

## STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-80-R-16

Study No.: 230756

Title: Development of management scenarios for lake and stream habitat and fisheries under current and future land-use and climate conditions

Period Covered: October 1, 2014 to September 30, 2015

**Study Objectives:** The overall objective of this project is to develop a decision support tool that incorporates land-use and climate change scenarios and societal values of lakes and streams to identify management priorities based on assessed sensitivity and risk. The specific objectives of this study are to:

1. Assess habitat conditions for all lakes and streams statewide under current land-use and climate conditions.
2. Determine how current habitat conditions influence sport fish populations and fish community structure in lakes and streams.
3. Determine the potential changes in habitat suitability, sport fish populations, and fish community structure in response to changes in land-use and climate conditions.
4. Identify and map the lakes and streams that are most at risk to change.
5. Develop statistical models to predict how anglers use lake and stream resources at a statewide scale.
6. Generate information for evaluating non-fisheries uses of lake and stream resources at a statewide scale using GIS techniques.
7. Prioritize lakes and streams for management based on their habitat and fisheries risks and social uses and values.

**Summary:** Fish modeling datasets were updated to include more recent survey data. Future habitat assessments were modified to account for biogeographic constraints and impediments to migration including lake isolation and barriers. Changes in thermal regime and fish species suitability were estimated with updated data for all lakes greater than or equal to 10 acres. Maps were updated with new modeling output showing distribution changes for individual species and the total number of species changes (additions and subtractions) in 6,500 lakes under different climate warming scenarios. Work continued on manuscripts describing lake temperature modeling, stream temperature modeling, and lake fish species modeling.

**Findings:** Jobs 7–10 were active this year, and progress for each is reported below.

**Job 7. Assess future habitat and fish changes.**—The fish distribution dataset was updated to include 2014 fish survey data. Fish distribution modeling output were modified to account for biogeographic constraints and impediments to migration including natural and anthropogenic fragmentation. Using the updated fish dataset and the modifications to account for migration potential, changes in thermal regime and fish species suitability were estimated for 6,500 lakes using 14 climate scenarios for mid-century and late-century.

**Job 8. Identify and map vulnerable waters.**—Maps were updated with new modeling output showing distribution changes for individual species and the total number of species changes (additions and subtractions) in 6,500 lakes under different climate warming scenarios.

**Job 9. Write annual performance reports.**—This performance report was prepared as scheduled.

**Job 10. Write manuscripts.**—Work continued on manuscripts describing lake temperature modeling, stream temperature modeling, and lake fish species modeling.