

STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-35-R-23

Study No.: 662

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

Period Covered: April 1, 1997 to March 31, 1998

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: Stream fish communities were sampled in 11 streams in 1997. Stream temperature data are being recorded in 20 streams and additional temperature data have been collected from other sources. Upper Peninsula stream temperature regimes were generally more stable than for streams in the lower peninsula. Watershed scale data are being assembled in a format compatible with geographic information system analysis.

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 being entered. 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 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. 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 and incomplete.

Mesohabitat variables were measured at the 11 sites that were sampled for fish community composition (Job 3). Mesohabitat variables included 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) 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 11 streams during 1997 (Table 1). Many of the streams were selected because they have USGS discharge records. Other streams were selected based on the geological characteristics of the watershed. For those streams with USGS discharge records we sampled at or near the USGS gage site. Sampling sites at other streams were selected by ease of access and habitat composition (pool, riffle, run habitat). Stream fish communities were sampled with DC electrofishing gear after blocking nets were placed at the upstream and downstream boundaries of the study sites. 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.

Job 4. Title: Monitor stream temperatures.

Findings: Continuous temperature recorders are in place in 20 streams across the Upper Peninsula. Temperature data have also been collected from temperature loggers that were placed in streams in 1996. Stream temperature data I have collected and data from District Fisheries files (total N=40) have been analyzed using the same techniques used for Lower Peninsula streams. Results indicated that most of the Upper Peninsula 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 and incomplete.

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 1997 stream surveys.

Stream/Date Sampled	Species Collected	Biomass (g/hectare)
Pine River (Chippewa Co.)/14 August	blacknose dace	41
	brook stickleback	605
	central mudminnow	326
	chinook salmon	119
	longnose dace	11,020
	logperch	613
	rainbow trout	6,253
	slimy sculpin	7,345
Middle Branch Escanaba River (Marquette Co.)/27 July	black bullhead	2,445
	central mudminnow	1,068
	largemouth bass	1,631
	northern pike	475
	slimy sculpin	710
West Branch Sturgeon River (Dickinson Co.)/30 July	white sucker	61
	blacknose dace	8,453
	blackside darter	4
	brook stickleback	13
	brook trout	14,773
	central mudminnow	137
	creek chub	2,920
	hornyhead chub	824
	Johnny darter	320
	longnose dace	8,346
	mimic shiners	297
	pearl dace	573
	slimy sculpin	2,272
white sucker	66,341	
Rapid River (Delta Co.)/6 July	blacknose dace	2,265,869
	brook stickleback	37,764
	common shiner	40,912
	fantail darter	632,555
	Johnny darter	62,941
	longnose dace	1,450,786
	northern redbelly dace	173,087
	pearl dace	346,174
	white sucker	88,117
Sturgeon River (Delta Co.)/3 September	blackside darter	493
	bluntnose minnow	8
	brown trout	8
	burbot	5,883
	central mudminnow	88
	creek chub	354
	fantail darter	658
	Johnny darter	649
	largemouth bass	13
	longnose dace	10,727
	mimic shiner	42
	northern hogsucker	627
	rainbow trout	1,478
	rock bass	344
	sculpin	654
white sucker	1,237	
yellow perch	3	

Table 1.- (continued).

Tenmile Creek (Menominee Co.)/11 September	blacknose dace	8,080
	blackside darter	1,236
	brook stickleback	78
	brook trout	52
	burbot	23,007
	central mudminnow	78
	common shiner	21,546
	creek chub	846
	fantail darter	3,505
	hogsucker	4,407
	hornyhead chub	13,162
	johnny darter	1,829
	logperch	576
	longnose dace	11,976
	mimic shiner	335
	northern redbelly dace	91
	rainbow trout	1,362
	rock bass	365
	smallmouth bass	893
	white sucker	913
Trap Rock River (Houghton Co.)/10 July	blacknose dace	2,122
	brook trout	16,344
	central mudminnow	505
	coho salmon	561
	common shiner	84
	creek chub	395
	pumpkinseed	820
	rainbow trout	2,072
	slimy sculpin	8,337
	white sucker	58
Laughing Whitefish River (Alger Co.)/1 August	black bullhead	722
	blacknose dace	2,873
	brook stickleback	493
	burbot	930
	central mudminnow	2,793
	coho salmon	59
	common shiner	5,352
	creek chub	3,454
	hornyhead chub	1,347
	Johnny darter	6,753
	rainbow trout	426,984
	slimy sculpin	20,587
	smallmouth bass	1,129
	white sucker	5,257
yellow perch	738	
Carp River (Marquette Co.)/5 August	bluntnose minnow	845
	brook trout	104,010
	central mudminnow	15,159
	creek chub	28,391
	longnose dace	416
	northern pike	31,862
	northern redbelly dace	10
	pumpkinseed	1,790
	white sucker	20,309
yellow perch	719	

Table 1.- (continued)

Sturgeon River* (Baraga Co.)/8 August	blacknose dace	163
	common shiner	51
	creek chub	930
	hornyhead chub	881
	longnose dace	1,361
	northern redbelly dace	2
	rock bass	133
	slimy sculpin	44
	white sucker	210
Big Pup Creek (Marquette Co.)/12 August	brook trout	84,611

*Data represent measured biomass from a single electrofishing pass.

Table 2. - Temperature classifications for 40 Upper Peninsula streams based on system developed for Lower Peninsula streams. 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.

Weekly Mean Temperature C° (6/24-7/21)	Weekly Temperature Flux C°			Total
	Stable (<6°)	Moderate (6-9°)	Variable (>9°)	
Cold (<19°)	4	16	0	20
Cool (19-22°)	2	13	1	16
Warm (>22°)	0	3	1	4
Total	6	32	2	40

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