

**MILL CREEK FISHERY DEVELOPMENT: EDUCATION, RESEARCH, AND
RECREATION: A PROPOSAL TO DEVELOP A
TROUT FISHERY IN MILL CREEK
PART II. THE 2010 STUDY**

A PROJECT OF THE ANN ARBOR CHAPTER OF MICHIGAN TROUT UNLIMITED

**A REPORT PREPARED BY THE MILL CREEK FISHERY DEVELOPMENT
COMMITTEE:**

**THOMAS EDSALL*, CARLOS FETTEROLF ,
WILLIAM PHILLIPS, AND GARY SLAUTER**

In 2010 we deployed temperature recorders in the Lower Main Branch of Mill Creek at Dexter; in the East Branch at Jerusalem Road; in the Middle Reach of the Main Branch at Dancer Road, Scio Church Road, and M-52 North; and in the Headwaters Reach of the Main Branch at M-52 South, Sylvan Road, and Sharon Hollow Road (Fig. 1). The recorders were set on June 17 and retrieved on August 6-7. Methods and equipment were identical to those used in 2009 (Edsall et al. 2010).

Daily water temperatures were lowest in early July, rose to a relatively stable, higher level during mid-July, and then declined in late July (Fig. 2). Mean July water temperatures were lowest at M-52 South (59.6°F); progressively higher at Jerusalem Road (63.5°F) and Sharon Hollow Road (66.2°F); closely similar and slightly higher at M-52 North (68.1°F), Scio Church Road (68.5°F), and Dancer Road (68.3°F); and highest at Sylvan Road and Dexter (71.7 °F).

The high water temperatures in the Headwaters Reach at Sylvan Road reflect the presence of an impoundment between Sharon Hollow Road and Sylvan Road (Fig.1). The sharp increase in water temperature on July 24 at M-52 and Jerusalem Road reflect a major rainfall event, which occurred on July 24 (1.77 inches in Ann Arbor; NCDC-NOAA 2010) and caused a sharp increase in creek discharge that overwhelmed cold groundwater inflow (base flow) for several days in these two smaller tributaries (Fig.3).

We used a habitat classification system based on stream temperature and associated stream fish assemblages (Lyons et al. 2009) to interpret the water temperatures in Fig. 2. This system was developed specifically for Wisconsin and Michigan, and uses mean July water temperatures that are easily generated and displayed in a simple graphic model. The model describes three major temperature habitat classes: coldwater, coolwater (or transitional), and warmwater. The coolwater class is further divided into cold-transitional and warm-transitional elements. The model shows coldwater fishes (blue curve) are most abundant (100%) in coldwater habitat, less abundant in coolwater habitat, and absent

*Corresponding author.

(0%) in warmwater habitat. Conversely, warmwater fishes (red curve) are most abundant in warmwater habitat, less abundant in coolwater habitat, and absent in coldwater habitat.

Plotting the mean July water temperatures on the Lyons et al. (2009) model graphic (Fig. 4) indicated trout abundance (blue curve) in July 2010 at M-52 South could have reached 100% of maximum capacity recorded for Michigan streams, 92% at Jerusalem Road, 77% at Sharon Hollow Road, 37% at M-52 North, 27% at Scio Church Road, 31% at Dancer Road, and 0% at Sylvan Road and Dexter.

Although Sylvan and Dexter fell into the warmwater habitat class in 2010, it should be recognized that the July 2010 air temperatures were unusually high and within 2.3°F of the 130-year record high of 77.5°F reached in 1995. Thus in more normal years, both Dexter (as shown in Edsall et al. 2010) and Sylvan, like Dexter, could be expected to support significant, fishable populations of trout, as would the other sites studied in 2010. Furthermore, trout that had been occupying the Sylvan reach in 2010 would have been able to move downstream to the cooler waters near M-52 North and those in the Lower Main Branch near Dexter would have been able to move upstream to the cooler waters in the East Branch near Jerusalem Road and also to the cooler Middle Reach of the Main Branch near Dancer Road.

