Cold-transitional Small River

A Brief Ecological Description of this Michigan River Type

Cold-transitional Small River segments are defined (by the Michigan Department of Natural Resources, Fisheries Division) as typically having drainage areas between 80 mi^2 and 300 mi^2 and fairly cold July mean water temperatures between 63.5ºF and 67.1ºF. These systems occur in two situations: 1) where **Cold Stream** headwaters grow to a river size where upriver warming of the river's water mass cannot be offset by moderate groundwater deliveries to the channel; thus they warm slightly; or 2) where very strong groundwater deliveries to the channel occur part way down a river that began as **Cold-transitional Stream** or **Cool Stream** headwaters. Such fairly cold river temperatures are found in regions where hills made of coarse-textured materials develop large aquifers that deliver very strong groundwater inputs down slope to the stream channel (much of the western and northern Lower Peninsula); or in regions where summer air temperatures remain quite cool (across the Upper Peninsula). Michigan's **Cold-transitional Small Rivers** represent an extremely rare coldwater resource within the Midwestern U.S.

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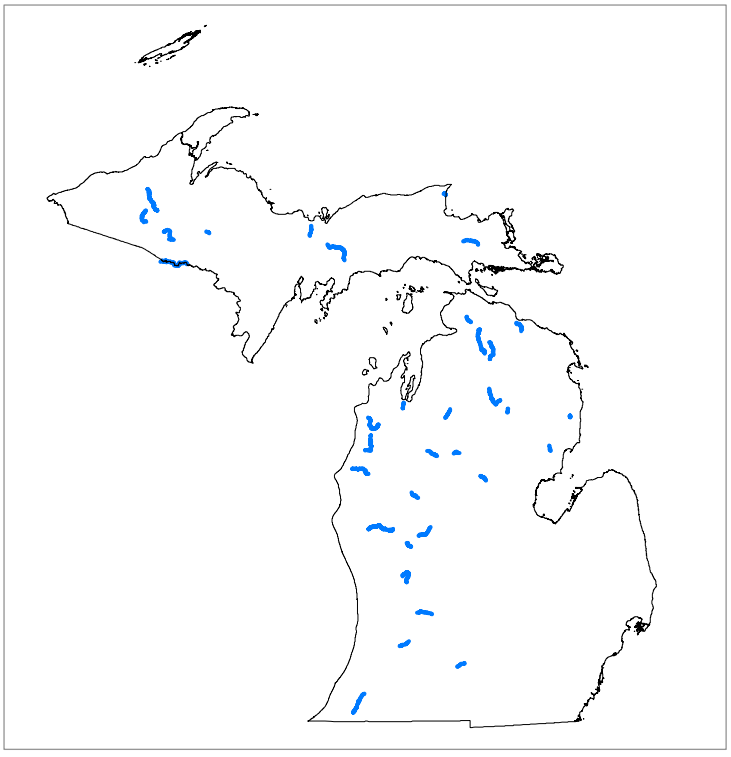
*Figure 1. Geographic distribution of **Cold-transitional Small River** segments in Michigan.*



Fish Species of **Cold-transitional Small Rivers**

July temperatures in **Cold-transitional Small Rivers** fall at the warmer edge of the acceptable range for trouts and juvenile salmons, and the slightly warmer (than in **Cold Small Rivers**) temperatures often promote rapid growth in trout and salmon. These temperatures also support a wider variety of fishes. The typical summer fish assemblage of a Michigan **Cold-transitional Small River** includes 12-18 fish species: some cold-adapted (juvenile salmons, trouts, and sculpins), some adapted to transitional temperatures (daces, suckers, burbots, and sculpins), and even some warm-adapted (shiners, pikes, and darters; these are supported because night temperatures don't get too cold). **Cold-transitional Small River** segments generally support good trout populations with excellent growth rates. Fish populations in these transitional rivers are sensitive to small changes in July water temperature.

