STUDY PERFORMANCE REPORT

State: Michigan   **Project No.:**   F-80-R-5

Study No.: 230701   **Title:** Decision-support tools for managing
                                                                                                            fisheries of inland lakes

Period Covered: October 1, 2003 to September 30, 2004

Study Objective: To prepare reviews of the characteristics of Michigan's inland lakes and of
    fisheries management of selected species in inland lakes, and to develop decision-support tools to
    help manage fisheries on inland lakes. One critical set of tools to be developed is methods for
    allocating fish among multiple fisheries that occur in the same lake, given a safe harvest level.
    Another objective of this study is to develop tools that help fisheries managers compare the status
    and potential of specific lakes and fisheries.

Summary: According to the study schedule, Jobs 4 and 5 were active this year. Several activities
    occurred under Job 4 in the development of decision-support tools.   Additional database
    information from Lake Summary cards and Limnology cards was entered into electronic form
    from the files at the Institute for Fisheries Research (IFR). An Access database was developed to
    help with the strategic planning process in Fisheries Division. Collaborations continued with
    university faculty and graduate students to analyze statewide patterns of fish growth rate. A
    bioenergetics-based model for fish growth is under development to explain and predict growth in
    fish length and condition as well as fish weight. Job 5 is to prepare this progress report.

Findings: Jobs 4 and 5 were scheduled for 2003-04, and progress is reported below.

Job 4.   Title: Develop additional decision-support tools.–Development continued on several
    database tables and geographic information system (GIS) files that will be used to build decision-
    support tools for natural resource managers. Additional records were entered for the Lake
    Summary cards in the files at IFR. These cards provide a concise summary of information useful
    for lake and fishery managers. Information on these cards is now in electronic form for 623
    lakes; this represents almost all the available Lake Summary cards for lakes greater than 300
    acres.

    Information is also being entered from Limnology cards in the IFR lake files. In this reporting
    period, 3,264 temperature and dissolved oxygen profiles have been entered into Excel, with an
    average of 9 temperature and dissolved oxygen records for each profile (a total of 29,601
    measurement records to date). Information on temperature and dissolved oxygen is important for
    making decisions about fish stocking and other management actions.

    An Access database was developed to help with the strategic planning process in Fisheries
    Division. Five strategic planning committees prepare lists of tasks that they recommend for
    "Areas of Emphasis" for the next fiscal year, and the Fisheries Division Management Team
    reviews and comments on each task. An Access database (including tables, queries, input forms
    and reports) was developed to record the tasks and priorities recommended by the committees as
    well as the responses and decisions made by the Management Team. It is intended that this
    system will facilitate the decision-making process as well as the ability to evaluate and report
    accomplishments.

Collaborations are continuing with faculty and graduate students at Michigan State University to analyze and explain patterns in fish growth rate across the state. A major goal is to develop predictive models that can help fisheries managers generate an expected growth rate for a particular lake against which to compare observed growth rate. Graduate students are preparing talks for scientific meetings to present initial results.

A bioenergetics-based model for fish growth is under development. The purpose of this model is to explain and predict growth in fish length and condition as well as fish weight, thus giving fish biologists a tool for interpreting differences in fish body condition between lakes or over time. Bioenergetics models have long been used to predict consumption rate or growth in fish weight. However, there has been little progress in understanding changes in length and body condition. Recent developments in the published literature (e.g., Whitledge and Hayward 1997; Whitledge et al. 1998; Bajer et al. 2003; Whitledge et al. 2003) as well as new lab data (collected under Study 669) have provided a new basis for evaluating and extending the approach described by Breck (1998). Initial comparisons of lab data and the model have been made using Mathcad software, and these comparisons are guiding further model development.

Job 5. Title: <u>Write progress report.</u>–This progress report has been prepared.

Literature Cited:

Bajer, P.G., G.W, Whitledge, R.S. Hayward, and R.D. Zweifel. 2003. Laboratory evaluation of two bioenergetics models applied to yellow perch (Perca fluviatilis): identification of a major source of systematic error. Journal of Fish Biology 62: 436-454.

Breck, J. E. 1998. Development of a warmwater fish community model. Michigan Department of Natural Resources, Fisheries Research Report 2033, Ann Arbor.

Whitledge G.W., and R.S. Hayward. 1997. Laboratory evaluation of a bioenergetics model for largemouth bass at two temperatures and feeding levels. Transactions of the American Fisheries Society 126: 1030-1035.

Whitledge, G.W., R.S. Hayward, D.B. Noltie, and N. Wang. 1998. Testing bioenergetics models under feeding regimes that elicit compensatory growth. Transactions of the American Fisheries Society 127: 740-746.

Whitledge, G.W., R.S. Hayward, R.D. Zweifel., and C.F. Rabeni. 2003. Development and laboratory evaluation of a bioenergetics model for sub-adult and adult smallmouth bass. Transactions of the American Fisheries Society 132: 316-325.

Prepared by: <u>James E. Breck</u>
Date: <u> September 30, 2004</u>