MUSSEL CONSERVATION IN THE CHICKASAWHATCHEE AND ELMODEL WILDLIFE MANAGEMENT AREAS: METHODS FOR A RELOCATION STUDY

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Abstract. Southwest Georgia has among the richest mussel assemblages in the world. The Chickasawhatchee Wildlife Management Area (WMA), location of the second largest swamp in Georgia, and the Elmodel WMA have recently been placed into permanent conservation status (+15,000 acres) providing an opportunity for the management of mussels. In 2001, 16 locations within the WMAs were surveyed for mussels using visual and tactile methods. Nine species were found with one being very rare (*Alasmidonta triangulata*) and another federally endangered (*Lampsilis subangulata*). Mussel densities were much lower than those found in nearby streams, which may be due to prior land use and historical droughts. During the spring of 2003, we plan to relocate three mussel species (*Elliptio complanata*, *E. crassidens*, *Villosa vibex*) that serve as surrogates for endangered species. Their survivorship will be observed for two years; in addition, water quality and hydrology will be monitored. We hope that with the development of relocation methods and identification of suitable habitat, populations of endangered species can eventually be established within the WMAs.

INTRODUCTION

Conservation efforts frequently require the removal of endangered mussels prior to activities that may pose a threat to populations or their habitat. Relocation is also used to establish new populations of endangered species. Habitat needs, pollution sensitivities, and relocation potential of rare or sensitive species may be species-specific and are generally not understood (Cope and Waller 1995). Previous relocation studies have identified a suite of concerns related to mussel relocation efforts, including destination habitat conditions, handling and transport methods, season of relocation, and among-population differences in relocation potential due to source habitat conditions (Cope and Waller 1995). Our goals were to assess the mussel population on the WMAs, determine possible source and relocation sites for mussels, and suggest methods for their relocation.

METHODS

From 25 June to 25 October 2001, mussel beds were surveyed at ten locations in the Chickasawhatchee WMA and six sites in the Elmodel WMA (Figure 1). At access points (bridge crossings and levees) within the WMAs, searches were often conducted up and downstream with distances ranging from 10m to 200m. For two of the ten sites at Chickasawhatchee WMA only presence/absence of species was noted, but for the remaining searches abundance was recorded. Surveys were conducted by either grubbing (i.e., tactile) or

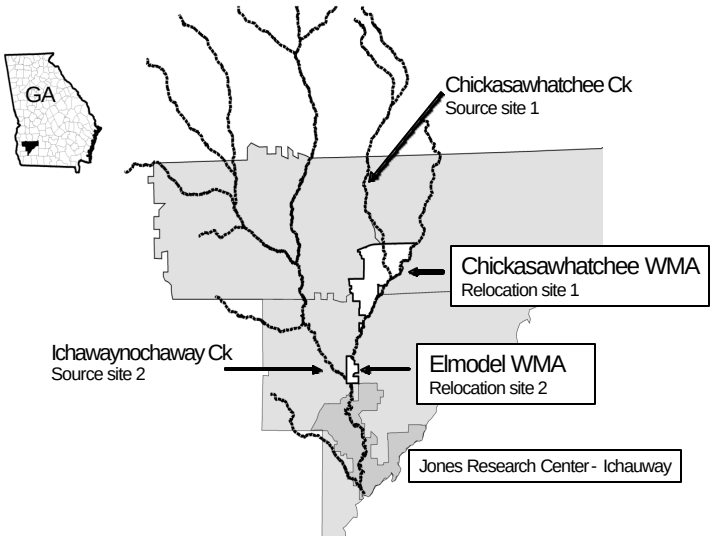

Figure 1. Chickasawhatchee and Elmodel WMAs in southwest Georgia. Location of proposed relocation and source sites for mussels are indicated.

visually searching for mussels. Mussels were identified to species except for E. *complanata* and *E. icterina*, which were grouped as *E. complanata/icterina* because of difficulty in distinguishing between species in the field. In addition, habitat conditions were noted at all sites at time of searches. Baseflow hydrologic conditions were noted on 2-3 October 2001 to determine the extent of perennial aquatic habitat within the WMAs.

RESULTS AND DISCUSSION

Mussel Survey

Mussel densities were relatively low at most sites (Table 1). We found over 275 mussels representing nine different taxa. Three of the taxa are considered very rare (*Alasmidonta triangulata*), of special concern (*Quincuncina infucata*), or listed as federally endangered (*Lampsilis subangulata*).

