



## Commentary

## Invasive species early detection and eradication: A response to Horns (2011)

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The Laurentian Great Lakes are among the most heavily invaded freshwater ecosystems in the world. Despite regulation of ballast water discharge and other prevention efforts, new species continue to invade. When prevention efforts fail and a new species is detected, there is currently little choice but to accept the new arrival, along with its potential ecological and economic impacts. Are there proactive measures that could improve the efficacy of invasive species management? This is the fundamental question we posed in a recent paper (Vander Zanden et al., 2010), in which we explored the concept of early detection and eradication of aquatic invasive species in the Laurentian Great Lakes. Our intent was to engage science and management communities regarding some of the factors that early detection and eradication efforts should consider.

In a response to our article, Horns (2011-this issue) highlights difficulties associated with invasive species early detection and eradication: arrival of an invasive species is a rare event, only a fraction of established species become problematic, some species may not be eradicable, and species may be detected too late to be eradicated. Horns concluded that developing early detection and eradication capabilities would not be worthwhile. Yet by focusing

solely on monitoring and detection probabilities, this paper did not consider the broader post-detection decision making process. If a new species is detected through active or passive monitoring efforts, should eradication be attempted? Informed decision-making requires estimating the expected costs of eradication and the likelihood of eradication success, and comparing these values to the expected costs of inaction (i.e., the impacts of the invader). Uncertainty is associated with all of the above, and any eradication assessment would require the application of robust decision-making principles. Though Horns noted that eradication was costly in several marine examples, these costs are meaningless unless compared to the damages avoided by stopping these invasions.

Horns' analysis also assumed a limited and centralized monitoring program. While we noted the role of a coordinating body (perhaps analogous to the Great Lakes Fishery Commission), we highlighted the roles of both active and passive monitoring, and the importance of supporting and expanding the invasive species monitoring capacity of existing programs and agencies. Improved invasive species monitoring would provide diverse benefits. Beyond facilitating 'early detection' – an important prerequisite for species eradication, invasive species monitoring is the basis for assessing whether ballast water regulations and other legislative efforts are effective in slowing the invasion rate. Surveillance is essential to any adaptive management-based approach (Holling, 1978).

Invasive species have indelibly harmed the Laurentian Great Lake ecosystems and economy. At present, there is limited capacity for resource managers to respond in a meaningful way when a new invasive species appears. The situation stands in stark contrast with natural disasters, where disaster preparedness and emergency response plans are the norm, even in cases where disasters are rare events (Ricciardi et al., 2011). Can we do better? Can we move toward proactive management whereby we actively stop new species from establishing and spreading? Does the situation merit a societal investment in monitoring, preparedness, and rapid response capacity? History includes many examples of invasive species being eradicated if detected early (Simberloff, 2003). Beyond preventing invasion in the first place, the most effective way to deal with invasive species is to detect them early and eradicate or contain them before they have the chance to spread. Creating a rapid response capacity for the Great Lakes would be ambitious and would challenge human ingenuity. It would also hasten the development of innovative methods and technologies to detect and eradicate new invasive species. The Great Lakes research and management community could choose to provide leadership in invasive species management. Doing so will require leadership, a bold vision, and taking the long view.

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