To better show the longer term potential of the Middle Reach of the creek's Main Branch to support trout we developed a least-squares regression of the relation between mean daily July 2010 Ann Arbor air temperatures (NCDC-NOAA 2010) and the pooled mean daily July 2010 water temperatures for M-52 North, Scio Church, and Dancer roads. We pooled the water temperature data because they were closely similar (Fig. 2), which allowed the three sites to be represented by a single equation (Fig. 5). The regression describing the air-water temperature relation in Fig. 5 is,

$$y = 1.7132x + -41.669$$

where y = air temperature, 1.7132 = the slope of the regression line, x = water temperature, and -41.669 = the slope intercept.

Substituting the mean monthly air temperature for y in the equation and solving the equation for x allowed us to calculate the mean July water temperature for the Middle Reach of the creek's Main Branch for any year prior to 2010. For example, if $y = 67.8^\circ\text{F}$, as for 2009 in Table 1, then $1.7132 x = 67.8 + 41.669$, and $x = 63.9^\circ\text{F}$.

Plotting the mean July water temperatures for 2001-2010 from Table 1 on the Lyons et al. (2009) model graphic (Fig. 6) showed the Middle Reach of the creek would have been classified as cold-transitional in 2001-2004, and 2007-2009; and warm-transitional in 2005, 2006, and 2010. These plots also showed that trout abundance could have ranged from about 67% to 97% of maximum in 2001-2004 and 2007-2009 and about 33% to 43% in 2005, 2006, and 2010.

If the maximum abundance of trout in Michigan streams is about 100 fish per 100 m of stream length, as suggested by the data in Wehrly et al. (2007), then the abundance scale in Fig. 5 can also be read as numbers of trout per 100 m of stream. Thus, the mean potential abundance of stocked trout in the Middle Reach of Mill Creek in 2001-2010 would have been about 68 per 100 m of stream.

Conclusion

The results of this study indicate that the Middle and Headwaters reaches of Mill Creek provide cold and coolwater habitat that is capable of supporting stocked trout at levels of abundance that would create an attractive fishery.

References

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NCDC-NOAA. 2009. NCDC.NOAA.gov website for The University of Michigan weather station, Ann Arbor, July 2010.

Wehrly, K.E., L. Wang, and M. Mitro. 2007. Field-based estimates of thermal tolerance limits for trout: incorporating exposure time and temperature fluctuation. *Transactions of the American Fisheries Society* 136:365-374.

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FIGURE 1. MILL CREEK STUDY SITES, JULY 2010.

