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## **Regional Invasive Species & Climate Change Management Challenge: Taking Action. Managing invasive species in the context of climate change**

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## Taking Action:

### Managing invasive species in the context of climate change

#### Summary

Climate change is likely to alter the timing and effect of invasive species management, as well as the suite of species we are managing. Despite concern about the effects of climate change, lack of information about how and when to take action is a barrier to climate-smart invasive species management. Here, we outline strategies for incorporating climate change into management along with examples of tools that can inform proactive decision-making.

#### Motivations for incorporating climate change into management

1. Invasives may emerge earlier and persist longer in response to longer growing seasons
2. Warming causes invasives to shift their ranges into new ecosystems
3. Invasives are introduced via new shipping pathways due to sea ice melt
4. Extreme weather events and sea level rise cause disturbance that creates new opportunities for invasion
5. Herbicides may be less effective with higher atmospheric CO<sub>2</sub>
6. Invasives become more competitive with warming and higher atmospheric CO<sub>2</sub>



#### Strategic Planning

##### Recommendations:

- Prioritize land conservation and management action based on vulnerability to climate change and invasion.
- Increase restoration, management, and early detection & rapid response in areas vulnerable to disturbance caused by extreme weather events.
- Advocate for invasive species management funding to be included in climate change adaptation and response plans.

**Example:** Mount Grace Land Trust protected lands identified as resilient to climate change (Fig. 1) using TNC's resilient land tool. These lands are high priority for preventative invasive species management and monitoring.



Fig 1. Site prioritized by TNC's resilient land tool ([maps.tnc.org/resilientland](https://maps.tnc.org/resilientland)).



#### Preventative Management

##### Recommendations:

- Plant species native to Eastern North America that are resistant to climate change (e.g., drought-tolerant, broad hardiness zones; Fig. 2).
- Develop watch lists and proactive management plans for invasive species predicted to shift into your region.
- Prioritize treatment of existing invasive species predicted to spread or increase in abundance with climate change.
- Monitor non-natives for increases in populations ('sleeping species').

**Example:** Tug Hill State Forest in NY planted native, warm-adapted trees to reduce future disturbance and resist invasions with climate change.

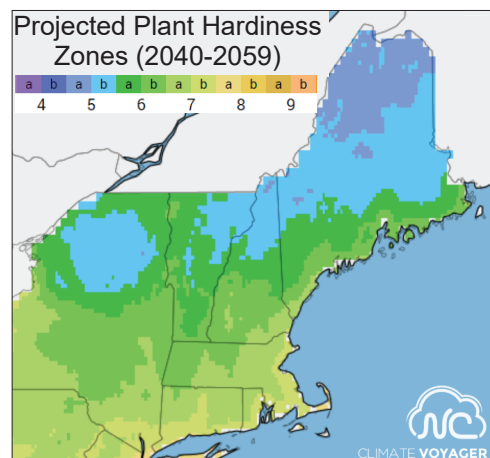


Fig 2. Climate Voyager maps future hardiness zones ([climate.ncsu.edu/voyager/](https://climate.ncsu.edu/voyager/)).



## Treatment & Control

### Recommendations:

- Time invasive species management with shifts in the growing season.
- Test new management techniques in the event that existing treatments become less effective with climate change.
- Identify and monitor for range shifting invasive species.
- Connect with managers, both locally and in other regions, about effective treatments for watch list species.

**Example:** Pesticides need to be applied quickly following the emergence of Gypsy Moth caterpillars. Optimal timing for control can be predicted based on climate (Fig. 3). Sign up with the NPN to be notified ahead of time.

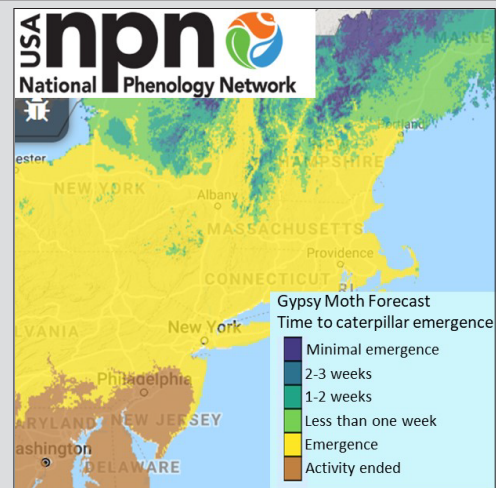


Fig 3. NPN phenology visualization tool ([www.usanpn.org/data/visualizations](http://www.usanpn.org/data/visualizations)).



## Education & Outreach

### Recommendations:

- Stay informed (e.g., RISCC research summaries, other science digests).
- Attend workshops, webinars, and meetings to learn about emerging threats and potential management practices.
- Educate the public on invasive species and climate change.
- Document and share your efforts and best management practices - help others access your knowledge!

**Example:** Pennsylvania shared outreach materials on spotted lanternfly to help other states increase awareness (Fig. 4). Similar campaigns could be used to highlight species shifting their ranges due to climate change.



Fig 4. Coordinated efforts can spread invasive species awareness.



## Policy

### Recommendations:

- Enforce current invasive species policy and streamline the process for updating prohibited species lists.
- Ban the distribution of high-impact, range-shifting invasive species.
- Switch to pest-free packaging to reduce the introduction of warm-adapted forest pests.
- Support boundary-spanning organizations that coordinate research and management.
- Include climate change in invasive species policy and vice versa.

**Example:** New York policymakers identified range-shifting invasive plants for their prohibited plant list using a tool now available on EDDMapS (Fig. 5).

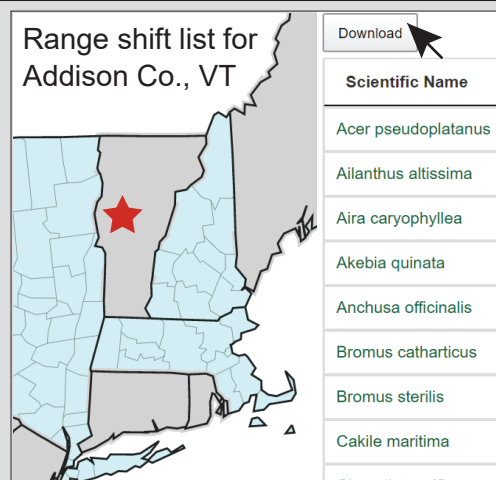


Fig 5. Identify your list of range shifting plants ([eddmeps.org/rangeshiftlisting](http://eddmeps.org/rangeshiftlisting)).

References: Beaury et al. 2019 Biological Invasions; RISCC 2019 Symposium Report; Mount Grace Land Conservation Trust at <https://www.mountgrace.org/stoddard-land-becomes-part-new-athol-town-forest>.

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