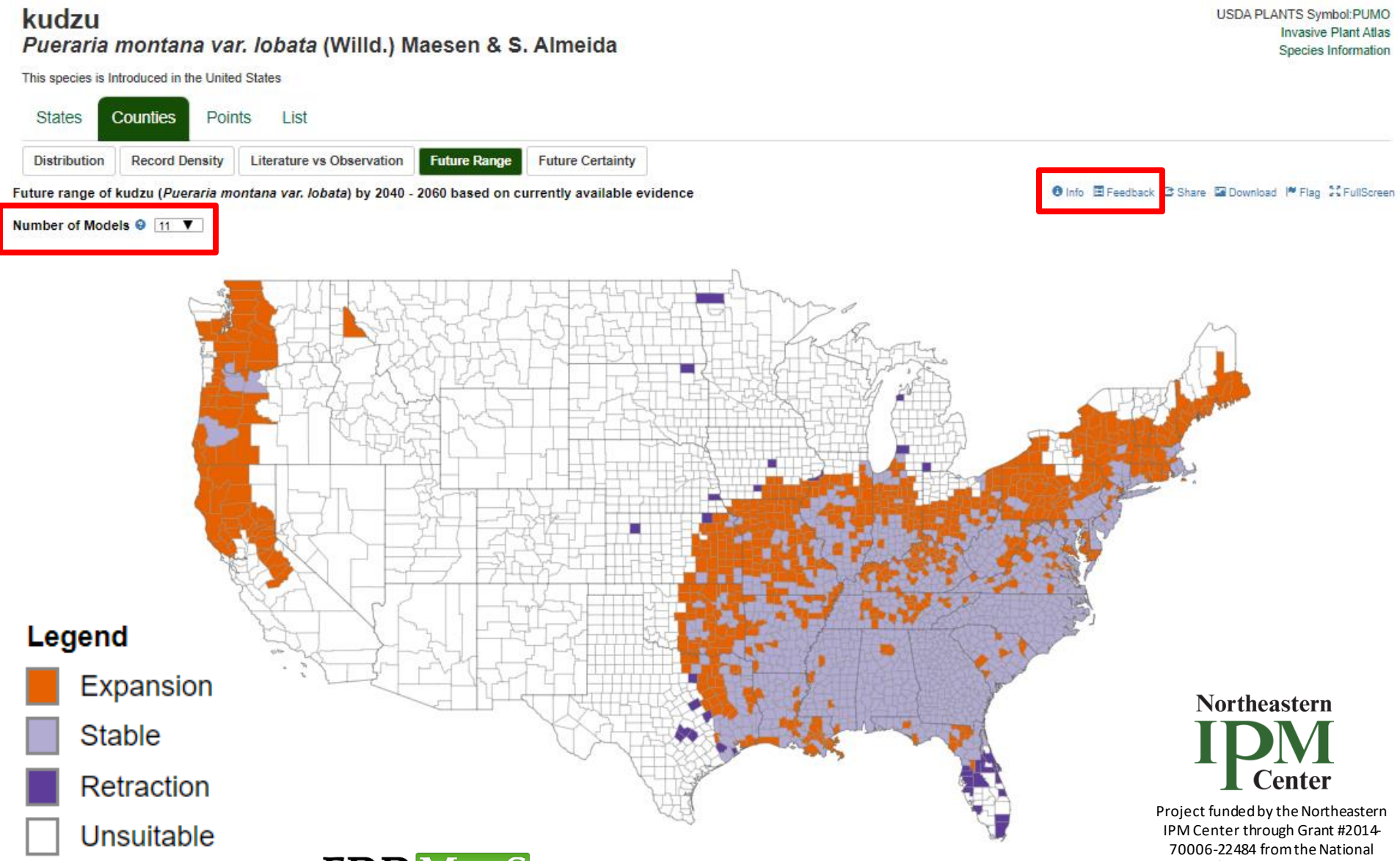
**kudzu**
***Pueraria montana var. lobata* (Willd.)**
**Maesen & S. Almeida**
This species is Introduced in the United States

USDA PLANTS Symbol:PUMO
Invasive Plant Atlas
Species Information

EDDMapS
Early Detection & Distribution Mapping System



# Range Shift Map




In collaboration with EDDMapS Early Detection & Distribution Mapping System

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Project funded by the Northeastern IPM Center through Grant #2014-70006-22484 from the National Institute of Food and Agriculture, Crop Protection and Pest Management, Regional Coordination Program.

