

Preparing for sleeper species

Climate change could awaken some naturalized species

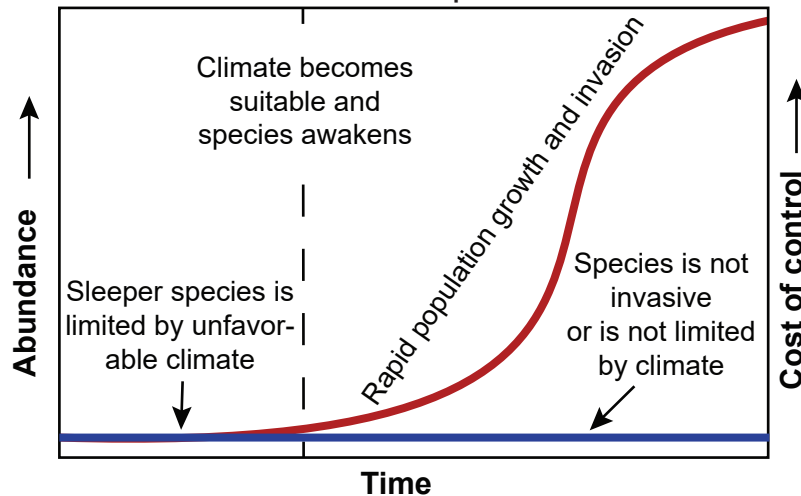
Summary

Many naturalized non-native species never become invasive and generally are not prioritized for management due to limited resources. However, climate change could enhance the success of these species, causing some to become invasive. Therefore, we need to reassess the current pool of naturalized species to identify and prioritize management of 'sleeper' species.

What are sleeper species?

Sleeper species are naturalized in a region, potentially invasive, but not yet invasive because they are limited by biotic or abiotic conditions. Many naturalized species remain at low abundance and will never become invasive, but others are constrained by unfavorable climate conditions. Climate change could create newly favorable conditions for naturalized species limited by climate, enabling them to 'awaken' and resulting in rapid population growth and invasion.

Transition from sleeper to invasive



Definitions

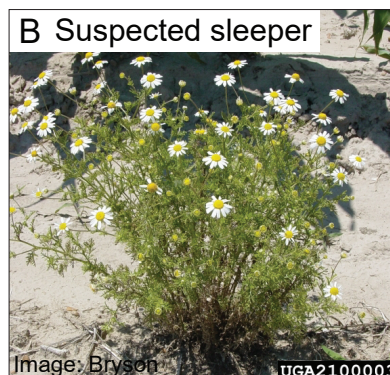
Non-native: A species unlikely to have arrived without human assistance.

Naturalized: A non-native species with established populations but that is not spreading or causing negative impacts.

Invasive: A non-native species that is naturalized and is spreading with negative economic and/or ecologic impacts.

Climate change: Rising temperatures, altered precipitation, etc. attributed to human activities that increase atmospheric greenhouse gases.

Examples of sleeper species



A) Acorn barnacle (*Austrominius modestus*), a cold-intolerant species first introduced around 1955 off the U.K. coast, did not become invasive until 50 years later after a series of mild winters. **B)** Mayweed chamomile (*Anthemis cotula*) was introduced to Massachusetts over a century ago. Its ability to respond quickly to climate change may give the plant a competitive advantage, shifting it from naturalized to invasive. **C)** First discovered in New York in 2004, Sirex woodwasp (*Sirex noctilio*) currently impacts stressed pines. Increasingly frequent disturbance events due to climate change may lead to greater damage from this forest pest.

Is the Northeast susceptible to sleepers?

The Northeast was one of the first regions of North America colonized by Europeans, creating a long history of non-native species introductions. When compared to the native ranges of many naturalized species, the Northeast is also relatively cool. For example, plants, which have been deliberately introduced for centuries as ornamentals, tend to originate in warmer regions. Ornamental plants, in turn, serve as the primary vector of invasive pests and pathogens from warmer climates. Likewise, shipping is a major vector of invasions, particularly for marine species, and routes to the Great Lakes tend to originate in warmer waters. As a result, many naturalized plants, insects, pathogens and marine species in the Northeast may be pre-adapted to warmer climate conditions, enabling a new wave of invasions with climate change.