- 1. SHARON HOLLOW, 2. SYLVAN, 3. M-52 NORTH, 4. M-52 SOUTH,**
- 5. SCIO CHURCH, 6. DANCER, 7. JERUSALEM, 8. DEXTER.**

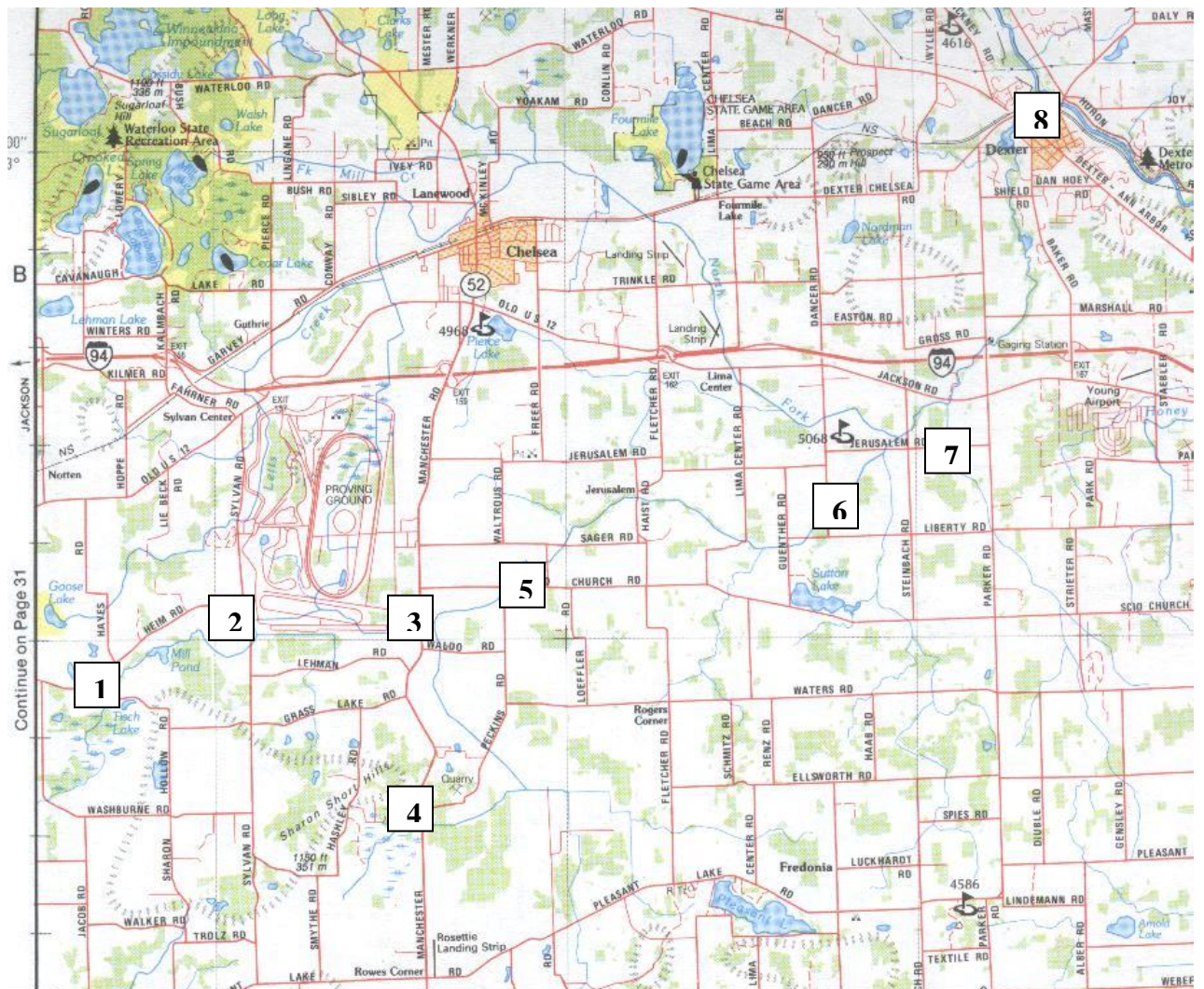


