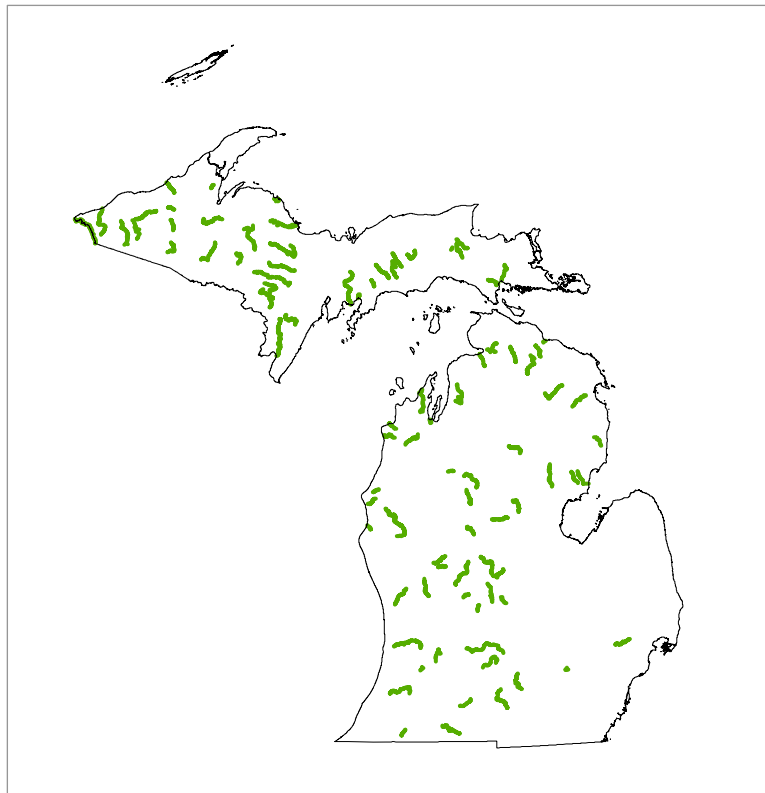


Cool (or Warm-transitional) Small River

A Brief Ecological Description of this Michigan River Type

Cool Small River segments are defined (by the Michigan Department of Natural Resources, Fisheries Division) as typically having drainage areas between 80 mi² and 300 mi² and cool July mean water temperatures between 67.1°F and 69.8°F. These systems occur in two situations: 1) where **Cold Stream** or **Cold-transitional Stream** headwaters grow to a river size where upriver warming of the river's water mass cannot be offset by modest groundwater deliveries to the channel; thus they warm slightly; or 2) where modest groundwater deliveries to the channel occur part way down a river that began as **Warm Stream** headwaters. **Cool Small Rivers** occur in landscapes of fine and medium textured geologies and gentle topographic relief, where groundwater deliveries to stream channels are moderate. **Cool Small Rivers** are generally found in the transitional regions between colder and warmer stream regions and are widespread across the Upper Peninsula where summer air temperatures remain cool.

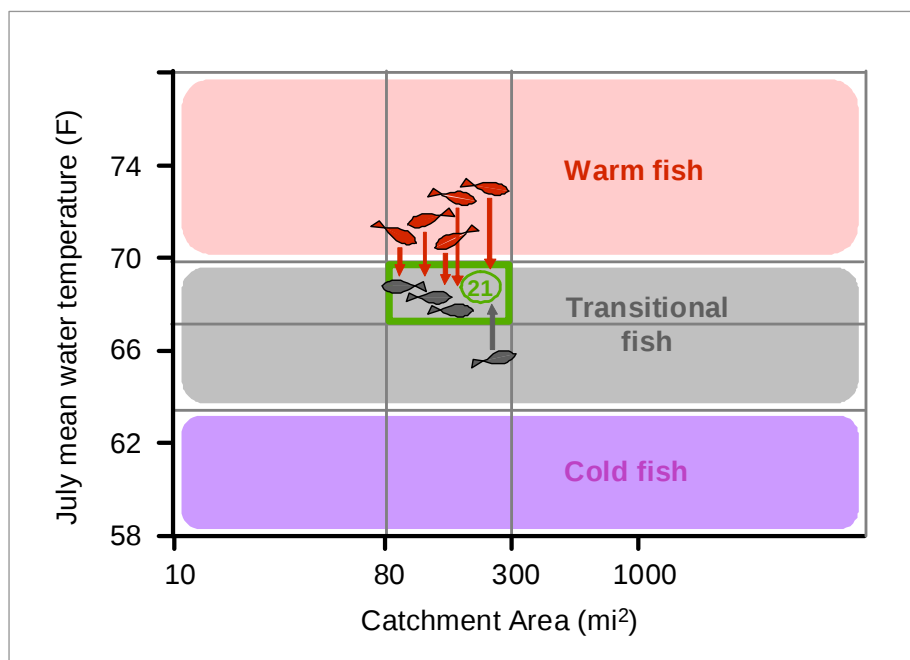
*Figure 1. Geographic distribution of **Cool Small River** segments in Michigan.*



Fish Species of **Cool Small Rivers**

The typical summer fish assemblage of a Michigan **Cool Small River** includes 20-25 fish species: most adapted to transitional temperatures (chubs, daces, suckers, bullheads, and burbots). July diurnal temperature fluctuations are modest, allowing several warm-adapted fishes to be supported (chubs, shiners, minnows, pikes, sunfishes, and darters).

*Figure 2. Michigan's **Cool Small Rivers** type highlighted (green box) on the environmental gradients of river segment catchment area and July mean water temperature. The typical number of characteristic fish species for this river type is shown circled in green. And the proportional makeup of the expected fish assemblage 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 **Cool Small Rivers**. Warm fishes are **red font**; thermally transitional fishes are **gray font**.

John Lyons



rock bass (www.wiscfish.org)



northern pike (K. Schmidt MN DNR)



common shiner (www.gwphotos.com)



rainbow darter (OH DNR)



blackside darter (K. Schmidt MN DNR)

white sucker (www.gwsphotos.com)



longnose dace (www.fishbase.org)



creek chub (www.gwsphotos.com)

w. blacknose dace (K. Schmidt MN DNR)



Fish species characteristic of Michigan's **Cool 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.

Northern hog sucker

Brown bullhead

River chub

Rock bass

Greenside darter

Logperch

Northern pike

Bluntnose minnow

Common shiner

Hornyhead chub

Rainbow darter

Blackside darter

Green sunfish

Grass pickerel

Burbot

White sucker

Black bullhead

Johnny darter

Longnose dace

Creek chub

Western blacknose dace

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.