Management recommendations

- ★ Create priority lists to identify sleeper species
- ★ Eradicate high priority sleeper species
- ★ Keep an eye on medium and low priority species for changes in population size
- ★ Reduce the spread of sleepers by encouraging native plantings
- ★ Share effective management practices; learn from neighbors in warmer climates

How can we prioritize sleeper species?

1. Identify naturalized species in your area

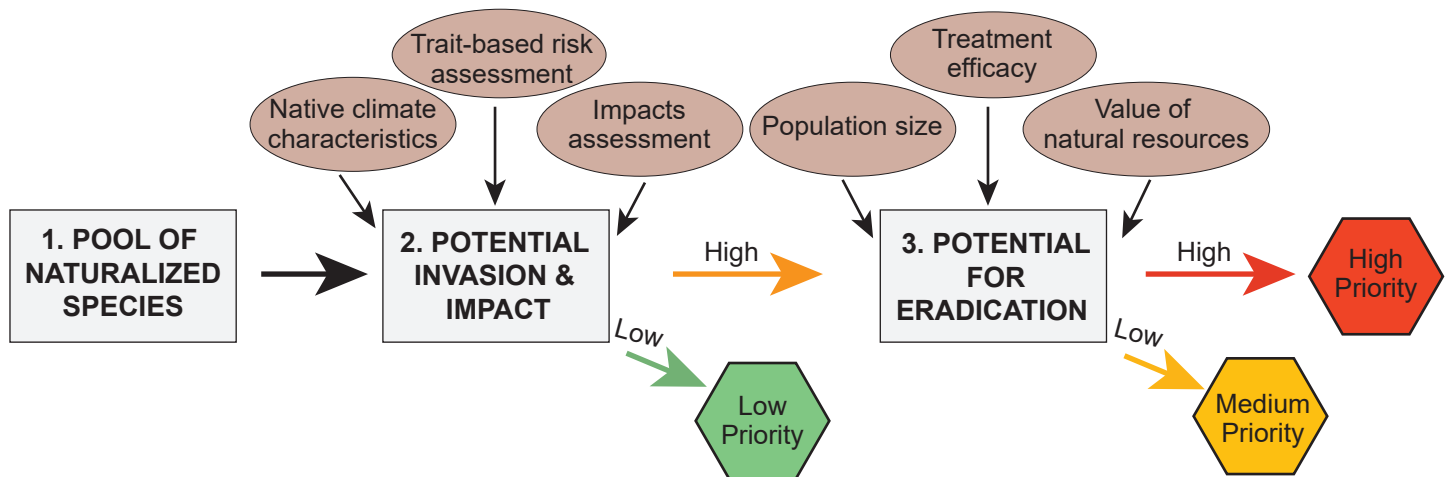
Until recently, a naturalized species that has persisted in an area for about 50 years without becoming invasive was considered unlikely to do so. With climate change, that rule of thumb may no longer apply.

2. Prioritize based on potential invasiveness and impact

Species most likely to 'awaken' are those from warm climates or those with traits linked to invasiveness (e.g., rapid growth, short generation time, high reproductive output, disturbance responsive). Trait- and impact-based risk assessments can help determine the likelihood that a naturalized species will become invasive.

3. Evaluate eradication feasibility in areas with important natural resources

Species with high invasion risk can be further prioritized based on potential for eradication such as the size of the naturalized population, number of populations, ease of access for treatment, proximity to natural resources, and (for plants) seedbank longevity.



References: Ayres, M. P., et al. 2014. PloS one; Bradley, B. A., et al. 2012. Frontiers in Ecol & Environ; Keller, R.P., et al. 2011. Div. & Distrib.; Koop, A. L., et al. 2012. Biol. Invasions; Liebhold, A. M., et al. 2012. Frontiers in Ecol & Environ; Mack, R.N. and Erneberg, M. 2002. Ann. Missouri Bot. Garden; Pheloung, P. C., et al. 1999. J. Environ. Mgmt; Van der Veken, S. et al. 2008. Frontiers in Ecol & Environ; Willis, C. G., et al. 2010. PloS one; Witte, S., et al. 2010. Biol. Invasions

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