FIGURE 2. MILL CREEK WATER TEMPERATURES, JULY 2010

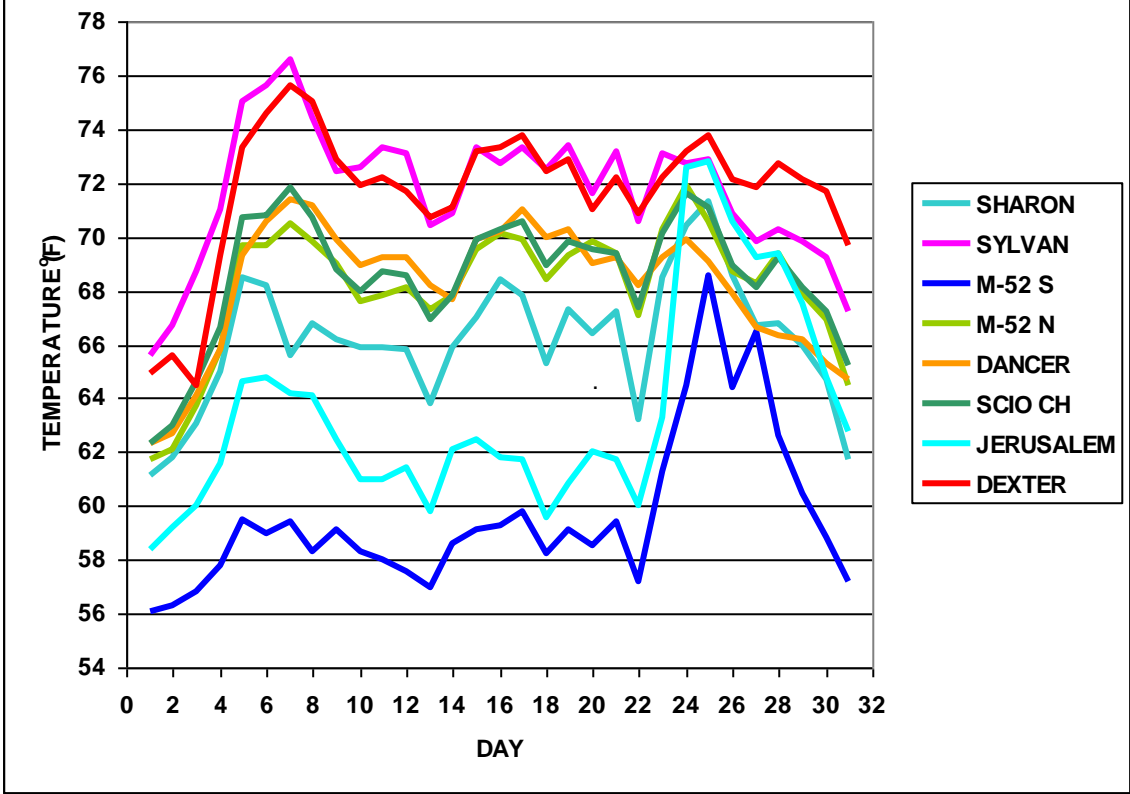


FIGURE 3. MILL CREEK DISCHARGE, JULY 1-AUGUST 28, 2010.

