

Detailed Inventory of Freshwater Mussels in the Lower Ohio River, Miles 918.0 to 981.0

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Abstract. The Louisville District of the U.S. Army Corps of Engineers is developing a detailed inventory of freshwater mussels in the lower Ohio River, mile 918.0 to mile 981.0, to delineate the areal extent of unionid mussel concentrations. This reach of the Ohio River has been physically inventoried to determine presence/absence of unionids because of ongoing navigation maintenance dredging requirements. Past surveys of this portion of the Ohio River provided limited accurate data regarding bounds of mussel beds. The recent intensive brailing and diver studies have emphasized the use of Global Positioning Satellite relative positioning equipment to provide clear, reproducible mapping coordinates of study transects and known and/or new beds. The intent of the current mussel investigation is to provide the maintenance dredging program with the best possible location data regarding mussel resources to ensure avoidance of mussel concentrations and adverse impacts.

Introduction

The Louisville District of the U.S. Army Corps of Engineers conducts a major annual navigation channel maintenance dredging program. Dredging to maintain minimum navigable channel depth and width typically begins in mid-May and is completed by mid-September. The majority of the dredging occurs in the lower Ohio River from Smithland Locks and Dam (Ohio River Mile [ORM] 918.0) to Cairo, Illinois (ORM 981.0), the confluence of the Ohio River with the Mississippi River.

Channel maintenance dredging is performed by a large cutterhead suction dredge with disposal of dredged material in open water areas removed from the navigation channel. Although the volume of material dredged varies considerably, it is not unusual for about 2 million cubic yards of material to be removed from this reach of the Ohio River each year.

This paper is not intended to be a detailed report of work by others; rather, it is a review of the actions and data needs of a federal agency that has responsibilities that may significantly affect some of the best freshwater mussel populations in the Ohio River drainage. Specific reports of findings can be obtained from the Louisville District.

Need For Inventory

In August 1991, the contractor conducting maintenance dredging removed a small area of gravel substrate near Mound City, Illinois, that was deter-

mined to be a potential hazard to commercial navigation traffic. Along with the gravel and sand substrate, several thousand unionid mussels were also dredged and disposed of on a mid-river gravel bar. The vast majority of the dredged mussels were lost. The mussel resource impacted by the dredging operation had not been identified in earlier resource inventories.

It was determined that the most prudent course of action would be to conduct a detailed inventory of mussel resources at the earliest possible date to insure that such an event would not again occur. Potential material removal areas were determined based on past dredging records. Large zones were delineated to include any disposal activity along with possible sediment plumes that might be associated with open water disposal of dredged material. The emphasis of these inventory efforts was focused on presence and absence of unionids with a clear plan to practice total avoidance of mussel resources in all future navigation dredging activity. It was also decided that the mapping should use the most current available position location equipment, and Global Positioning Satellite (GPS) receivers were identified as the most appropriate equipment.

Previous Unionid Information

The unionid population for this reach of the Ohio River had last been systematically inventoried by

Williams and Schuster (1989) in 1981 as part of work conducted for a joint study by the Corps of Engineers, the Kentucky Department of Fish and Wildlife Resources, and the U.S. Fish and Wildlife Service. Earlier work in the lower Ohio River included an inventory by Neff (1980) for the Louisville District. Williams' 1967 inventory of the Ohio, Tennessee, and Green rivers provides the best early baseline information for the lower Ohio River (Williams 1969).

The 1967 study identified nine areas of unionid concentrations in the study area during brailing (Williams 1969). Thirteen years later, Neff (1980) found mussel concentrations at a total of 10 locations. But in 1981, Williams and Schuster (1989) located only five mussel beds in this reach of the Ohio River.

Descriptions of the locations of these areas varied by investigator, water conditions at the time of survey, availability of landmarks (or the lack of them), and equipment available for position determination. This lack of certainty of location made these inventories poorly suited to be guides for maintenance dredging activity.

Materials and Methods

Inventory of the reach from ORM 918.0 to ORM 981.0 was accomplished by contract efforts with Environmental Science and Engineering (ESE), Inc. and Malacological Consultants. ESE conducted field inventories during October 1991 for the reach from ORM 918.0 to ORM 938.9. Malacological Consultants inventoried the remaining reach (ORM 938.9 to ORM 981.0) during June and July 1992.