# Future Range Certainty

**kudzu**

***Pueraria montana var. lobata* (Willd.) Maesen & S. Almeida**

USDA PLANTS Symbol:PUMO
Invasive Plant Atlas
Species Information

This species is Introduced in the United States

States | Counties | Points | List

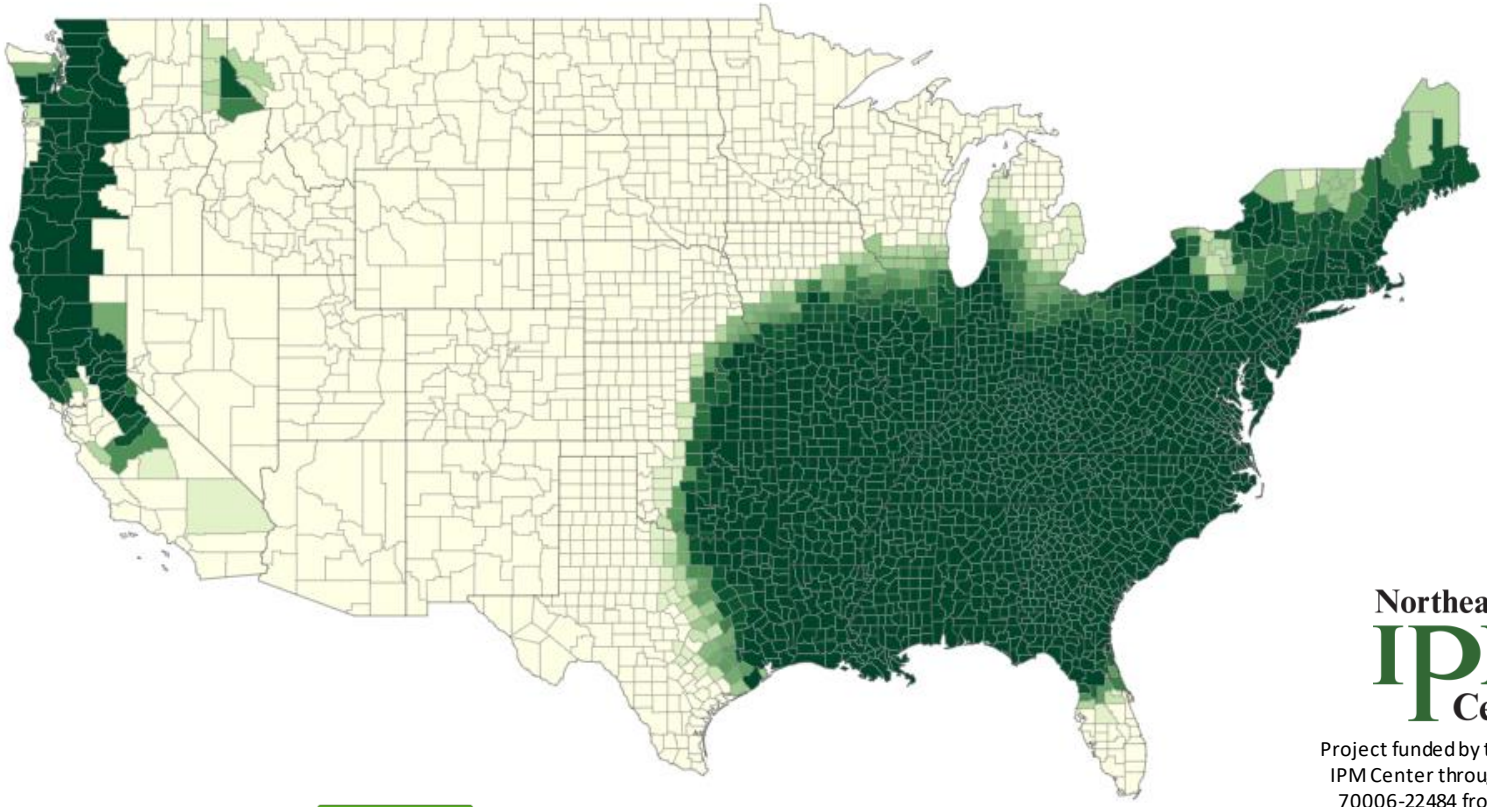
Distribution | Record Density | Literature vs Observation | Future Range | Future Certainty

