## STUDY PERFORMANCE REPORT

State: Michigan

Study No.: 230722

Project No.: F-80-R-7

Title: Implications of lakeshore development for fishery resources in Michigan

Period Covered: October 1, 2005 to September 30, 2006

Study Objectives: Develop models integrating information from the literature and from new data collections to predict the response of fish populations and communities to lakeshore development.

Summary: Relatively little work has been accomplished on jobs for this study this year. The dearth of information available in the literature that is directly applicable to the modeling task has hampered my efforts greatly, and leads me to question whether defensible models could be built without field work designed to directly address key questions. Collaboration with Mary Bremigan and Kim Scribner has lead to work relating fish genetics and demographics, which is a component of the overall relationship between fish populations and their habitat.

Findings: Jobs 2, 4, and 5 were scheduled for 2005-06, and progress is reported below.
Job 2. Title: Develop initial modeling framework.-A conceptual model for largemouth bass in lakes was developed (Figure 1), forming the basis for modeling efforts, but has not been refined further.

Job 4. Title: Develop a field research agenda.-Based on the field research agenda developed in 20032004, I have continued to work with Mary Bremigan and Kim Scribner to develop a project addressing some of the critical data gaps identified. A research proposal for this project was submitted for consideration by the fisheries division's management team but was not funded. I have continued to seek a source of support for this project.

Job 5. Title: Prepare annual report and communicate program results.-This report was prepared as scheduled.

Prepared by: Daniel Hayes
Dated: September 30, 2006

## Mature adults

-fecundity dependent on size/age distribution
-maturation schedule based on size of fish a prior year's growth rate
-sex ratio dependent on sex-specific mortality rates

## Spawning and Nesting

-spawning sites selected based on substrate and depth
-spawning timing based on water temperature
-egg development based on temperature
-larval growth dependent on temperature
-larval survival dependent on growth -adult survival rate dependent on intensity of catch/release fishing during spawning, as well as constant natural mortality rate during spawning -weight loss of adults during spawning dependent on duration of larval period

## Age-0 (after leaving nest to spring of following year)

-literature not clear on habitat preferences
-growth dependent on temperature (following bioenergetics equations)
-survival dependent on growth, amount of cover (including macrophytes and woody material)

## Juvenile and Adult Stage (age 1+)

-able to actively seek and maintain location in preferred habitat conditions -preference based on temperature, oxygen, vegetation, substrate, overhead cover, and fish density
-survival determined by natural mortality and fishing mortality. Fishing mortality
modified by vegetation density
-growth dependent on productivity index, temperature (following bioenergetics equations)

Figure 1.-Conceptual model of the relationship between largemouth bass population dynamics and lake habitat condition.

