



Project Status Report

Upper Mississippi River
Long Term Resource Monitoring Program
U.S. Geological Survey

An Empirical Fingernail Clam Model for Upper Mississippi River Pools 7 and 8

by
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Fingernail clams (Sphaeriidae) are important food sources for fish and migrating waterfowl in the Upper Mississippi River (UMR). Historically, fingernail clam densities ranged from 1,000 - 10,000 m⁻² (per square meter) in parts of the UMR. Recent studies indicate that fingernail clam populations may be on the decline. In 1975, lower Pool 8 had fingernail clam densities as high as 2,400 m⁻². More recent sampling (yearly since 1992) conducted by personnel from the Long Term Resource Monitoring Program, the U.S. Fish and Wildlife Service, and the Wisconsin Department of Natural Resources have shown fingernail clam densities averaging < 20 m⁻² in lower Pool 8 of the UMR.

To try to understand the fingernail clam population distribution, a study was initiated during 1995 in Lake Onalaska of UMR Pool 7 and expanded to lower Pool 8 in 1996. The main focus of this study was to create and test an empirical model that would identify suitable areas for fingernail clams based on modeled water flow and bathymetry (water depth). The St. Paul District of the U. S. Army Corps of Engineers provided flow data from a hydraulic model called FastTABS and the Environmental Management Technical Center provided bathymetry information.

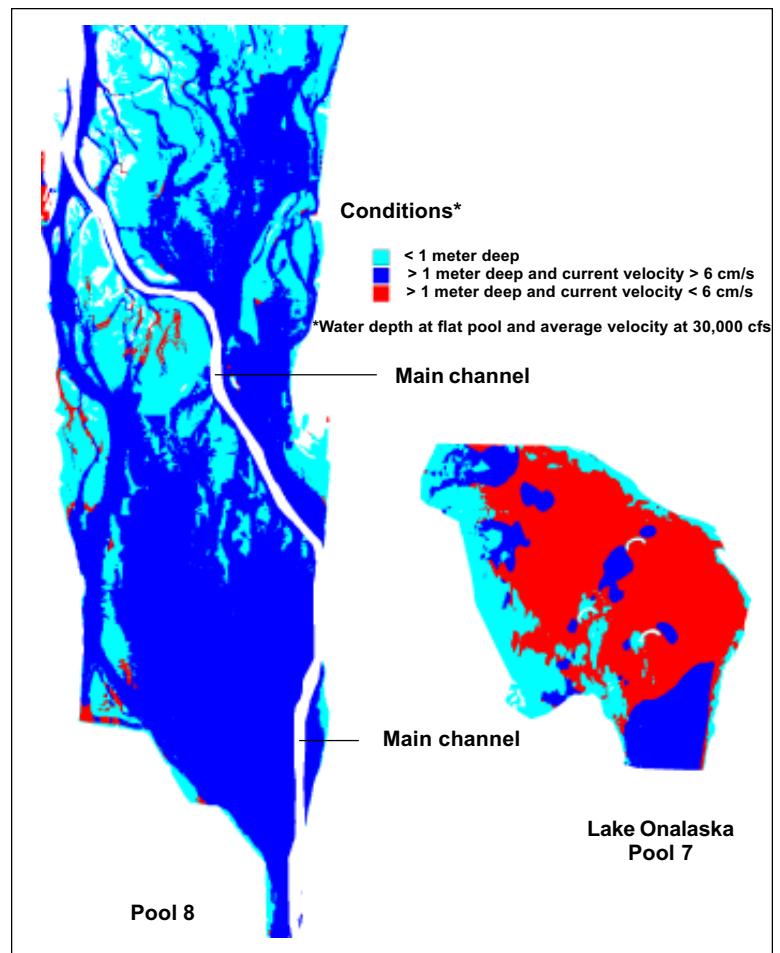


Figure 1. Predicted suitable areas for fingernail clams in lower Pool 8 and Lake Onalaska, Pool 7, of the Upper Mississippi River. The red areas represent the preferred habitat for fingernail clams based on water flow and depth.

(over)

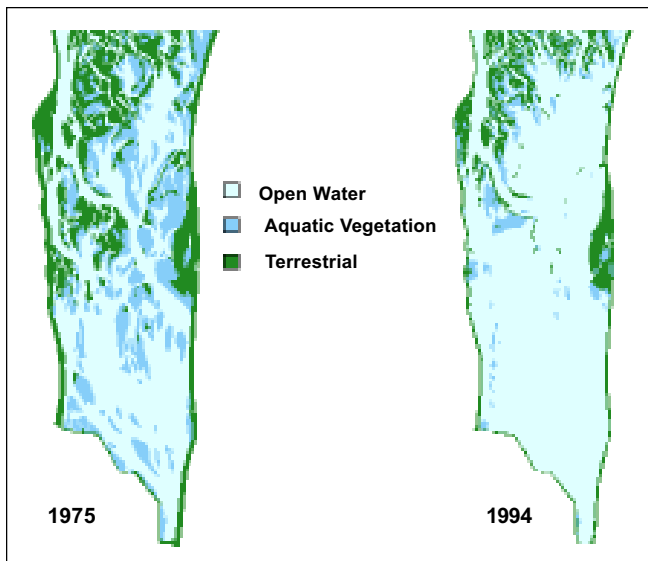


Figure 2. Land, water and vegetation coverages for lower Pool 8 of the Upper Mississippi River during 1975 and 1994.

Field samples consisted of 48 standard ponar samples per pool, randomly selected within 6 regions (8 sites/region) and classified by modeled flow and bathymetry. Sites were sampled in July and August of 1995 and during July and September of 1996. All samples were preserved and the fingernail clams were later identified and enumerated in the lab.

In 1995, 61% of the variance in fingernail clam densities in Lake Onalaska was explained by modeled regions (Figure 1). Power test analysis suggests that this model best predicts fingernail clam distributions during August and September (power=99) versus July (power=19). The model suggests that suitable areas for fingernail clams in August were characterized by average flow < 6 cm/s and depths from 1 to 2 meters. These areas were heavily populated, accounting for 67% of the fingernail clams collected.

In 1996, lower Pool 8 of the UMR was modeled using the same Pool 7 hydrodynamic criteria and

random sampling design. The map generated by the model (Figure 1) suggests that suitable areas for fingernail clams are almost non-existent in lower Pool 8 due to higher flows and greater depths. Field data confirmed this prediction, with a maximum of 3 fingernail clams collected at a single site.

These results suggest that fingernail clam declines in lower Pool 8 may be linked to habitat loss. Some massive habitat changes have occurred in lower Pool 8 since 1975 (Figure 2), when fingernail clam densities were found as high as 2,400 m⁻². Vast vegetation beds and small islands present in 1975 have all but disappeared. With these losses, the hydrodynamics of lower Pool 8 have changed. Many low flow areas associated with vegetation beds and islands have been lost.

The fingernail clam model has successfully predicted suitable areas for fingernail clams in non-vegetated areas, but the hydraulic model does not currently include the effects of vegetation beds on flow. Therefore, areas where vegetation may reduce the flow to a suitable level are not yet adequately classified. In 1998, we will initiate investigations of fingernail clam densities in the vegetated areas of Pools 7 and 8 of the UMR. □

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