Acknowledgments

I thank Jim McGinity, Else Ankel, Kim Forbeck, and the Urban Ecology Center for help and background information; Will Wawrzyn of the Wisconsin Department of Natural Resources for background information and suggestions on the manuscript; Kim Forbeck for assistance with plant identification; and Al Heldermon and Jane Porath for field assistance.

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Great Lakes Clams Find Refuge from Zebra Mussels in Restored, Lake-Connected Marsh (Ohio)

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Since the early 1990s, more than 95 percent of the freshwater clams once found in Lake Erie have died due to the exotic zebra mussel (*Dreissena polymorpha*). Zebra mussels attach themselves to native clams in large numbers, impeding the ability of the clams to eat and burrow. However, in 1996, we discovered a population of native clams in Metzger Marsh in western Lake Erie (about 50 miles [80 km] east of Toledo) that were thriving despite the longtime presence of zebra mussel in surrounding waters. At that time, Metzger Marsh was undergoing extensive restoration, including construction of a dike to replace the eroded barrier beach and of a water-control structure to maintain hydrologic connections with the lake (Wilcox and Whillans 1999). The restoration plan called for a drawdown of water levels to promote plant growth from the seedbank—a process that would also destroy most of the clam population. State and federal resource managers recommended removing as many clams as possible to a site that was isolated from zebra mussels, and then returning them to the marsh after it was restored.

In 1996, following a rigorous rescue effort that included identification to species, measurement and tagging, we moved about 7,000 native clams representing 20 species and multiple ages into a boarding site adjacent to Metzger Marsh in Ottawa National Wildlife Refuge. We selected this site because 1) populations of live clams at the site indicated that it had suitable habitat, 2) it had containment features that would allow us to retrieve the clams, and 3) government jurisdiction provided protection. With the exception of individuals representing three Ohio state-listed species, which were moved to a facility in Columbus, the clams remained at the site for three years.

During summer 1999, we moved the clams from the boarding site back to Metzger Marsh. Of the 6,399 native clams planted, we recovered 4,022 live individuals representing all 17 species. Thin-shelled, highly mobile species, such as the fragile papershell (*Leptodea fragilis*) and giant floater (*Pyganodon grandis*), had the lowest recapture rates and the highest mortality rates. We could not find 1,421 individuals of these species, either live or as dead shell, and we believe that many had scattered widely into the boarding area. Although the thick-shelled species moved little and showed less growth, all individuals of five of these species survived and were recaptured. Growth for many species during this time period was phenomenal, with some animals growing 1.8 inches (45 mm) per year, and increasing up to 4 inches (100 mm) while in the boarding facility.

All but three of the adult clams returned to Metzger Marsh survived through the last census in 2002, and many females were gravid. However, we were most concerned about successful reproduction. Native clam reproductive cycles are complex, as young clams must attach to a fish to complete their life cycle. We monitored fish passing into the restored wetland through a fish-control structure (Wilcox and Whillans 1999). Many fish species were present and passed directly over the replanted clams when entering the marsh. We did not find any young clams in 2000 or 2002, although we did find some young clams representing three species in 2001. These were identified, measured, and replaced where captured. These young clams were more than 328 feet (100 m) from the adults, and closer to the emergent vegetation where fish tended to congregate.

The species composition of clams in Metzger Marsh has changed and will continue to change. In 1996, at least 20 species were present. However, we returned only 17 species due to loss of the species-of-interest that were sent to Columbus. In addition, during the initial removal from Metzger Marsh, we collected only single individuals of several species. Even though these animals survived the boarding experience, their ability to reproduce successfully was obviously limited. Without an influx of individuals of these species from outside populations, clam diversity will continue to decrease over the next few decades. Unfortunately, the presence of large numbers of zebra mussels just outside of the marsh limits the opportunity for new clams to immigrate into the marsh.

Metzger Marsh and the boarding site proved to be acceptable habitat for growth and survival for many native clam species, and they provided protection from zebra mussels. However, good

habitat for successful reproduction of native clams requires access to fish populations. While lake-connected wetlands are not common in western Lake Erie due to extensive diking, there are many along the shores of the other Great Lakes. Since we first reported finding the clams at Metzger Marsh (Nichols and Wilcox 1997, Nichols and Amberg 1999), a few other remnant clam populations have been found in similar habitats in this region. However, these additional populations are few in number, widely separated, low in population density (less than 2,000 individuals), and vulnerable to water-level fluctuations and changing land-use patterns. Zebra mussels are also an ever-present threat. Managed, but lake-connected wetlands, such as Metzger Marsh, with rich sources of food, controlled landscape use, and easy access to lake fish populations remain one of the best potential refuges for Great Lakes native clams.

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FROM: Joint Conference on the Science and Restoration Efforts of the Greater Everglades and Florida Bay Ecosystem

17.1

Reestablishing the Hydrogeomorphic Habitat Templet in the Kissimmee River. Anderson, D.H., South Florida Water Management District, Kissimmee Division, MC 4920, 3301 Gun Club Rd., West Palm Beach, FL 33406, 561/682-6716, Fax: 561/682-6442, dander@sfwmd.gov. P. 8.

During the first phase of the project to restore the Kissimmee River in Florida, workers filled 7.4 miles (12 km) of the constructed river channel and carved new river channels to connect remnants of the historic river channel and create 15 miles (24 km) of continuous river channel. Sampling of the substrate before and after the project indicated that the mean thickness deposition layer decreased 71 percent, and the average percentage of samples on a transect without a deposition layer increased from 3 percent to 64 percent. Anderson notes that the changes in the substrate characteristics are approaching the changes expected, but at a much faster rate than anticipated.

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River Rehabilitation and Fish Populations: Assessing the Benefit of Instream Structures. 2003. Pretty, J.L., School of Biological Sciences Queen Mary University of London, Mile End Road, London E1 4NS, England, +44 20 78823718, j.l.pretty@qmul.ac.uk; S.C. Harrison, D.J. Shepherd, C. Smith, A.G. Hildrew and R.D. Hey. **Journal of Applied Ecology** 40(2):251-265.

The authors studied the effects of two common, small-scale in-stream rehabilitation techniques—artificial riffles and flow deflectors—on fish assemblages in 13 lowland rivers in central and eastern Britain. In each river, they sampled fish populations in an unrehabilitated reach and in a reach that had undergone a rehabilitation scheme. Overall, total fish abundance, species richness, diversity, and equitability did not differ significantly between the rehabilitated and the control reach. The authors found few significant relationships between the fish fauna and physical variables, leading them to conclude that increasing habitat heterogeneity does not necessarily translate to higher biological diversity. They therefore caution against using physical responses to rehabilitation as a reliable predictor of ecological response and argue that physical restoration should be combined with other strategies, such as water quality management, to enhance fish populations.

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Cat Island Work Could Start in 2004. 2003. Rebhahn, P., prebhahn@greenbaypressgazette.com. **Green Bay Press-Gazette,** March 17.

The U.S. Army Corps of Engineers is proceeding with plans to restore the Cat Island chain of Green Bay in Wisconsin. The project would use sediment dredged from a shipping channel to create three islands, replacing ones destroyed by nature in the 1970s. Janet Smith, a field supervisor for the U.S. Fish & Wildlife Service, notes that the islands helped protect the wetland area from wave action. The vegetation in the calm waters provided habitat for shorebirds, waterfowl, and amphibians. Critics fear that the sediment will contain high levels of PCBs (polychlorinated biphenyls) and that the islands and surrounding waters will become a "toxic trap" for wildlife. According to one of the project proponents, however, the project will use only clean dredge materials, meaning sediment with PCB concentrations no higher than were there originally.