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The influence of physiography, landscape characteristics, and drought on species richness and presence of imperiled unionids in the Lower Flint River

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Abstract Text:

The southeastern United States has experienced rapid human population growth during the past 30 years, which has resulted in increased development and demand for the Region's water resources. Freshwater mussels (unionids) in the Region have experienced substantial population declines during the same time period. Consequently, there is growing interest in determining how mussel population declines are related to activities associated with water resource development. Determining the causes of mussel declines requires an understanding of the factors driving mussel population and community dynamics. Unfortunately, little is known about basic mussel ecology, life history, and population and community level parameters (e.g., birth, survival, and colonization rates) for many species. To predict how species respond to changes in the physical environment, we generated statistical models relating unionid species richness and presence to physiography, land use, drought, link magnitude (stream size), and isolation due to impoundment. We used a combination of historical and contemporary (7 year time-span) mussel presence/absence and abundance data collected from 107 sites in 35 streams throughout the lower Flint River Basin, Georgia. Model results suggest that species richness was most strongly and negatively related to drought and isolation due to impoundment. The presence of Elliptio purpurella (a Georgia species of special concern) was most strongly related to link magnitude and drought while Hamiota subangulata (federally endangered) was negatively related to isolation and drought. Pleurobema pyriforme (federally endangered) presence was negatively related to link magnitude, isolation, and percent urban land use. These models will be used in conjunction with ongoing research to inform management decisions aimed at identifying and conserving at-risk populations of rare and endangered unionids.

Impact Statement:

This project will improve water resource management by providing information about the effects of water resource development activities on populations of rare and endangered unionids. Quantitatively linking changes in the physical environment to changes in the distribution and abundance of mussels enables biologists and managers to consider the ecological effects of development when developing resource management plans. Human population growth and development are continuing at a rapid rate in the southeastern United States. Hence, understanding how unionids respond to changes in the physical environment is an important step towards successful future management of the Region's water resources.