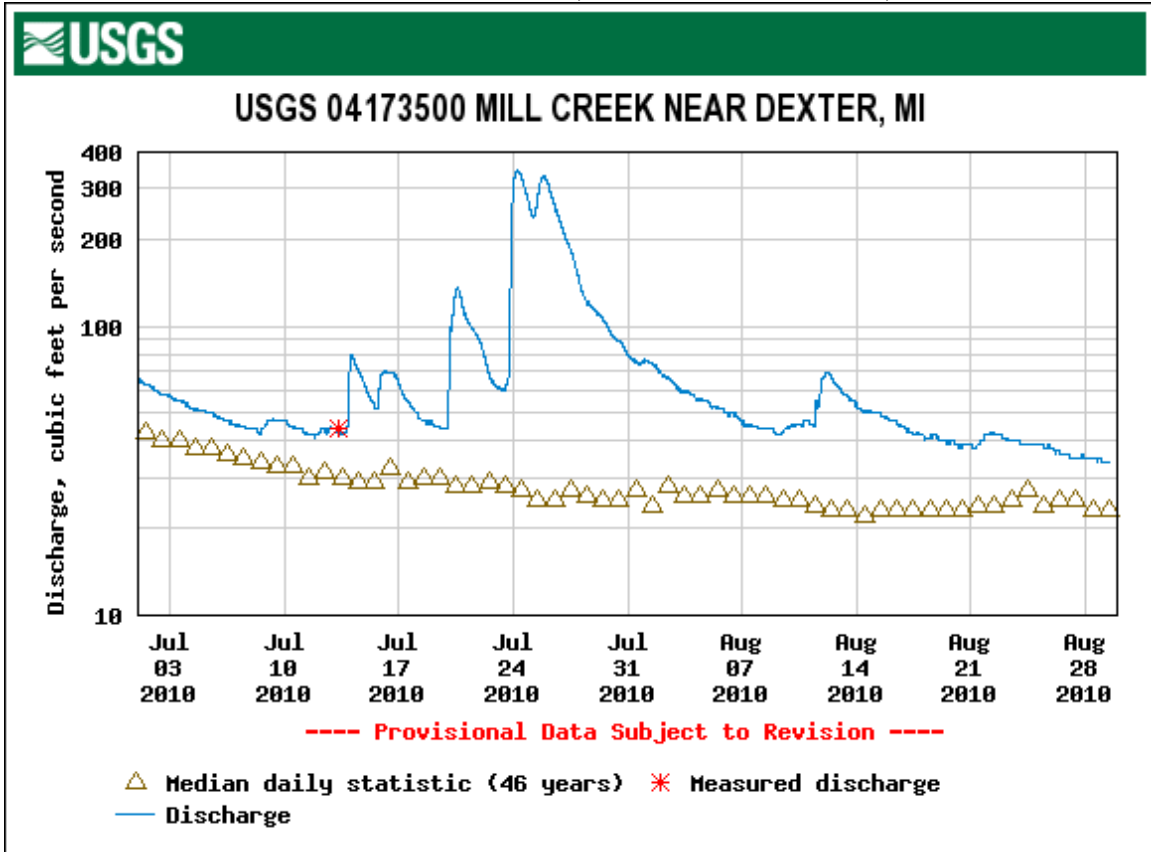


FIGURE 4. STREAM TEMPERATURE HABITAT MODEL (AFTER: LYONS ET AL. 2009).
 COLDWATER = <63.5°F; COOLWATER OR TRANSITIONAL= CT + WT; CT = COLD-
 TRANSITIONAL = 63.5- 67.5°F; WT = WARM-TRANSITIONAL = 67.5- 69.8°F; WARMWATER
 = >69.8°F.