Future certainty of kudzu (*Pueraria montana var. lobata*) by 2040 - 2060 based on currently available evidence

Info | Feedback | Share | Download | Flag | FullScree

**Number of Models**

0
1
2
3
4
5
6
7
8
9
10
11
12
13



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# QUESTIONS?

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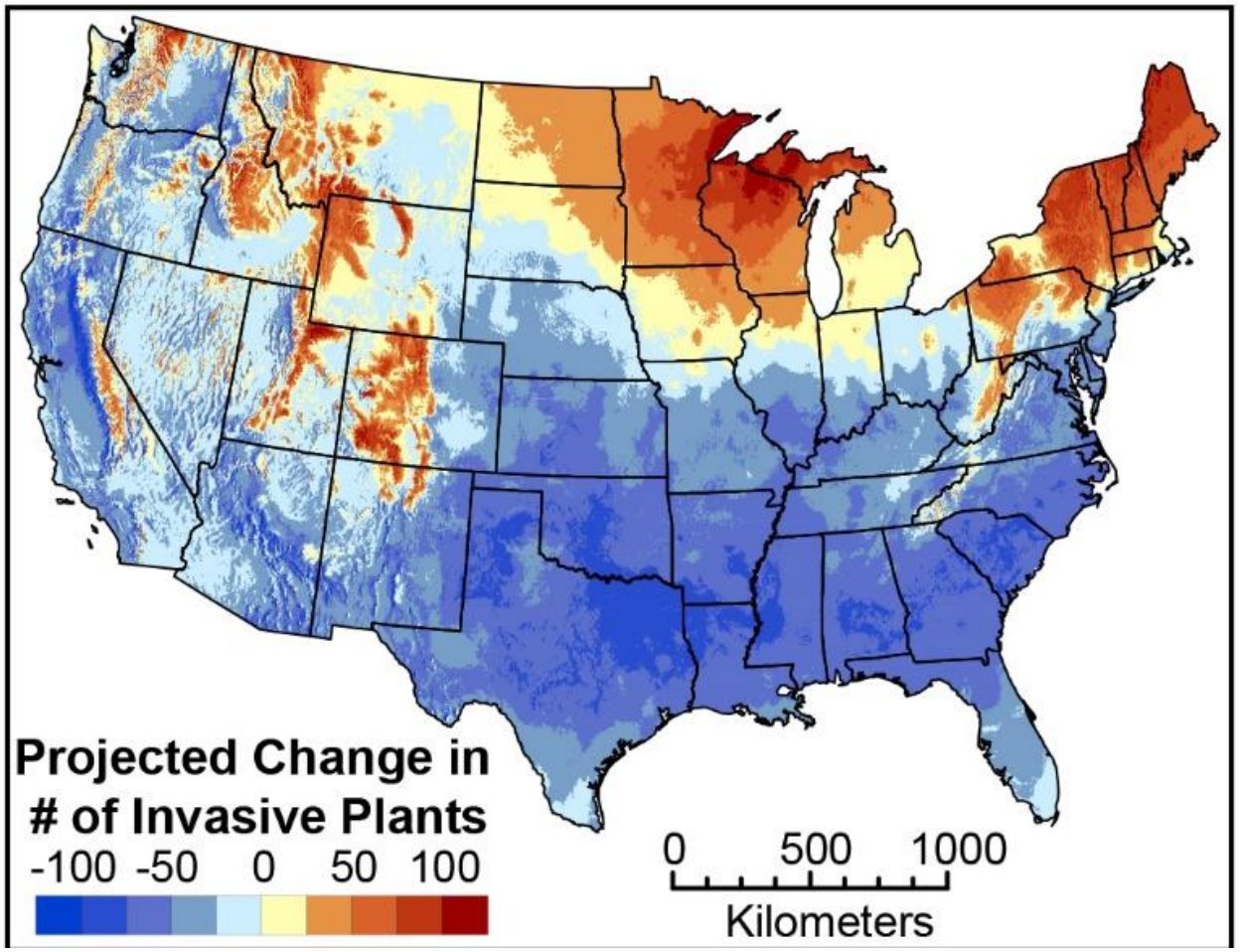
# Use range shift projections for many species to generate state or county lists




