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A Regional-scale Habitat Suitability Model to Assess the Effects of Flow Reduction on Fish Assemblages in Michigan Streams

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Abstract.–Sound management and protection of the Great Lakes Basin's abundant freshwater resources requires the ability to predict local habitat conditions and fish communities across regional spatial scales. In response to concerns over increased use and potential diversion of its plentiful freshwater resources, the State of Michigan enacted legislation in 2006 that required creation of an integrated assessment model to determine potential for water withdrawals to cause an adverse impact to Michigan's waters or water-dependent natural resources. As part of this effort, we developed a model to predict how fish assemblages in different types of Michigan streams would change in response to decreased base flows. The model uses habitat suitability information from Michigan (catchment size, base flow yield, July mean water temperature) for over 40 fish species to predict assemblage structure and characteristic fish assemblages in individual river segments under a range of base flow reductions. River segments were classified into eleven strata based upon catchment size and July river temperature, and fish assemblages were predicted for each category. By synthesizing model runs for individual fish species at representative segments of each river type, we developed curves describing how typical fish assemblages in each type respond to flow reduction. The strata-specific, fish response curves can be used to identify streamflow reduction levels resulting in adverse resource impacts (ARIs) to characteristic fish populations. Our model provides a framework for evaluating impacts of flow withdrawals on biotic communities across a diverse regional landscape.