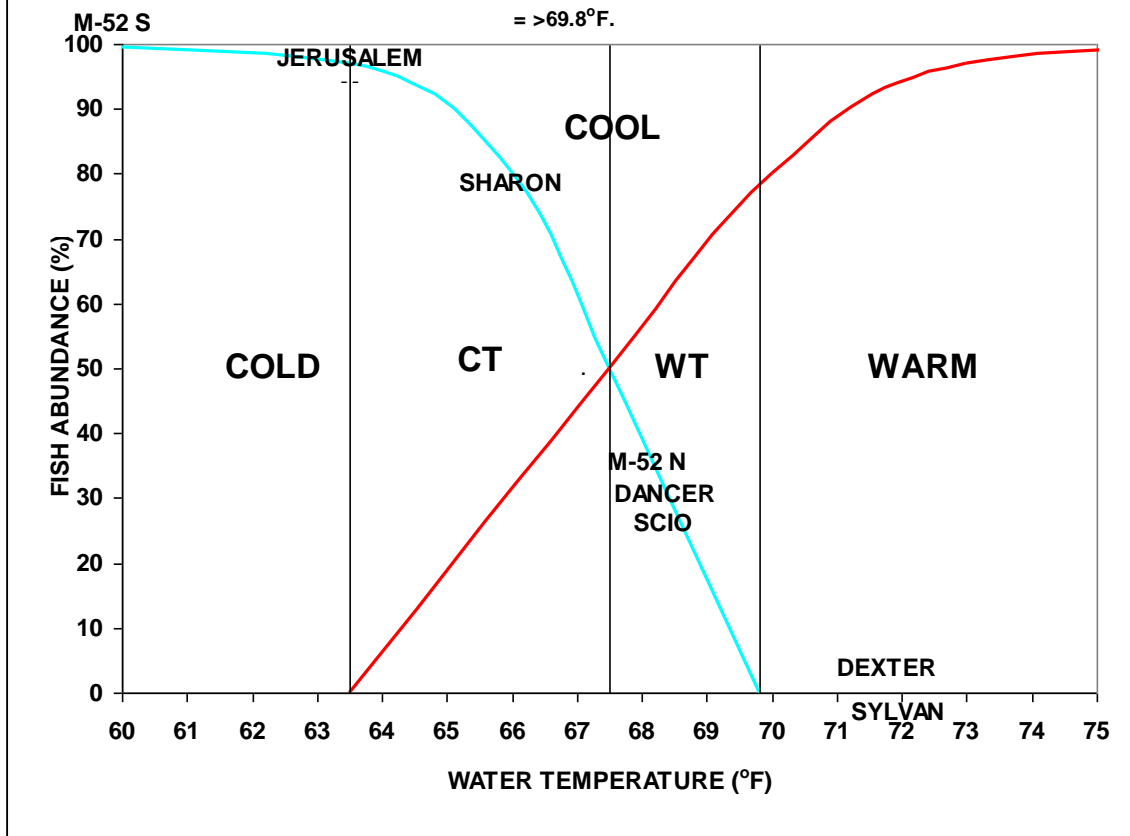


FIGURE 5. RELATION BETWEEN MEAN DAILY ANN ARBOR AIR TEMPERATURE AND MILL CREEK WATER TEMPERATURE AT M-52 N, DANCER, AND SCIO CHURCH ROADS, JULY 2010.

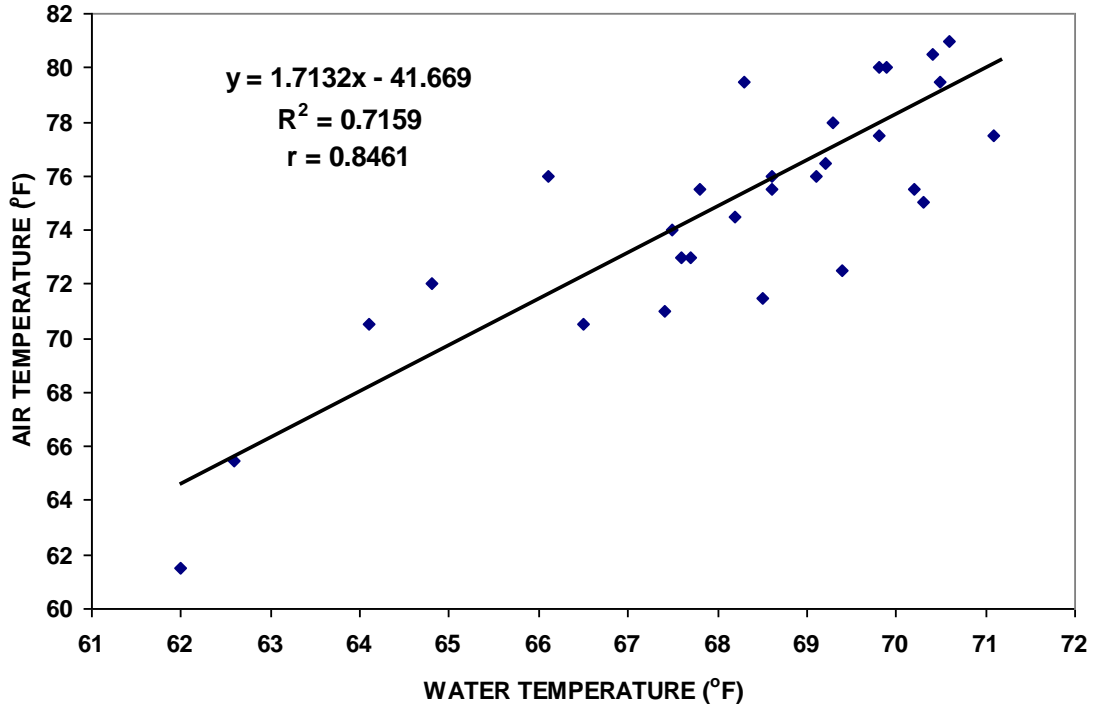


FIGURE 6. STREAM TEMPERATURE HABITAT MODEL (AFTER: LYONS ET AL. 2009).
 COLDWATER = <63.5°F; COOLWATER OR TRANSITIONAL= CT + WT; CT = COLD-
 TRANSITIONAL = 63.5- 67.1°F; WT = WARM-TRANSITIONAL = 67.1- 69.8°F; WARMWATER =
 >69.8°F.