Allen & Bradley, 2016

# Range Shift Listing Tool

*Invasive Range Expanders Listing Tool*

Terrestrial invasive plants are expected to shift their ranges in response to changing climate. This tool provides lists of terrestrial invasive plants expected to expand their ranges into the chosen county or state with climate change by 2040-2060. Climate change expansions are based on 13 future climate models and users must select the level of consensus (1-13 models) required to add a species to the state or county list. In addition, users can filter the list to species currently observed within a chosen geographic proximity to the focal county or state. Lists for range expansion with climate change include species that have not been observed within the focal state or county, do not have current suitable climate there, but are predicted to have suitable climate by 2040-2060 according to the selected number of climate models.The lists generated are for informational purposes and contain only species that are already present in the contiguous United States.

Select State: Alabama

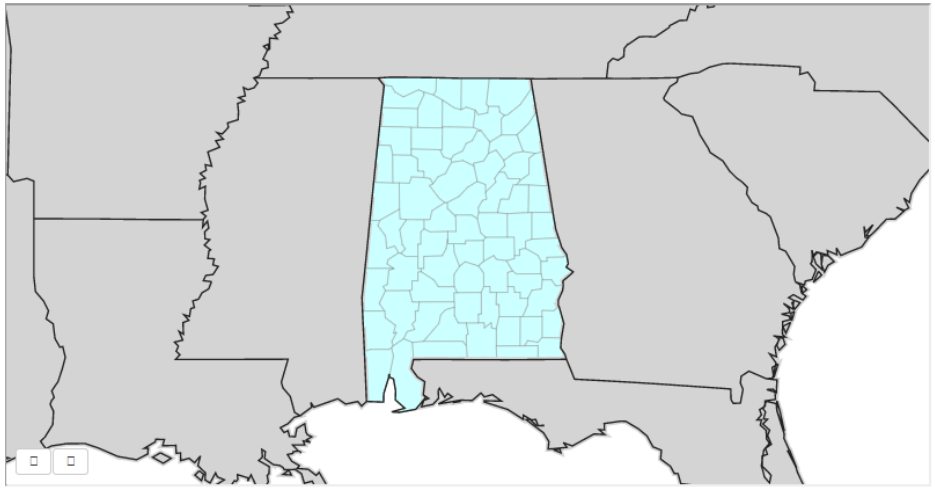
Select County: All Counties

Choose Number of Models: 13

Refine List by: Species observed within the country

Range Expansion Definition: Range expansion with climate change

Regions where the species has been found



List of species within current climate

Download

Search:

| Scientific Name | Common Name | Map |
|---|---|---|
| Cenchrus purpureus | elephant grass | |
| Hyparrhenia rufa | jaraguagrass | |
| Kalanchoe delagoensis | chandelier plant | |
| Miscanthus sacchariflorus | Amur silvergrass | |
| Pennisetum purpureum | | |
| Thunbergia alata | blackeyed Susan vine | |
| Urena lobata | Caesarweed | |

