## Prioritizing range-shifting invasive plants

### High-impact species coming to the Northeast

### Summary

Prevention of new invasions is a cost-effective way to manage invasive species and is most effective when emerging invaders are identified and prioritized before they arrive. Climate change is projected to bring nearly 100 new invasive plants to the Northeast. However, these plants are likely to have different types of impacts, making some a higher concern than others. Here, we summarize the results of original RISCC research that identifies high priority, range-shifting invasive plants based on their potential impacts.

### Range-shifting invasive plants assessed for impacts

We assessed all non-native, invasive plants that are rare or absent in Connecticut, Massachusetts, New York, or Rhode Island but projected to expand into the region by 2050. Based on the scientific literature through 2018, **red species have ‘major’ impacts** on native community diversity, **orange species have ‘moderate’ impacts** on single-species populations, **blue species have ‘minor’ impacts** that don’t affect species populations.

**Note:** understudied species may have higher impacts than currently reported.

### Why is risk higher in the Northeast?

Because invasive plants are more prevalent in states to our south and many species are shifting their ranges poleward in response to climate warming, the Northeast is a hotspot of risk from range-shifting species (red areas in Figure 1). A study by Allen & Bradley (2016) modeled the current and potential ranges by 2050 for 896 invasive plants in the continental U.S. Up to 100 new invasive plants are likely to shift into Northeast states with climate change.

### Fig 1. Projected number of new invasive plants by 2050.

<table>
<thead>
<tr>
<th>Projected Rise in # of Invasive Plants</th>
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<tbody>
<tr>
<td>0</td>
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### Range-shifting invasive plants assessed for impacts

<table>
<thead>
<tr>
<th>Anthriscus caucalis</th>
<th>Achyrantes japonica</th>
<th>Lotus pedunculatus</th>
<th>Arum italicum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ardisia elliptica</td>
<td>Alyssum murale</td>
<td>Lythrum virgatum</td>
<td>Avena sterilis</td>
</tr>
<tr>
<td>Arundo donax</td>
<td>Aralia sericifera</td>
<td>Mahonia bealei</td>
<td>Buddleja lindleyana</td>
</tr>
<tr>
<td>Avena barbata</td>
<td>Asclepias curassavica</td>
<td>Nandina domestica</td>
<td>Carduus tenuiflorus</td>
</tr>
<tr>
<td>Cardaria chalepensis #</td>
<td>Bellardia triago</td>
<td>Opisumenus hirtellus</td>
<td>Centaurea iberica</td>
</tr>
<tr>
<td>Carthamus lanatus #</td>
<td>Brachypodium distachyon</td>
<td>Paspalum urvillei</td>
<td>Centaurea melitensis</td>
</tr>
<tr>
<td>Cortaderia selloana</td>
<td>Cardaria pubescens</td>
<td>Peganum harmala</td>
<td>Crotalaria spectabilis</td>
</tr>
<tr>
<td>Cunninghamia lanceolata #</td>
<td>Centranthus ruber</td>
<td>Persea americana</td>
<td>Elaeagnus pungens</td>
</tr>
<tr>
<td>Ehrharta erecta</td>
<td>Cestrum diurnum</td>
<td>Prunus laurocerasus</td>
<td>Firmiana simplex</td>
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<tr>
<td>Hemarthria altissima</td>
<td>Ceratocephala testiculata</td>
<td>Quercus acutissima</td>
<td>Hibiscus tiliaceus</td>
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<tr>
<td>Ludwigia grandiflora</td>
<td>Conyza bonariensis</td>
<td>Senna occidentalis</td>
<td>Leontodon taraxacoides</td>
</tr>
<tr>
<td>Pinus pinaster</td>
<td>Cyrtus striatus</td>
<td>Sesbania punicea</td>
<td>Phyllostachys aurea</td>
</tr>
<tr>
<td>Rubus ulmifolius</td>
<td>Dalbergia sissoo</td>
<td>Sinapis arvensis</td>
<td>Poncirus trifoliata</td>
</tr>
<tr>
<td>Rubus vestitus #</td>
<td>Daphne laureola</td>
<td>Spartium junceum</td>
<td>Prunus lusitanica</td>
</tr>
<tr>
<td>Tamarix aphylla</td>
<td>Festuva brevipila</td>
<td>Stellaria media</td>
<td>Pseudognaphalium luteolum</td>
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<tr>
<td>Tamarix chinensis</td>
<td>Hedera helix ssp. canariensis</td>
<td>Tamarix africana</td>
<td>Rumex stemophyllus</td>
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<tr>
<td>Trifolium hirtum #</td>
<td>Hedera hibernica</td>
<td>Alhagi maurorum</td>
<td>Sacciolepis indica</td>
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<tr>
<td>Ventenata dubia</td>
<td>Hypericum calycinum</td>
<td>Aegilops ovata</td>
<td>Stachys arvensis</td>
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<tr>
<td></td>
<td>Lagerstroemia indica</td>
<td>Anchusa arvensis</td>
<td>Vitis vinfera</td>
</tr>
<tr>
<td></td>
<td>Ligustrum japonicum</td>
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<td>Youngia japonica</td>
</tr>
</tbody>
</table>