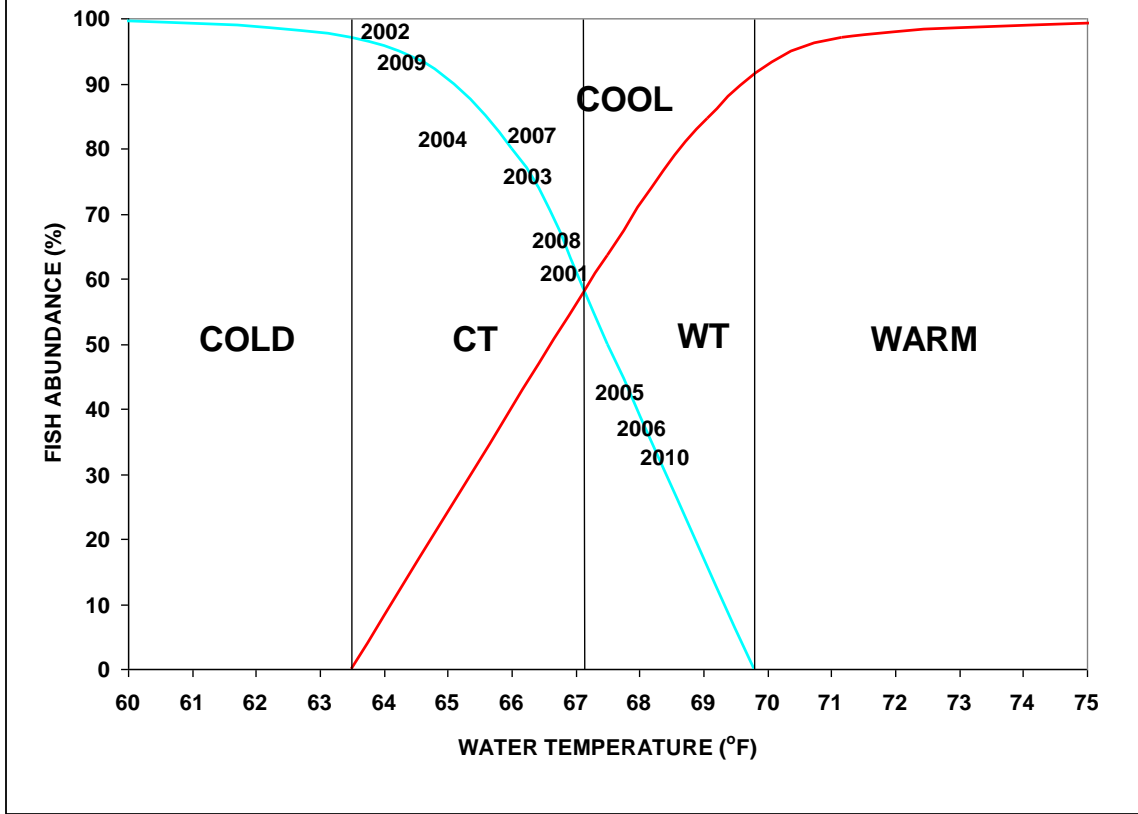


TABLE 1. AIR-WATER TEMPERATURE RELATION
IN THE M-52, SCIO CHURCH, AND DANCER ROADS
REACH OF MILL CREEK, 2001-2010.

YEAR	AIR	WATER
2001	73	66.9
2002	67.2	63.6
2003	72.8	66.2
2004	71.2	65.9
2005	74.4	67.8
2006	74.8	68
2007	71	65.8
2008	72.6	66.7
2009	67.8	63.9
2010	75.3	68.3