Showing 1 to 7 of 7 entries

Previous 1 Next

This tool was funded by the Northeastern IPM Center through Grant #2014-70006-22484 and supported by Southern IPM Center throught Grant #2018-70006-28884 from the USDA National Institute of Food and Agriculture, Crop Protection and Pest Management, Regional Coordination Program.Read modeling details in the scientific publication here

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In collaboration with EDDMapS Early Detection & Distribution Mapping System

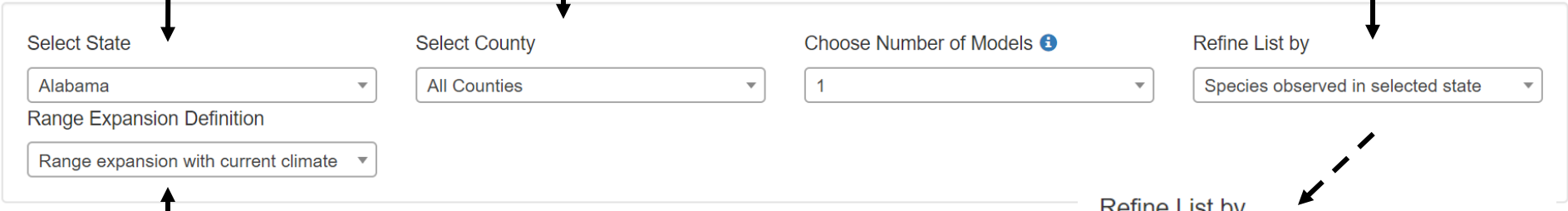
# User Defined Options

Focal State

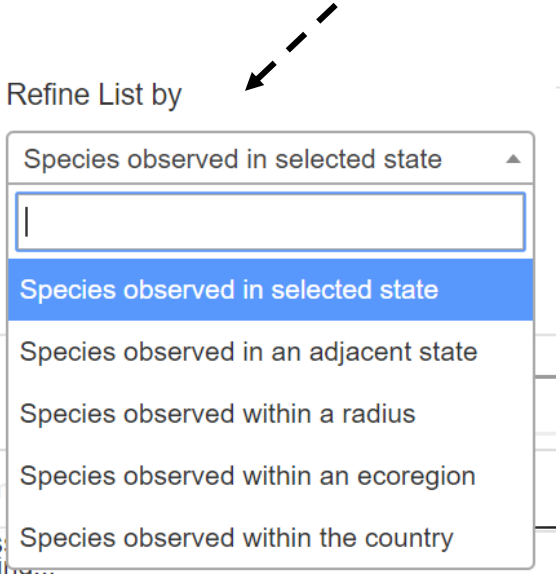
Specific County
(or all for state list)

Model Consensus

Geographic
Refinement
Options




Current or Future Range Expansion
(or both)




Map and list update with user selections

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# QUESTIONS?

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# Prioritize watch lists with impacts assessment (EICAT)

- Read titles & abstracts of all peer-reviewed papers for the species of interest
- Identify all papers that measure impacts

*Diversity and Distributions, (Diversity Distrib.)* (2015) **21**, 1360–1363

BIODIVERSITY LETTER

**Framework and guidelines for implementing the proposed IUCN Environmental Impact Classification for Alien Taxa (EICAT)**

Charlotte L. Hawkins[1], Sven Bacher[2], Franz Essl[3], Philip E. Hulme[4], Jonathan M. Jeschke[5,6], Ingolf Kühn[7,8], Sabrina Kumschick[9,10], Wolfgang Nentwig[11], Jan Pergl[12], Petr Pyšek[12,13], Wolfgang Rabitsch[14], David M. Richardson[9], Montserrat Vilà[15], John R. U. Wilson[9,10], Piero Genovesi[16] and Tim M. Blackburn[1,17,18,*]

