STUDY PERFORMANCE REPORT

State: Michigan **Project No.:** F-81-R-1

Study No.: 662 **Title:** Inventory and classification of Michigan rivers and river fish communities.

Period Covered: October 1, 1999 to September 30, 2000

Study Objectives: (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 habitat classification. (6) Evaluate interactions between water temperature and fish community dynamics, including distribution and abundance for Michigan river fish communities.

Summary: Data entry for historic stream fish survey data has been completed and a random sample of records is being checked for quality control. Geographic Information Systems (GIS) data have also been assembled and GIS analysis is ongoing. Stream fish communities were sampled at eight sites from six streams in 2000. Stream temperature data were recorded from two sites in one stream and additional temperature data have been collected by management units. Watershed scale data are being assembled in a format compatible with GIS analysis.

Job 1. Title: Compile MDNR fish data.

Findings: We have entered all historical fish survey data for major and minor Upper Peninsula watersheds found in files at the Marquette Fisheries Station into a spreadsheet. In addition, we have obtained fish species occurrence data from the United States Fish and Wildlife Service Sea Lamprey Control Office in Marquette and from Michigan Department of Environmental Quality reports.

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 have been assembled and analysis is ongoing. 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. The elevation data layer has been transformed to yield a slope layer that has been combined with the surficial geology layer to yield a groundwater index map. GIS analysis is ongoing.

Mesohabitat variables were measured at eight stream sites that were sampled for fish community composition (Job 3). Mesohabitat variables were collected at equally spaced transects in the

sampled reach and included mean channel width, thalweg depth (deepest point in a cross section of the channel) and water velocity, 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) gaging stations for all currently operating and defunct stations.

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

Findings: We conducted stream fish community surveys at eight sites in six streams during 2000 (Table 1). Sites were selected because they have USGS discharge records or because of the geological characteristics of the watershed. For those streams with USGS discharge records we sampled at or near the USGS gage site. Stream fish communities were sampled with DC electrofishing gear and the length of stream sampled was at least 110 m, except the site sampled in Little Munuscong River was 52 m. Sites were sampled by three consecutive electrofishing passes and all fish captured during each pass were removed. Fish species abundance was then estimated using the Zippin removal method (Zippin 1956, 1958), total biomass by species was estimated from the abundance data, and the average individual fish weight for each species calculated from the gross weight of all individuals of the same species.

Job 4. Title: Monitor stream temperatures.

Findings: Continuous temperature recorders were placed in three streams across the Upper Peninsula. Stream temperature data analysis is ongoing. Stream temperature data I have collected and data from management unit files through 1999 (total N=70) have been analyzed using the same techniques used for Lower Peninsula streams (Wehrly et al. 1998). Results indicated that most of the streams sampled to date are cold or cool water streams that have stable or moderate temperature variations. No clear relationship has been found between stream temperature regimes and watershed characteristics.

Job 5. Title: Analyze data.

Findings: Data analysis is ongoing. This progress report was prepared on schedule.

References:

Wehrly, K. E., M. J. Wiley, and P. W. Seelbach. 1998. A thermal habitat classification for lower Michigan Rivers. Fisheries Research Report No. 2038, Michigan Department of Natural Resources, Ann Arbor.

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.

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Table 1.–Streams, dates, and locations (township, range, section) sampled for mesohabitat and fish communities in 2000.

Stream	Date Sampled	Township, Range, Section	Number of Species
Rock River	7/7/00	47N, 21W, 22	7
Days River	7/14/00	40N, 22W, 03	15
Two Hearted River	7/24/00	49N, 10W, 11	5
Charlotte River	7/25/00	46N, 01E, 27	16
Little Munuscong River	7/26/00	45N, 01E, 30	6
Dead River-site 1	8/7/00	48N, 25W, 18	3
Dead River-site 2	8/8/00	48N, 26W, 13	10
Dead River-site 3	8/9/00	48N, 26W, 13	5

Table 2.–Temperature classifications for 70 Upper Peninsula streams based on system developed for Lower Peninsula streams (Wehrly et al. 1998). Weekly mean temperature and weekly temperature flux (difference between weekly maximum and minimum temperature) were calculated from continuous data for the period 24 June to 21 July, 1996-1999.

Weekly Mean	Weekly Temperature Flux °C			
Temperature °C (6/24-7/21)	Stable (<6°)	Moderate (6-9°)	Variable (>9°)	Total
Cold (<19°)	7	26	3	36
Cool (19-22°)	2	21	4	27
Warm (>22°)	0	5	2	7
Total	9	52	9	70