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## FRESHWATER MUSSEL (*MOLLUSCA: UNIONIDAE*) HABITAT VARIABILITY AND MOVEMENT PATTERNS FOLLOWING RELOCATION: A CASE STUDY OF *POTAMILUS CAPAX* (GREEN 1832)

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### **Abstract**

Relocation of freshwater mussel aggregates has been used as a mitigation strategy for nearly 30 years. Methodologies for relocation have been studied showing that identification of appropriate habitat characteristics are among the most important aspects when selecting a viable relocation site. Though relocation methodologies have been studied, little is known about the influence on behavioral patterns following relocation. This project is aimed at addressing information gaps regarding post-relocation monitoring activities which will be incorporated into the biological assessment of a proposed permit streamlining initiative between the US Fish and Wildlife Service, Federal Highway Administration, and Arkansas Transportation and Highway Department.

The focus of this initiative is the fat pocketbook, *Potamilus capax* (*Mollusca: Unionidae*), which was designated as "Endangered" in June 1976 by the USFWS in the entire range of the species. The present general distribution of *P. capax* has been reported from the upper Mississippi River on the borders of Minnesota, Wisconsin, Iowa, Illinois, and Missouri, the Ohio River System on the borders of Indiana, Illinois, and Kentucky, especially its tributary the Wabash River in Indiana and Illinois, the White River of Missouri and Arkansas, and the St. Francis River system in Arkansas. These systems typify mid-western Mississippi River drainages with areas of slow moving water and substrate ranging from shifting sand and gravel to sand, silt, and clay substrates, suitable habitat for *P. capax*. This species is further characterized as being a long-term breeder with fertilization occurring in spring and gravid females present from June to October and uses the freshwater drum (*Aplodinotus grunnius*) as its host. Though *P. capax* was at one time present in many of these systems, historical accounts indicate that it was never a predominate species within the assemblage. Though mussels, in general are considered relatively stationary, many species, including *P. capax*, have adopted a mobility trait which may yield inaccurate monitoring results.

The objectives of this study are to 1) analyze seasonal movement patterns of resident and relocated individuals and 2) relate movement to sediment characteristics at the relocation site. We hypothesize that relocated *P. capax* will show a greater displacement than resident *P. capax*. We also expect this displacement to be associated with habitat selection and/or reproduction. We have examined movement patterns of resident and relocated *P. capax* within an agricultural drainage system of the Saint Francis River system of Arkansas and Missouri. Two treatment groups have been monitored with different monitoring intervals. The first group was fitted with radio transmitters and was monitored at a maximum of one month intervals from October, 2005 to January, 2006 and July, 2006 to November, 2006 using radio telemetry. The second treatment group was monitored using mark and recapture (shell etch) techniques and positions recorded once quarterly from May, 2005 through March, 2007. Substrate composition (sand, silt, and clay), water depth, and water velocity were determined using 65 meter bank to bank transects at 10 meter intervals for the length of the 200 meter relocation reach. Substrate, depth and velocity were interpolated using kriging and spatial data analysis in GIS.

Initial movement results of the quarterly sampling show native individuals ( $n = 41$ ) with a displacement range between 0.88 m and 151.92 m while relocated animals ( $n = 13$ ) have displacement range between 3.44 m and 18.87 m. At the  $\alpha = 0.10$ , this difference is significant ( $p = 0.09$ ). Data for the transmitter treatment group are still being collected, but preliminary indications from the October, 2005, to January, 2006, monitoring period contradict this trend. In this time period, resident individuals ( $n = 11$ ) had a range of total displacement from 0.60 m to 9.12 m while relocated individuals ( $n = 10$ ) had a range of total displacement from 2.67 m to 14.90 m with a significantly greater average range as well ( $p < 0.10$ ).

Results of this study will help refine relocation monitoring methods involving freshwater mussels with a movement characteristic in their life history. Because monitoring of relocated *P. capax* has proven to be largely unsuccessful, better understanding their movement abilities may help to establish more appropriate monitoring methodologies for performance standard assessment. Also, a more thorough understanding of how this species uses available habitat on a seasonal basis will help refine selection criteria for potential relocation sites. This assessment information will also be used in the biological opinion by the US Fish and Wildlife Service in formulating the biological opinion of the proposed permit streamlining initiative.