Mei Rockwell-Postel

# Example Impacts Summary

*Arundo donax*

| SUMMARY | | | | |
|---|---|---|---|---|
| **Type** | **Max. Recorded Impact** | **All Impact Scores** | **Number of Studies** | **Habitat Codes** |
| ***Competition*** | 4 (Major) | 4,4,4,4,4,4,4,4,4,3,3,3 | 12 | Permanent Rivers, Streams, Creeks [includes waterfalls]; Wetlands (inland); Marine Coastal; Grassland |
| ***Hybridization*** | NA | | | |
| ***Disease Transmission*** | Not ranked | Agricultural impact | 1 | Wetlands (inland) |
| ***Parasitism*** | NA | | | |
| ***Poisoning/toxicity*** | NA | | | |
| ***Bio-fouling*** | NA | | | |
| ***Physical Impact*** | 4 (Major) | 4,4,4,4,3,3 | 6 | Permanent Rivers, Streams, Creeks [includes waterfalls]; Wetlands (inland) |
| ***Chemical Impact*** | 3 (Moderate) | 2,3 | 2 | Permanent Rivers, Streams, Creeks [includes waterfalls]; Wetlands (inland) |
| ***Structural Impact*** | 4 (Major) | 4,4,4,4,4,4,4,4,3,3,3 | 11 | Permanent Rivers, Streams, Creeks [includes waterfalls]; Wetlands (inland); Grassland |
| ***Interaction with Other Aliens*** | 3 (Moderate) | 3, Agricultural impact | 2 | Grassland; Wetlands (inland) |
| ***Agricultural*** | Present | Disease transmission, interaction | | |
| ***Economic*** | NA | | | |
| ***Human Health*** | NA | | | |

Summary Sheet | Summary Sheet Metadata | Data Sheet | Data Sheet Metadata

# Example Impacts Data Sheet

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Assesse | USDA Code | Scientific name | Common name | Growth form | First author | Year | Journal | DOI | Citation | Affected Syster | Impact | Mechanism | Descriptio |
| 2 | MRP | ARDO4 | Arundo donax | Giant reed | Graminoid, Subshrub, Shrub | Ambrose | 2007 | University of C | Not Available | Ambrose, R.F. | Ecological | 2 - Minor | Chemical Impact | Alters soil nutrients post fire |
| 3 | MRP | ARDO4 | Arundo donax | Giant reed | Graminoid, Subshrub, Shrub | Tzanakakis | 2015 | Water | 10.3390/w701 | Tzanakakis, V | Ecological | 3 - Moderate | Chemical Impact | Alters carbon storage |
| 4 | MRP | ARDO4 | Arundo donax | Giant reed | Graminoid, Subshrub, Shrub | Rieger | 1989 | USDA Forest S | Not Available | Rieger, J.P. a | Ecological | 4 - Major | Competition | Inhibits establishment of native species |
| 5 | MRP | ARDO4 | Arundo donax | Giant reed | Graminoid, Subshrub, Shrub | Bell | 1997 | Plant Invasion | Not Available | Bell, G.P., 199 | Ecological | 4 - Major | Competition | Outcompetes native vegetation |
| 6 | MRP | ARDO4 | Arundo donax | Giant reed | Graminoid, Subshrub, Shrub | Tracy | 1998 | Arundo and Sa | Not Available | Tracy, J.L. an | Ecological | 4 - Major | Competition | Decreases native vegetation |
| 7 | MRP | ARDO4 | Arundo donax | Giant reed | Graminoid, Subshrub, Shrub | Ambrose | 2007 | University of C | Not Available | Ambrose, R.F. | Ecological | 4 - Major | Competition | Reduces native plant abundance, density, and productivity post fire |
| 8 | MRP | ARDO4 | Arundo donax | Giant reed | Graminoid, Subshrub, Shrub | Mack | 2008 | Weed Science | 10.1614/WS-( | Mack, R.N., 2( | Ecological | 4 - Major | Competition | Outcompetes neighboring native plants |
| 9 | MRP | ARDO4 | Arundo donax | Giant reed | Graminoid, Subshrub, Shrub | Coffman | 2010 | Biological Inva | 10.1007/s105 | Coffman, G.C. | Ecological | 4 - Major | Competition | Reduces native plant cover after fire |
| | MRP | ARDO4 | Arundo donax | Giant reed | Graminoid, Subshrub, Shrub | Cushman | 2010 | Biological Inva | 10.1007/s105 | Cushman, J.H | Ecological | 4 - Major | Competition | Reduces native plant species |