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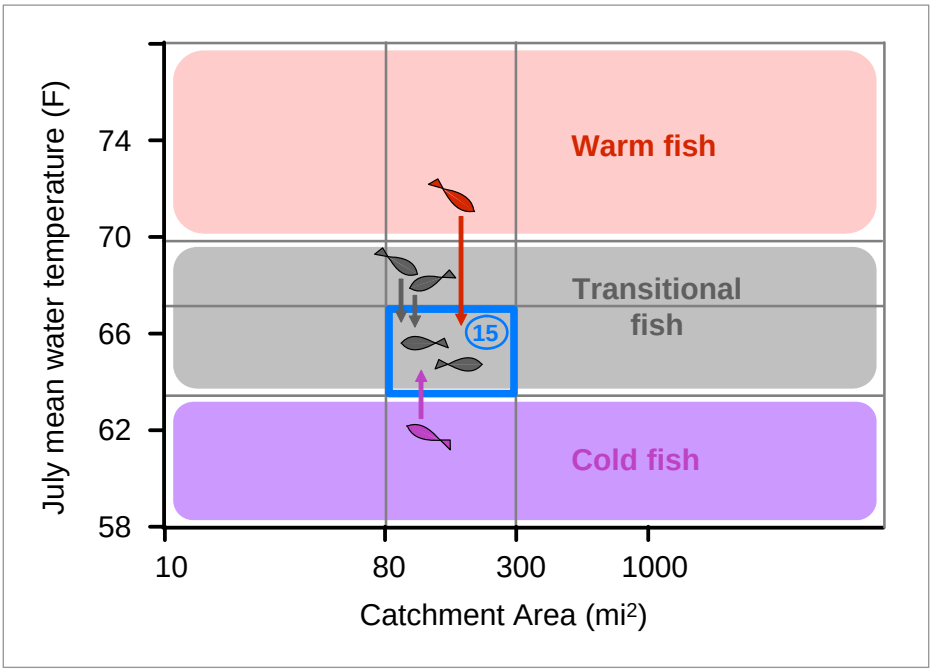
*Figure 2. Michigan's **Cold-transitional Small Rivers** type highlighted (**blue box**) on the environmental gradients of river segment drainage areas and July mean water temperatures.* A typical number of characteristic fish species for this river type is shown circled in blue. And the proportional makeup of the expected fish assemblage for this river type is shown by the number of colored fish icons representing each of three thermal preference zones.



Photos of some fish species characteristic of Michigan's **Cold-transitional Small Rivers**. Warm fishes are **red font**; thermally transitional fishes are **gray font**; cold fishes are **purple font.**

common shiner (www.gwsphotos.com)

burbot (www.fishbase.org)

white sucker (www.gwsphotos.com)

w. blacknose dace (www.wiscfish.org)

mottled sculpin (www.nativefish.org)

rainbow trout juvenile (www.calfish.org)

brown trout (K. Schmidt MN DNR)

Fish species characteristic of Michigan's **Cold-transitional Small Rivers**. This is a generalized, potential species list for an "average" river site; samples from any specific site are expected to be a variable subset of this list. Fish species are listed in descending order of their preferred mean July temperature, based on Michigan river surveys (Zorn et al. In press). Warm fishes are red font; thermally transitional fishes are gray font; cold fishes are purple font**.**

Common shiner
Rainbow darter
Blackside darter
Burbot
White sucker
Central mudminnow
Longnose dace
Creek chub
Western blacknose dace
Northern redbelly dace
Mottled sculpin
Chinook salmon
Rainbow trout
Brown trout
Coho salmon

Literature on Michigan River and Stream Fish Assemblages
and their Relationship to Summer Water Temperatures

Bailey, R. M., and G. R. Smith. 2002. Names of Michigan fishes. Michigan Department of Natural Resources, Fisheries Division, Ann Arbor.

Brenden, T. O., L. Wang, and P. W. Seelbach. 2008. A landscape-based river valley segment classification of Michigan rivers and streams for fisheries and environmental management. Transactions of American Fisheries Society 137:1621-1636.

Lyons, J., T. G. Zorn, J. Stewart, P. W. Seelbach, K. E. Wehrly, and L. Wang. In Press. Defining, characterizing, and quantifying coolwater streams and their fish assemblages in Michigan and Wisconsin, USA. North American Journal of Fisheries Management.

Wehrly, K. E., M. J. Wiley, and P. W. Seelbach. 2003. Classifying regional variation in thermal regime based on stream fish community patterns. Transactions of the American Fisheries Society 132:18–38.

Zorn, T. G., P. W. Seelbach, and M. J. Wiley. 2002. Distributions of stream fishes and their relationship to stream size and hydrology in Michigan's Lower Peninsula. Transactions of the American Fisheries Society 131:70–85.

Zorn, T. G., P. W. Seelbach, and M. J. Wiley. In press. Relationships between habitat and fish density in Michigan streams. Michigan Department of Natural Resources, Fisheries Research Report, Ann Arbor.

Zorn, T. G., P. W. Seelbach, E. S. Rutherford, T. C. Wills, S. Cheng, and M. J. Wiley. 2008. A regional-scale habitat suitability model to assess the effects of flow reduction on fish assemblages in Michigan streams. Michigan Department of Natural Resources, Fisheries Research Report 2089, Ann Arbor.