# Low confidence that ‘major’ impacts are caused by the invasive plant (e.g., reported impacts are anecdotal)
Measuring potential impact

The Environmental Impact Classification of Alien Taxa (EICAT) assesses the magnitude of invasive species’ impacts using the scientific literature. This protocol was developed in consultation with the International Union for Conservation of Nature (IUCN) and was formally adopted as their method for classifying environmental impacts of alien species. We performed EICAT assessments on 100 range-shifting invasive plants (Rockwell-Postel et al. In Review). **Major Impact** species negatively affected native communities (i.e. a decline in native species richness, diversity, evenness, or the abundance of multiple species). Below, we highlight high impact species shifting or expanding into southern New England as well as their likelihood of affecting Northeast ecosystems.

Want to perform an EICAT assessment? This tutorial will help you get started https://doi.org/10.7275/jx9a-ft39

**Major impact species most likely to affect Northeast ecosystems**

**Anthriscus caucalis** (bur chervil)

**HIGH** Impact: Outcompetes native plants in grasslands and forest edges. Closely related to wild chervil (*Anthriscus sylvestris*).

**HIGH** Vulnerability: Invades disturbed areas across the U.S. and Canada, but more prevalent in the Western U.S. Easily spreads on animals and equipment.

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**Arundo donax** (giant reed)

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

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

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**Avena barbata** (slender wild oat)

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

**HIGH** Vulnerability: Invades grasslands, crop systems, and disturbed fields. Introduced as a fodder crop and crop contaminant. Chemical or mechanical removal prior to seed production may be effective.

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**Ludwigia grandiflora** (water primrose)

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

**HIGH** Vulnerability: Invades wetlands and water bodies. Introduced as an ornamental, could arrive quickly - it has already been identified in New York. Propagules spread easily via waterways, boats, and wildlife. Chemical control can be locally effective.

*Confidence refers to the number of models projecting future climatic suitability for the species
**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; could arrive quickly. Mechanical and chemical control somewhat effective.

**Major impact species less likely to affect Northeast ecosystems**

**Ardisia elliptica** (shoebottom ardisia)

**HIGH** Impact: Forms dense stands, outcompetes and replaces native plants. Dominates forest canopy.

**LOW** Vulnerability: Invades tropical habitats. Model projection for the Northeast is likely flawed due to low numbers of distribution points. Prolific fruit production and seeds spread by birds and bats. Introduced as an ornamental.

**Cortaderia selloana** (Pampas grass)

**HIGH** Impact: Outcompetes native species, reduces macroinvertebrate diversity, and alters wetland structure.

**MEDIUM** Vulnerability: Largest impacts are in Mediterranean coastal ecosystems, with lower impacts in forests, grasslands, and wetlands. Introduced as an ornamental; could arrive quickly.

**Ehrharta erecta** (panic veldtgrass)

**HIGH** Impact: Reduces cover of native shrubs, grasses, and forbs. Dense litter layer prevents germination of native seedlings.

**MEDIUM** Vulnerability: Currently found in California where it invades grassland, disturbed areas and turf grass. Northeast grasslands might be vulnerable if the species is introduced. Accidentally introduced and transported along disturbance corridors.

**Hemarthria altissima** (limpograss)

**HIGH** Impact: Outcompetes native wetland plants via the creation of dense monocultures and the production of allelopathic compounds.

**MEDIUM** Vulnerability: Invades wetlands and wet prairie grassland. Introduced as a pasture grass in Florida. Managed with glyphosate or grazing.
Major impact species *less likely* to affect Northeast ecosystems (cont’d)

*Pinus pinaster* (maritime pine)

**HIGH** Impact: Outcompetes native plants; changes habitat structure and water availability by increasing tree cover.

**LOW** Vulnerability: Impacts are mainly in Mediterranean shrubland systems. Unlikely to have similar impacts in Northeast forests. Introduced in plantations and as an ornamental. Mechanical control can be effective.

*Tamarix aphylla* (athel tamarisk)

**HIGH** Impact: Outcompetes and crowds out native plants, alters stream hydrology.

**MEDIUM** Vulnerability: Primarily invades in drier wetland and river systems of the western U.S., so Northeast might be less vulnerable. Introduced as an ornamental; could arrive quickly. Mechanical control requires excavating stumps.

*Tamarix chinensis* (five stamen tamarisk)

**HIGH** Impact: Outcompetes and crowds out native plants, poor habitat for native birds.

**MEDIUM** Vulnerability: Primarily invades drier wetland and river systems of the western U.S., so Northeast might be less vulnerable. Introduced as an ornamental; could arrive quickly. Biocontrol is a potential option.

*Ventenata dubia* (wiregrass)

**HIGH** Impact: Reduces native plant diversity in shrublands and grasslands. Reduces quality and quantity of hay and forage crops.

**MEDIUM** Vulnerability: Primarily invades wetlands within semi-arid shrubland in the western U.S., so Northeast might be less vulnerable. Spreads easily on equipment and in disturbed areas. Difficult to control.

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**References:**

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