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Responding to Invasive Species on the Lands and Coastal Wetlands of the Great Lakes Region

The USGS Great Lakes Science Center (GLSC) is dedicated to advancing scientific knowledge and providing scientific information for restoring, enhancing, managing and protecting the living resources and their habitats in the Great Lakes basin ecosystem.

The Invasion

Often unnoticed, a silent but incessant invasion is occurring right before our eyes. Plants and animals that are not native to North America are invading Great Lakes landscapes. National parks, fish and wildlife reserves, national forests, nature preserves, state parks and forests, and private residential lands and farms throughout the Great Lakes region are experiencing these invasions. The President's Executive Order 13122 defined **invasive species** as "**a plant or animal, including its seeds, eggs, spores, or other biological material that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm**." One of the top priorities for managers, farmers and property owners is the detection, control, or eradication of invasive species.

Dame's rocket infestation

Invasive Plant and Animal Species

Of the plants introduced from other continents only 5 to 10% become invasive. For many citizens the invaders go unnoticed because they are cryptic, small, or are not recognized from the background vegetation. Sometimes the invasive species become noticeable because of their flower color and density (for example purple loosestrife (*Lythrum salicaria*) or stature (for example common reed or phragmites (*Phragmites australis*). Others become noticeable due to their abundance; for example, Japanese *Popillia japonica* or Asian Lady beetles (*Harmonia axyridis*). Landscape disturbance and habitat factors influencing invasive and non-native plants and their effects on native plant survival rates are being studied in the Great Lakes region. Research is focusing on development of early detection systems for invasive plant species. Ongoing research is centered on impacts of invasive plants on terrestrial ecosystems and methods for their control.

Impacts on Vegetation

Previous GLSC studies have examined the impacts and control of the invasive Baby's breath (*Gypsophila paniculata* L.) that has invaded the sand dunes at Sleeping Bear Dunes National Lakeshore. Other research has looked at the impacts and optimal control strategies for phragmites on wildlife refuge wetlands. Ongoing work is assessing the impacts of Dame's rocket (*Hesperis matronalis*, the "spring phlox") on understory vegetation of mesic forests in the lower Great Lakes. These research projects contribute to an increasing scientific understanding that invasive species affect soil structure and nutrients, community composition, and biological diversity.

Rare Yellow lady-slipper surrounded by Oriental bittersweet

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Prevention and Hygiene

Techniques for the prevention of invasive species need to become common knowledge, since most people are unaware of preventative tools. Cleaning shoes, clothing, vehicles, and vessels are preventative measures. For instance managers often brush their footwear before entering a high quality area to remove invasive seeds.

Oriental (left) and American (right) bittersweet

Species Identification

Managers and the public need to know how to identify invasive species if they wish to control them. For many species, identification is easy, for others it is difficult even for professionals. For example, distinguishing the non-flowering plants of the native American bittersweet (*Celastrus scandens*) and the invasive Oriental bittersweet (*C. orbiculatus*) is difficult, hampering managers' ability to control the invasive and save the native species. Oriental bittersweet has been shown to change the forest composition and direction of vegetation change by growing to the tree crowns and subsequently aiding in the downfall of trees. Oriental bittersweet has taken over forests in the Northeast and is rapidly spreading throughout the Midwest. Scientists at the Lake Michigan Ecological Station in Porter, Indiana have discovered and successfully developed a morphological method for distinguishing the two species. Further work will focus on Oriental bittersweet control and the potential for this species to hybridize with the native bittersweet. Differentiating between the non-invasive, native strain and the invasive, monoculture-forming strain of phragmites is also difficult and requires close examination of the plants.

Early Detection

Research has shown that invasive species undergo several phases of invasion. The stages include establishment, lag phase, colonization, and invasion phase. From an economic and strategic perspective, early control in the establishment and lag phases is best because infestations are small and controllable with minimal cost. Thus there is considerable interest in early detection systems and methods. To date, early detection systems have been adhoc or focus on single species. We are using data on invasive plant distributions in three national parks to assess the feasibility of developing plant community level early detection systems.

Control Strategies

Optimal strategies for control of invasive species vary and depend on landscape setting, species composition, and hydrologic regime, among others. When invasive species biomass is dense, removal typically is required by mechanical means or controlled burning. Use of herbicides approved for aquatic ecosystems in conjunction with mechanical control methods have been successful for Great Lakes coastal wetland restoration. Where water levels are controlled, hydrologic inundation or drying can be used to control invasive species as well.

Monitoring

Information about the distribution and abundance of invasive species is of great importance to managers of large tracts of land. In 2003, Lake Michigan Ecological Station scientists surveyed two national parks for native and invasive forms of phragmites and demonstrated that only a few native stands still exist at Indiana Dunes whereas most populations are the native at Sleeping Bear Dunes. Thus managers of these parks are able to target invasive phragmites stands.

Conclusion

With support, scientists at the GLSC will continue to conduct invasive species research that will benefit land managers and the public throughout the Great Lakes Region. Scientific research is the cornerstone to developing tools for the prevention of invasion and control of invasive species.

Oriental bittersweet invasion at Sleeping Bear Dunes National Lakeshore