Both contractors were directed to perform brailing of known or potential work areas as defined by maps supplied by the Louisville District. The location and number of brail transects were not fixed for the purposes of the contracts since the mussel beds were poorly defined and flexibility for the study investigators was necessary. Only the size of the brail (minimum 8 ft) and the length of transects (minimum 100 m) were defined in the contract scope. The intent of the brailing effort was to obtain reasonably defined areas of mussel concentrations and to focus diver surveys to further define bed limits. If mussel concentrations extended to the limits shown on mapping provided by the Louisville District, the contractor was directed to continue brailing until the limits of the bed were found.

Each contractor was directed to provide divers to define bed locations. The method to be employed by these divers was left vague again for the investigator since this reach of the Ohio River is subject to significant variations in stage and flow. These fluctuations can make dive survey conditions simple exercises or provide current and visibility conditions that prohibit

diving. Live boat diving was the preferred technique but was limited to periods of low current velocity.

An additional requirement of each contractor was the use of GPS positioning equipment to determine locations of all brail transects and limits of mussel concentrations. It was recognized that the full constellation of GPS transmitters had not yet been reached and that some bogus location readings could result during field studies. This was determined acceptable for several reasons. First, this reach of the Ohio River has few landmarks, and accurate positioning using existing maps is difficult for even those individuals familiar with this area. Second, the position of beds relative to shoreline varies with river stage, and precise locations based on "snapshot" observations are of little use for relocation of beds. Also, the Louisville District is rapidly moving to the use of GPS for all bathymetric surveying and dredge positioning. The location of resources by GPS will be easily integrated into the total District program. Important to future resource inventories, these GPS location coordinates can be reconfirmed by future studies or updated as better equipment becomes available. Finally, a geographic information system (GIS) database is being developed for this reach of the Ohio River, and accurate positioning of mussel concentrations was considered necessary.

Results

A field survey of the entire study reach was completed in July 1992, but mapping and reports for the lower portion (ORM 938.9 to ORM 981.0) have yet to be completed. A description of the work accomplished for the reach between ORM 918.0 to ORM 938.9 characterizes results to date.

This upper portion of the study area was found to include four distinct mussel beds. This compares to one as described by Williams (1989) and none by Neff (1980). The one bed reported by Williams (1989) was found to be significantly longer than previously reported. Additional beds were noted along the Illinois shore (one bed) and the Kentucky shore (two beds). One of the newly identified beds along the Kentucky shore extends about 3.5 miles (5.6 km), representing a significant finding.

The study of this upper portion of the reach of interest included 152 brailing transects. The beginning and ending points of these transects were recorded for location of large-scale maps. Many of these transects yielded no unionids. Null result information is, however, equally valuable as compared to brail hauls that provided a number of individuals, particularly since the dredging program intends to accomplish resource avoidance.

Summary

The use of brailing transects with confirmatory diver surveys was an effective technique for this mussel inventory. Brail transects in the three new beds and one bed extension provided a good first indication of mussel presence. Diver surveys indicated, however, that portions of the beds were covered with thin layers of silt, typically between 0.5 to 1 inch in depth (1 to 2 centimeters). In these areas, brailing was of limited success or unsuccessful. Divers, however, were able to easily find concentrations of mussels and completed the delineation of the mussel beds. An absence of diver surveys would have resulted in much smaller areas noted as beds with significant portions of mussel concentrations missed. Diver surveys alone are prohibitively expensive for a river as large as the Ohio. The combination of techniques provided the best available survey results.

GPS for mapping is clearly the tool to be used for future resource inventory on large rivers. The relative success of this technology at present is based on satellite availability, equipment with a sufficient number of receiving channels, and operator experience. The continued use of GPS for resource mapping will improve the location coordinates of critical resources and will help assure that accidental intrusions into mussels beds during dredging will be limited in the future.

Acknowledgments

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The principals involved in the contract efforts are to be commended for their patience in conducting surveys with much flexibility designed in the scopes of work and with the use of emerging GPS technology. Specifically, both Brent McClane (now Ecological Specialists, Inc.) and Brent Kuhl of Environmental Science and Engineering, Inc. are to be recognized for their efforts in the first study, which field-tested the techniques and equipment. Marian Havlik of Malacological Consultants is recognized for her work completing the work for this reach, particularly in light of difficult river stages and currents throughout her field efforts.

Literature Cited

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