Summary Sheet | Summary Sheet Metadata | **Data Sheet** | Data Sheet Metadata

# Of 100 range-shifting plants assessed:

*Scanned 14,000 + titles, compiled data from 865 papers*

- 67 evaluated (33 data deficient)
- 9 high priority ("major" ecological impact AND socio-economic impact)
- 38 medium priority ("major" ecological impact OR socio-economic impact)
- 17 low priority (no "major" ecological impact, no socio-economic impact)

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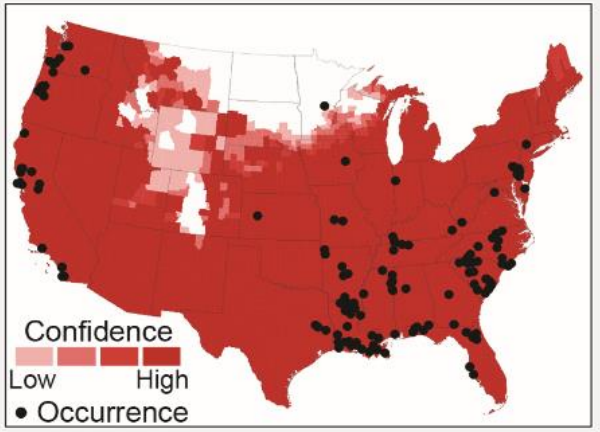
# High Impact, Could Establish Now and Expand Range by 2050

*Ludwigia grandiflora* (water primrose)

**HIGH** Impact: Outcompetes native plants, creates anoxic conditions in water bodies, increases flood risk.

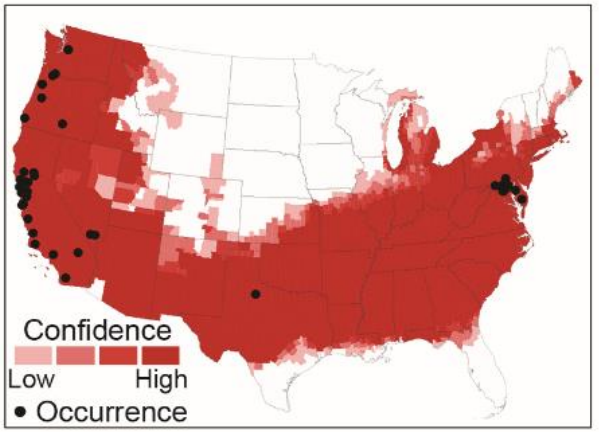
**HIGH** Vulnerability: Invades wetlands and water bodies. Introduced as an ornamental, so arrival could be fast and already identified in New York. Propagules spread easily through waterways, boats, and wildlife. Chemical control can be locally effective.




*Rubus ulmifolius* (elmleaf blackberry)

**HIGH** Impact: Outcompetes natives, creates dense thickets, threatens native endemic *Rubus* species through hybridization, and hosts crop diseases.

**HIGH** Vulnerability: Invades forests and pastures, including in the Northeast (populations in Delaware). Introduced as an ornamental; arrival could be fast. Mechanical and chemical control somewhat effective.

