

## STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-35-R-24

Study No.: 662

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

Period Covered: April 1, 1998 to September 30, 1999

**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:** 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 in 26 streams in 1998 and 21 streams in 1999. Stream temperature data were recorded in all 47 streams sampled and additional temperature data have been collected by management units. Watershed scale data are being assembled in a format compatible with geographic information system 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

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that has been combined with the surficial geology layer to yield a groundwater index map. GIS analysis is ongoing.

Mesohabitat variables were measured at the 47 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 in 26 streams during 1998 and 21 streams in 1999 (Table 1). Thirty four of the stream sites were randomly selected by the Environmental Protection Agency (EPA) to be sampled for our cooperative study “Development of watershed indicators in the Northern Lakes and Forests Ecoregion.” Other sites were selected because they have USGS discharge records or based on 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 generally 35 times the mean stream width. Stream sites selected by EPA were sampled by single pass electrofishing and relative abundance and biomass of each species captured was calculated from the total catch. The remaining 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 estimate (Zippin 1956, 1958) and 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 all 47 streams across the Upper Peninsula. In addition, temperature data have also been collected from temperature loggers that were placed in streams that were not sampled for fish community composition (N=3). Stream temperature data analysis is ongoing. Stream temperature data I have collected and data from management unit files (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 1998 and 1999.

Stream	Date Sampled	Township, Range, Section	Number of Species
Big Pup Creek <sup>A</sup>	6/26/98	50N, 28W, 25	1
Little Manistee River <sup>A</sup>	6/29/98	20N, 14W, 16	6
East Creek <sup>A</sup>	6/30/98	24N, 01W, 11	11
Upper South Branch Thunder Bay River <sup>A</sup>	7/01/98	29N, 04E, 34	13
East Branch Black River <sup>A</sup>	7/02/98	32N, 01E, 27	9
Rapid River <sup>A</sup>	7/06/98	43N, 23W, 09	10
Ford River <sup>A</sup>	7/08/98	41N, 30W, 18	12
McKellum Creek <sup>A</sup>	7/10/98	43N, 27W, 35	13
First Creek <sup>A</sup>	7/14/98	41N, 30W, 18	5
Black River <sup>B</sup>	7/16/98	46N, 29W, 02	11
Ravine River <sup>B</sup>	7/22/98	51N, 31W, 14	4
Sucker River <sup>A</sup>	7/23/98	49N, 13W, 12	14
East Branch Waiska River <sup>A</sup>	7/24/98	46N, 01W, 06	18
Chocolay River <sup>B</sup>	7/28/98	47N, 24W, 25	11
Unnamed creek <sup>A</sup>	7/30/98	38N, 02W, 36	6
Gimlet Creek <sup>A</sup>	7/31/98	25N, 08E, 05	19
East Branch Sand River <sup>B</sup>	8/03/98	46N, 22W, 07	6
Sleepy Creek <sup>A</sup>	8/05/98	52N, 37W, 25	5
Tiebel Creek <sup>A</sup>	8/06/98	50N, 45W, 33	5
Deer Creek <sup>A</sup>	8/06/98	50N, 40W, 21	15
Obenhoff Creek <sup>B</sup>	8/11/98	54N, 35W, 02	3
Jumbo River <sup>B</sup>	8/13/98	47N, 37W, 22	13
Montreal River <sup>B</sup>	8/18/98	58N, 29W, 20	7
Elm River <sup>B</sup>	8/19/98	53N, 36W, 03	5
Shakey River <sup>B</sup>	8/20/98	36N, 28W, 33	16
Crow River <sup>B</sup>	8/21/98	42N, 11W, 03	11
Clam River <sup>A</sup>	6/15/99	22N, 09W, 22	12
Silver Creek <sup>A</sup>	6/15/99	20N, 11W, 17	4
West Branch Clam River <sup>A</sup>	6/16/99	20N, 06W, 07	27
Gold Mine Creek <sup>A</sup>	6/18/99	48N, 27W, 29	8
Anchor Creek <sup>A</sup>	6/20/99	31N, 04E, 24	15
Sturgeon River <sup>A</sup>	6/22/99	33N, 02W, 30	11
Huber Creek <sup>A</sup>	6/24/99	45N, 23W, 25	11
Iron River	6/28/99	43N, 35W, 26	18
Unnamed creek <sup>A</sup>	7/08/99	40N, 19W, 20	6
Obenhoff Creek <sup>A</sup>	7/12/99	54N, 35W, 02	3
Driggs River <sup>A</sup>	7/14/99	44N, 14W, 11	14
Unnamed creek <sup>A</sup>	7/15/99	49N, 43W, 01	9
West Branch Sage River <sup>A</sup>	7/16/99	45N, 09W, 14	15
Bryan Creek <sup>B</sup>	7/20/99	44N, 26W, 18	14
Indian River <sup>B</sup>	7/24/99	44N, 18W, 29	18
Tobacco River <sup>A</sup>	7/26/99	57N, 31W, 36	10
Biscuit Creek <sup>A</sup>	7/27/99	44N, 04W, 13	10
Little Two Hearted River <sup>A</sup>	7/28/99	49N, 09W, 11	9
South Branch Paint River <sup>A</sup>	8/06/99	44N, 37W, 11	10
West Branch Ontonagon River <sup>A</sup>	8/10/99	49N, 41W, 16	13
Middle Branch Ontonagon River <sup>A</sup>	8/11/99	45N, 38W, 18	16
East Branch Sturgeon River <sup>B</sup>	8/15/99	41N, 27W, 09	18

<sup>A</sup>Streams were sampled by single pass electrofishing.

<sup>B</sup>Streams were sampled by three pass electrofishing.

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