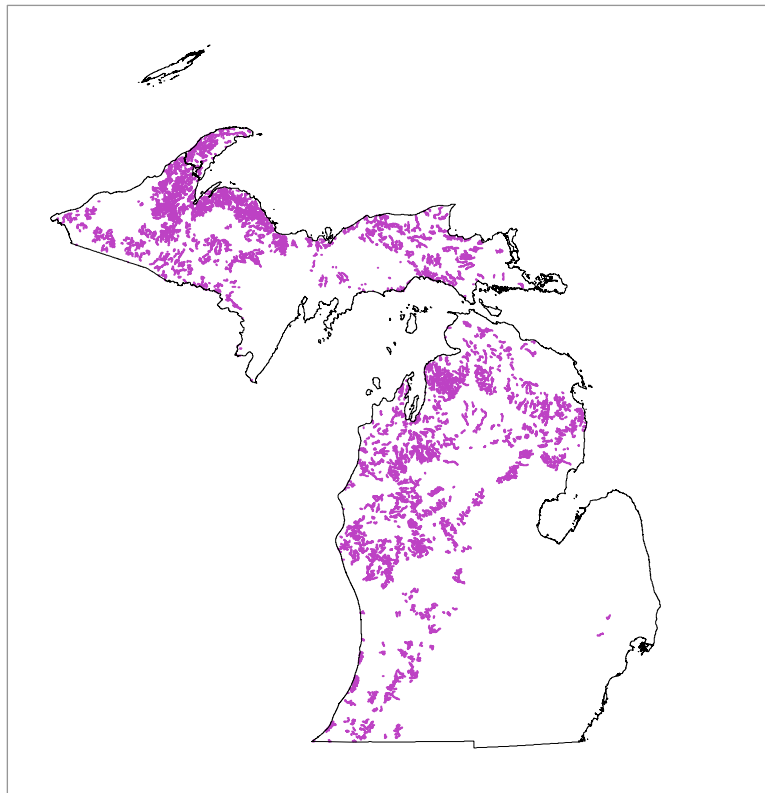


Cold Stream

A Brief Ecological Description of this Michigan River Type

Cold Stream segments are defined (by the Michigan Department of Natural Resources, Fisheries Division) as typically having drainage areas $< 80 \text{ mi}^2$ and cold July mean water temperatures $< 63.5^\circ\text{F}$. Such cold temperatures are maintained 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 northwest and northeast Lower Peninsula); or in regions where groundwater inputs are more modest but summer air temperatures remain quite cool (such as along the Lake Superior shoreline). **Cold Stream** segments also occur where streams drain steep valley walls of larger, incised river valleys and receive strong groundwater inputs from upslope aquifers (many small **Cold Streams** drain into the lower Grand River, even though this is a **Warm Large River**). Michigan has the most abundant **Cold Streams** resource in the Midwestern U.S.

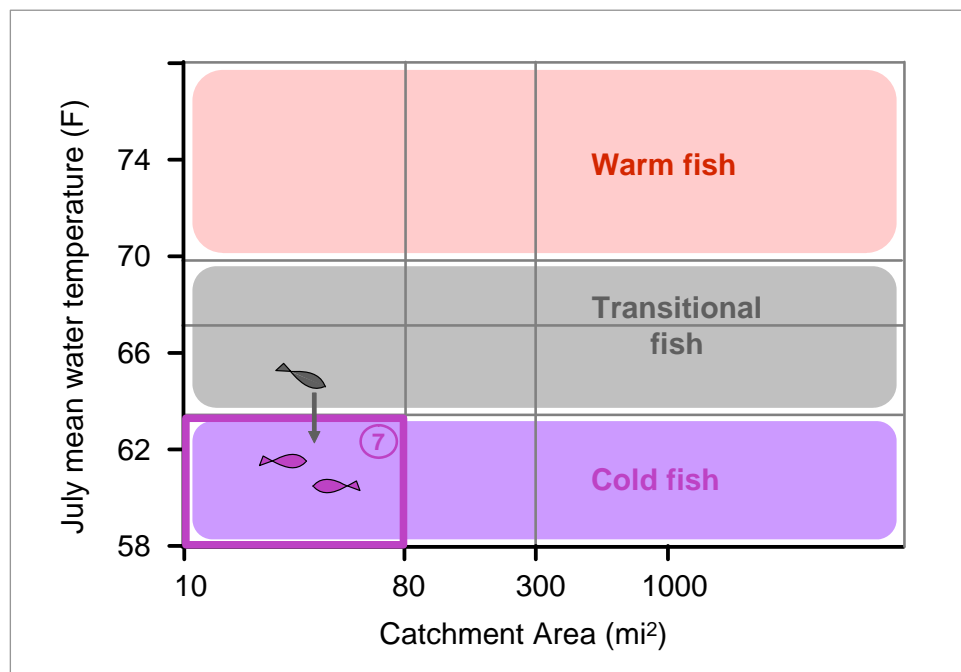
*Figure 1. Geographic distribution of **Cold Stream** segments in Michigan.*



Fish Species of **Cold Streams**

July water temperatures in a **Cold Stream** are diurnally (day-night) stable (constantly cold, even on a hot summer day due to continuous groundwater inputs). Flow discharge and velocities are strong, even during the lowest-flow months. The typical summer fish assemblage of a Michigan **Cold Stream** includes only 5-8 species adapted to cold or thermally transitional conditions: daces, juvenile salmons, trouts, and sculpins. No warmwater fishes are found. **Cold Streams** anchor the cold end of the summer water temperature range for Michigan river systems and support excellent populations of coldwater fishes; small changes in July water temperature will not result in a significant change to fish populations.

Figure 2. Michigan's **Cold Stream** type highlighted (**purple 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 purple**. 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 Streams**. Thermally transitional fishes are **gray font**; cold fishes are **purple font**.



Fish species characteristic of Michigan's **Cold Streams**. 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). Thermally transitional fishes are gray font; cold fishes are purple font.

Mottled sculpin
Chinook salmon
Rainbow trout
Brown trout
Coho salmon
Brook trout
Slimy sculpin

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

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