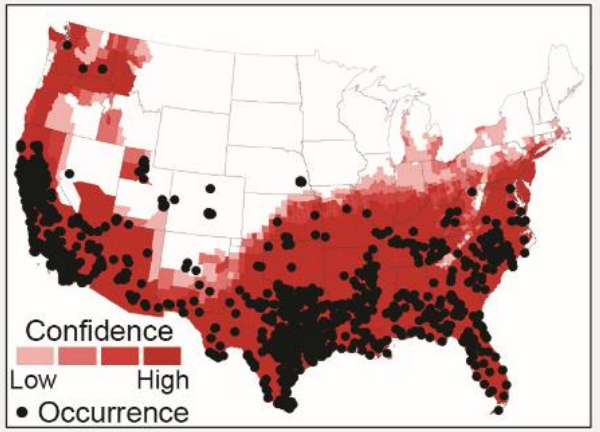


# High Impact, Could Establish by 2050

*Arundo donax* (giant reed)

**HIGH** Impact: Outcompetes native wetland plants, alters wetland structure, increases fire frequency., acts as a hosts for crop pests and pathogens.

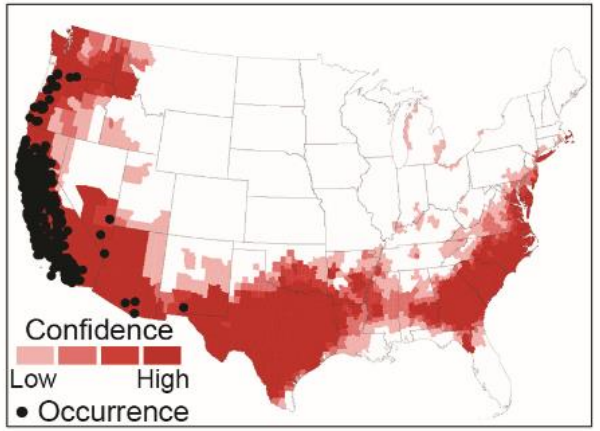
**HIGH** Vulnerability: Invades rivers, streams, wetlands, and coastal areas. Widely introduced as a biofuel crop, so introduction could be fast. Difficult to control and spreads by rhizomes along waterways.




*Avena barbata* (slender wild oat)

**HIGH** Impact: Outcompetes native grassland species. Hosts crop pathogens (wheat crown rust)

**HIGH** Vulnerability: Invades grasslands, crop systems, and disturbed fields. Introduced as a fodder crop and as a crop contaminant. Some chemical controls and mechanical removal prior to seed production can be effective.



Northeast RISCC Regional Invasive Species & Climate Change Management

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- We have a unique opportunity to identify and prioritize range shifting invasive plants
  - Species maps: EDDMapS County Distribution Maps
  - State and county lists: https://www.eddmaps.org/rangeshiftlisting/
  - Impacts assessments prioritize “high risk” range shifting invasives
  - EICAT template: https://people.umass.edu/riscc/resources.html
- But, we need to coordinate efforts across borders
  - Next up – expanding NY + New England regional partnerships

Find more about RISCC and get the EICAT template: https://people.umass.edu/riscc/

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# QUESTIONS?

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# Some Questions For You

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# Upcoming Events

**2020 RFA is available:** Deadline November 15th
https://www.northeastipm.org/grant-programs/ipm-center-grants/ipm-partnership-grants/

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- To post a profile about yourself and your work:
  http://neipmc.org/go/APra

- "Find a Colleague" site
  http://neipmc.org/go/colleagues

# Archive of Today's Webinar

- Today's webinar will be available to view **on demand** in a few business days.
  http://www.neipmc.org/go/ipmtoolbox

- You can watch as often as you like.

# Acknowledgments

*This presentation was funded in part by the Northeastern IPM Center through Grant #2018-70006-28882 from the National Institute of Food and Agriculture, Crop Protection and Pest Management, Regional Coordination Program.*