

STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-35-R-22

Study No.: 662

Title: Inventory and classification of Michigan rivers and river fish communities

Period Covered: April 1, 1996 to March 31, 1997

Study Objective: (1) Extend and modify as necessary models under development for Lower Peninsula rivers that describe site-specific fish habitat variables using watershed-scale variables to rivers of the Upper Peninsula; (2) Using variables defined in (1), classify Michigan river habitats into distinct types; (3) Determine composition of Upper Peninsula river fish communities from historic data and electrofishing surveys; (4) Extend and modify as necessary models predicting fish populations and community characteristics from site-specific and watershed-scale habitat variables that are being developed for Lower Peninsula rivers to include Upper Peninsula rivers; (5) Classify Michigan river fish communities into distinct types based on the habitat classification; (6) Evaluate the interactions between water temperature and fish community dynamics, including distribution and abundance for Michigan river fish communities.

Summary: Due to adverse conditions, stream fish communities were sampled in only four streams in 1996. Stream temperature data are being recorded in 13 streams and additional temperature data have been collected from other sources. A cursory examination of the limited data collected to date indicated maximum water temperature in Upper Peninsula streams typically occurred on or about June 21 (summer solstice), suggesting that latitude will be an important variable to consider when developing a predictive stream temperature model. Watershed scale data are being assembled in a format compatible with geographic information system analysis. Complete data layers include elevation, land use/land cover, surficial geology, bedrock geology, and stream network.

Job 1. Title: Compile MDNR fish data.

Findings: Marquette Fisheries Station and District 1 personnel have entered all historical fish survey data for major Upper Peninsula watersheds found in files at the Marquette Fisheries Station into a spreadsheet. Data from fish surveys of smaller watersheds are yet to be entered. In addition, we have obtained fish species occurrence data from the United States Fish and Wildlife Service Sea Lamprey Control Office in Marquette.

Job 2. Title: Compile watershed and site scale habitat data.

Findings: Data layers that will be used in a geographic information systems (GIS) analysis of watershed habitat for the Upper Peninsula are being assembled from a variety of sources. Complete GIS data layers assembled thus far include elevation, land use/land cover, surficial

geology, bedrock geology, precipitation, potential evapotranspiration, and stream network for all permanent streams.

Site scale habitat variables have been measured at four sites that were sampled for fish community composition (Job 3). Site scale variables include mean channel width, thalweg (deepest point in a cross section of the channel) depth and mean thalweg water velocity at equally spaced transects, substrate composition, riparian habitat, streambank stability, and percent of the sampled reach that is pool, riffle, and run habitat. Historical discharge data have also been compiled from United States Geological Survey (USGS) gauging stations for all currently operating and defunct stations.

Job 3. Title: Survey fish communities at selected additional sites.

Findings: Due to a heavy snowpack, late spring thaw, and above average summer precipitation, streamflow was consistently high during summer, 1996. Because of these factors, we conducted stream fish community surveys in only four streams during 1996. The sites were selected from the set of streams that have USGS discharge records. Streams sampled were Green Creek, Warner Creek, and Cherry Creek in Marquette County and Black River in Mackinaw County. Stream fish communities were sampled with DC electrofishing gear after blocking nets were placed at the upstream and downstream boundaries of the study sections. Three electrofishing passes were conducted and all fish captured during each pass were removed. Fish species abundance was estimated using the Zippin estimate (Zippin 1956, 1958) and total biomass by species was estimated from the abundance data and the average individual fish weight for each species (Table 1).

Green Creek and Warner Creek are both tributaries of the Middle Branch of the Escanaba River and had similar fish communities composed primarily of brook trout, brook stickleback and several minnow species (Table 1). The fish community of Cherry Creek was composed of two species, brook trout and slimy sculpin, and the fish community of Black River was composed of juvenile anadromous rainbow trout and coho salmon, brown trout, brook trout, slimy sculpin, and several minnow species.

Job 4. Title: Monitor stream temperatures.

Findings: Continuous temperature recorders are in place in 13 streams across the Upper Peninsula. However, data have not been retrieved from the recorders. I have obtained additional summer stream temperature data that were collected by Michigan Department of Natural Resources Fisheries Division personnel for the years 1994-95 from several streams. In addition, daily maximum and minimum stream temperature data have been obtained from USGS gauged streams.

A cursory examination of the stream temperature data indicated that streams in the Upper Peninsula reached maximum temperature near June 21 (summer solstice) in several years. This observation indicates that latitude may be an important variable in models that predict summer maximum temperature as well as temperature regime throughout the summer. Streams in the Lower Peninsula typically reach their maximum temperature during July or August, indicating air temperature is a more important predictor of stream temperature (P. Seelbach, MDNR, Ann Arbor, personal communication).

Job 5. Title: Analyze data.

Findings: Data analysis is ongoing and on schedule.

References:

Zippin, C. 1956. An evaluation of the removal method of estimating animal populations. *Biometrics* 12:163-189.

Zippin, C. 1958. The removal method of population estimation. *Journal of Wildlife Management* 22:82-90.

Table 1.—Estimated biomass (g/hectare) by fish species from 1996 stream surveys.

Species	Sample site			
	Green Creek	Warner Creek	Cherry Creek	Black River
Salmonidae				
Rainbow trout				11,416
Coho salmon				211
Brook trout	28,359	24,912	31,822	113
Brown trout				1,784
Cottidae				
Slimy sculpin	7,809		7,888	9,063
Gasterosteidae				
Brook stickleback	10,550	4,257		546
Catostomidae				
White sucker	9,123			83
Cyprinidae				
Common shiner	2,800	508		
Creek chub	27,123	621		
Northern redbelly dace				35
Pearl dace				455
Blacknose dace	13,989	640		
Longnose dace				15
Brassy minnow				194
Blacknose shiner	199			
Umbridae				
Central mudminnow	7,258			426
Percidae				
Johnny darter	1,500			
Blackside darter	1,746			
Petromyzontidae				
Lamprey ammocoete				1,517

Prepared by: Edward A. BakerDate: March 31, 1997