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# An Ecosystem Management Success Story: More than Science, More than Politics

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Ecosystem management requires more than only good science or only strong political will to correct environmental problems. Successful ecosystem management requires a continuous partnership among the scientific community, ecosystem managers, politicians, and the general citizenry. The Laurentian Great Lakes of North America provides an excellent example of ecosystem restoration and management based on such partnerships. The example is best shown by the history of the Lake Erie ecosystem recovery over the past 35 years. In the 1960s and early 1970s the Lake Erie ecosystem was severely damaged by cultural eutrophication and toxification by organic wastes (e.g. PAHs and PCBs) and heavy metals (e.g. mercury). The growth of noxious cyanobacterial phytoplankton rendered the lake undesirable for recreation and incapable of supporting efficient transfer of energy to higher trophic levels. Large areas of the lake became anoxic in the profundal zones. Fish stocks were rapidly declining, and the quality of fish was heavily damaged for human consumption. Drinking water quality was poor and required extensive treatment to bring it to a quality level safe for human consumption. The health of the ecosystem was poor and the usefulness of the lake for human activities was low. The system became heavily affected by nonindigenous invasive species that diminished the functioning of the plankton food webs. The results from my research group and the results of others continue to elucidate critical processes in the healthy functioning of this ecosystem. The understanding of ecosystem health depends largely on an understanding of those factors that control energy input and generation of growth-limiting nutrients. It is most important to understand the structure and functions of the base of the food web and the ecosystem properties that ensue from the proper functioning of the base of the food web. In Lake Erie energy input is largely due to phytoplankton photosynthesis, and phytoplankton photosynthesis is generally limited by availability of phosphorus. Ecosystem and community functions depend on proper amounts of P and its transport to higher trophic levels. Our research has shown the significance of both the grazing food chain and the microbial food web for transport of C and P to zooplankton. We also have shown seasonal and spatial differences in food web structure and functions, especially as related to the overall trophic state of the community. The more oligotrophic a community is, the greater the dependence on the microbial food web for nutrient and energy transport. Here I also discuss briefly the effects that various noxious inputs cause to food web functions. Scientific understanding of ecosystem problems as they arise is only one part of eventual ecosystem restoration and continued management. Laws need to be developed to control noxious inputs, and those laws need to be accepted by a well-informed citizenry. This is an exceptional case of bi-national cooperation through the International Joint Commission (IJC), an intergovernmental review and advisory panel to the governments of both the United States and Canada. Through the Council of Great Lakes Research Managers research issues are identified for funding support by the National Sea Grant network and other funding agencies. Results of funded research are made understandable to the public-at-large through the Great Lakes Information Network, a consortium of federally supported news writers and radio broadcasters. I end this story of Lake Erie ecosystem management success with a current example of an ecosystem problem and the way the scientific community, the IJC, the federal funding, and public information sources are cooperating to achieve a solid scientific understanding and eventual solution of the problem. In recent years large zones of anoxia have reappeared, the cause of these events is unknown. Through combined efforts of all stakeholders, this problem is currently under investigation.