Invasive species are non-native organisms capable of adversely affecting ecosystems they colonize. They can include all types of organisms, but aquatic and terrestrial plants and animals tend to be the most familiar. Most invasive species possess traits that provide competitive advantages over native species, including high dispersal ability, rapid reproduction, fast growth, and tolerance of a wide range of environmental conditions. Substantial ecosystem disruptions can result as invasive species replace native ones. Invasive species can carry diseases for which natives have no defense. They can greatly disrupt aquatic and terrestrial food webs. Invasive herbivores can cause geomorphic damage by denuding sensitive landscapes such as stream banks, which in turn may alter adjoining aquatic communities. In all, the most common consequence of invasive species tends to be reduced biodiversity. Human economic interests are often impaired by invasive species, including fishing, forestry, and agricultural industries.

The Great Lakes Region and Climate Change

Great Lakes ecosystems are threatened by a wide range of invasive species. Aquatic invaders typically include fish, mussels, plants, and crustaceans. The emerald ash borer (Aplitus planipennis) is an example of an upland insect devastating regional forests. Dispersal of invasive species is often assisted by humans, as invaders may “hitch a ride” in firewood, clothing, or ballast water of ships. Many invasive plants are intentionally planted. Invasive fish and upland animals disperse after the removal of natural physical barriers that traditionally limited their range. Invasive species also tend to be effective colonizers of disturbed landscapes that result from human activities. Ecological effects of climate change are likely to accelerate the spread of invasive species. Changes in temperature and precipitation could alter the ranges of native upland species, presenting opportunities for invasive species to establish. Native aquatic species may be unable to tolerate changes in water depth, duration, chemistry, and temperature. Fresh-water ecosystems are particularly vulnerable to threats because of their high degrees of isolation and endemism. Conditions confronted by native species of all types could result in physiological stresses, the inability to compete with invaders, and their ultimate extirpation from many areas. Ironically, human attempts to mitigate climate change could also create conditions favorable for invasive species. Land conversions to energy crop production for biofuels would essentially be monocultures that are prime targets for invasive insects. Wetland restoration efforts may be increased to store atmospheric carbon, but research shows that these sites are prone to problems with invasive plants.

Aquatic Invasive Species of the Great Lakes Region

Asian carp (Ctenopharyngodon idella) is a long, narrow invasive fish that attaches itself to larger fish with a suction-cup like mouth. Victims typically die from blood loss to the lamprey.

Rainbow smelt (Osmerus mordax) is a very small invasive fish that has disrupted fishing industries in many parts of the Great Lakes region by rapid population and out-competing native fish species.

Round goby (Neogobius melanostomus) is a small, bottom-dwelling fish native to central Eurasia. It arrived in the Great Lakes in ballast water, and can tolerate warm, degraded conditions. It has already had profound effects on the ecology of the Great Lakes.

Conclusions

The Great Lakes region is susceptible to threats from a wide range of invasive species, and many threats result from the effects of climate change. Aquatic invaders are perhaps the most troubling, as their establishment tends to result in monocultures with little biodiversity. Invasive species also tend to be effective colonizers of disturbed landscapes that result from human activities. Ecological effects of climate change are likely to accelerate the spread of invasive species. Changes in temperature and precipitation could alter the ranges of native upland species, presenting opportunities for invasive species to establish. Native aquatic species may be unable to tolerate changes in water depth, duration, chemistry, and temperature. Fresh-water ecosystems are particularly vulnerable to threats because of their high degrees of isolation and endemism. Conditions confronted by native species of all types could result in physiological stresses, the inability to compete with invaders, and their ultimate extirpation from many areas. Ironically, human attempts to mitigate climate change could also create conditions favorable for invasive species. Land conversions to energy crop production for biofuels would essentially be monocultures that are prime targets for invasive insects. Wetland restoration efforts may be increased to store atmospheric carbon, but research shows that these sites are prone to problems with invasive plants.

What are Invasive Species?

Invasive species are non-native organisms capable of adversely affecting ecosystems they colonize. They can include all types of organisms, but aquatic and terrestrial plants and animals tend to be the most familiar. Most invasive species possess traits that provide competitive advantages over native species, including high dispersal ability, rapid reproduction, fast growth, and tolerance of a wide range of environmental conditions.

Substantial ecosystem disruptions can result as invasive species replace native ones. Invasive species can carry diseases for which natives have no defense. They can greatly disrupt aquatic and terrestrial food webs. Invasive herbivores can cause geomorphic damage by denuding sensitive landscapes such as stream banks, which in turn may alter adjoining aquatic communities. In all, the most common consequence of invasive species tends to be reduced biodiversity. Human economic interests are often impaired by invasive species, including fishing, forestry, and agricultural industries.

What Can Be Done?

Once established, invasive species can be tremendously difficult to control or eradicate. In some cases researchers have developed chemicals to poison invasive species, but these often have undesirable side-effects. Physical removal of invaders is sometimes an effective measure, but can be very labor-intensive and time-consuming. Predator species may be imported that effectively limit expansion of the invasive species, but this strategy can be dangerous if there are uncertainties regarding the range of effects of the predator species. Management approaches often involve a combination of these various strategies. The best strategy is to prevent the establishment of invasive species by limiting their means of potential dispersal. Once invaders are detected, early treatment typically results in the greatest likelihood for successful removal. Sometimes establishment can not be reversed but subsequent dispersal to additional areas may be contained. Treatment of smaller, isolated establishments is usually more feasible than larger, wide-spread ones. Management options can be very expensive, so a cost-benefit approach may best suggest where to focus efforts. Public education is very important, as residents should be aware of the consequences of planting or transporting invasive species.

References