Elliptio complanata/icterina and *Uniomerus carolinianus* were the most abundant taxa in Chickasawhatchee WMA (Table 2). E.. *complanata/icterina, Elliptio crassidens, Villosa vibex*, and *L. subangulata* were most common in Elmodel WMA. Mussels were not as abundant as we had hoped based on other streams surveyed in the lower Flint River Basin (Johnson 2001). Low densities may reflect mortality caused by historical drought conditions, seasonal stagnation preventing colonization, or prior human disturbance in the watershed.

Our initial survey and additional searches of the Elmodel WMA uncovered nine specimens of *Alasmidonta triangulata*, a very rare mussel. Only two other specimens have been found in the Flint River Basin since 1991 (Brim Box and Williams 2000). Additional efforts should be made to learn more about *A. triangulata*. Future research may want to focus on determining gravid period, host fish, as well as, propagation methods for this mussel.

Methods for Relocation

Mussels proposed for relocation were based on availability and similarity to endangered species. Two relocation sites and two source sites were chosen because of mussel species' habitat preferences (Figure 1). Relocation site 1 on Chickasawhatchee Creek had the best flow conditions at baseflow in the WMA, which is an essential criterion. This site is characterized by sandy substrate with occasional deep pool areas; habitat where *E. complanata/icterina* and *V. vibex* are commonly found. *E. crassidens*, a species that prefers rock substrates and larger rivers, would be better relocated to Chickasawhatchee Creek on Elmodel WMA (Relocation site 2; Figure 1).

Since densities were so low on both WMAs we will harvest mussels for relocation outside of the WMAs (Figure 1). Source locations for *E. complanata/icterina* and *V. vibex* will be in the headwaters of Chickasawhatchee Creek (Source site 1) and *E. crassidens* will be obtained from the nearby Ichawaynochaway Creek (Source site 2). A total of 150 individuals of each species will be collected at the source site. Individuals will be weighed, measured, and tagged with 75 of each species to be returned to their source site and 75 of each species moved to their new relocation site (Sickel et al. 1997). Mussels at both sites will be placed evenly and randomly within several 1-m^2 quadrants.

Assessment of relocation success will occur at relocation and source sites. At each site, relocation quadrants and the surrounding area will be searched for mussels three times: two weeks post-relocation during Summer 2003, Fall 2003 and Summer 2004. Measurements to be collected at relocation and source sites include qualitative mussel searches and habitat assessment (substrate size, water depth, flow velocity, and channel morphology). In addition, water quality will be monitored using Hydrolab dataloggers (turbidity, temperature, DO, pH, conductivity) during

Table 1. Summary of mussel survey conducted in Chickasawhatchee and Elmodel WMAs in 2001

	Chickasawhatchee WMA*	Elmodel WMA
Number of sites	10	6
Search effort (people x hr)	17	29
Distance surveyed (m)	1020	1025
No. taxa	6	8
No. endangered /special concern/rare taxa	0	3
Total no. individuals	88	187
Avg. no. individuals/hr	5	6

* 2 sites no abundances recorded

Table 2. Relative abundance of taxa in the WMAs for 2001 survey

WMA	Species	% abundance
Chickasawhatchee	*E. complanata/icterina*	63
	Uniomerus carolinianus	11
	Villosa vibex	9
	Toxolasma paulus	8
	Villosa lienosa	6
	Villosa spp.	3
	Elliptio crassidens	*
Elmodel	*E. complanata/icterina*	31
	Elliptio crassidens	28
	Villosa vibex	18
	Lampsilis subangulata	15
	Villosa lienosa	3
	Alasmidonta triangulata	2
	Toxolasma paulus	2
	Quincuncina infucata	1
	Villosa spp.	1

* taxa observed but abundances were not recorded

the summer when conditions are most stressful for mussels. Surface water samples will also be collected monthly to monitor phosphorus, ammonia, nitrogen, pH, alkalinity, dissolved carbon levels (inorganic and organic), and suspended particulate organic matter. A complementary study is examining underground and surface water linkages (D.W. Hicks, Jones Research Center).

Analysis will consist of comparing water quality and flow data between relocation and source sites to ensure between-site similarities. Survival rates during the study period will be calculated for each site (Hamilton et al. 1997). Mussel mortality and habitat data will be compared to identify potential causative mechanisms for mortality.

IMPLICATIONS

Albertson and Torak (2002) have already surmised that continued water withdrawal during summer drought conditions is of particular concern to mussel survival: they suggest that several streams in southwestern Georgia containing endangered mussel species could potentially dry under present water withdrawal rates. A recent study indicates that mussel assemblages are already declining in the region as a result of the current drought (Golladay et al. 2003). If methods for relocation of mussels can be developed then endangered species could be relocated if their habitat becomes dewatered in low stream flow scenarios. It is also beneficial if sites are established on state protected land to ensure long-term access and protection of surrounding uplands.

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