MILL CREEK FISHERY DEVELOPMENT: EDUCATION, RESEARCH, AND RECREATION: A PROPOSAL TO DEVELOP A TROUT FISHERY IN MILL CREEK
PART I. BACKGROUND AND THE 2009 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

Background

Trout Unlimited's primary mission is to conserve, protect, and restore North America's coldwater fishes and their watersheds. The by-laws of the Ann Arbor Chapter of Trout Unlimited (AATU) name the middle reach of the Huron River and its watershed, which includes Mill Creek, as the chapter's home stream area, thus encouraging the chapter to engage in stream improvement activities, demonstrations, and educational efforts there, as these efforts will directly or indirectly benefit Trout Unlimited's primary mission.

In 2006, AATU began a search for a local stream that could serve as the chapter's home stream, where the members could conduct stream improvement projects and work to establish a public trout fishery. We began our search in the Huron River because a Michigan Department of Natural Resources and Environment (MDNRE) Fisheries Division publication (Hay-Chmielewski et al. 1995) characterized the reach of the Huron River between Baseline (Flook) Dam and Dexter as second-class coldwater habitat capable of supporting trout, but not natural reproduction by trout.

We deployed temperature recorders at several locations in the river between Baseline Dam and the tailwaters of Barton Dam in Ann Arbor, June-September 2006, to determine if water temperatures would allow survival of trout throughout the summer (AATU 2006). Study results showed that river temperatures exceeded lethal limits for trout in July and August. However, a recorder set in Mill Creek, between the Dexter Millpond Dam and the creek's confluence with the Huron River showed that temperatures in the creek would have supported trout for all but a few days in August. This result suggested that if the Dexter Millpond Dam was removed, trout could survive over summer in this reach of the creek.

* Corresponding author.

The Dexter Millpond Dam was removed in summer 2008 and we immediately initiated planning to conduct a temperature survey in summer 2009 to determine if water temperatures would allow survival of trout throughout the summer in the Lower Main Branch of Mill Creek (AATU 2007).

The Lower Main Branch of the creek, as we define it here, extends about 4.5 miles from the Huron River upstream to Steinbach Road (Fig. 1). We selected this reach of the creek for study for two equally important reasons: (1) the creek there is large enough to be easily waded or floated and to generally provide a pleasant angling experience, and (2) public access to the creek there is assured because (with one minor exception at Shield Road) the Village of Dexter, Dexter Public Schools, and Scio Township own the land on one or both banks of the creek upstream for about 2 miles from the Huron River (Fig. 2). Although the creek flows though private property for the rest of the way to Steinbach Road, we have been advised that the reach of the river upstream to Marshall Road carries a Natural Rivers designation and that the Village of Dexter and Scio Township (Arscott 2009) are developing a plan that would create a hiking trail along the creek from the Huron River to Marshall, Road, and thus provide about an additional 0.7 mile of public access to the creek.

Mill Creek Temperature Study, 2009

In mid-June 2009, we deployed temperature recorders in the Lower Main Branch of Mill Creek, in Warrior Park in Dexter, and at Shield, Marshall, and Steinbach roads (Edsall and Phillips 2009). The recorders collected water temperature hourly at these sites until mid-September. Study results show that summer water temperatures differed little between Steinbach Road and Warrior Park and met the temperature criteria used by the MDNRE (as reported by Latimore 2007), for a coldwater stream (July maximum water temperature not >75^{o}F), and for trout stocking (July maximum temperature <72^{o}F), except at Marshall Road on July 28 when the water temperature reached 72.1-73.2^{o}F for three hours. Based on these results we concluded that summer water temperatures in the Lower Main Branch in 2009 could have supported trout.

In response to criticism that we were basing our evaluation of the creek's potential to support trout on temperature data for only one summer, which was cooler than normal, we developed a simple empirical method for predicting creek water temperature in years prior to 2009. This approach is based on a least-squares regression of the relation between mean daily July 2009 Ann Arbor, air temperatures (NCDC-NOAA 2009), and our mean daily July 2009 water temperatures for Mill Creek (Fig. 3). We selected the Ann Arbor weather station because it was the one closest to Mill Creek with readily accessible historical records, and we selected 2001-2008 for analysis to permit examination of the recent between-year variability in air and water temperature. We also compared

the mean July air temperature for 2001-2009 with the mean July air temperature for 1950-2009 to determine if the temperatures for 2001-2009 were representative of that longer term period of record.

The regression equation describing the air-water temperature relation, in Figure 3 is,

$$y = 1.9912x + 62.829$$

where y = air temperature, 1.9912 = the slope of the regression line, x = water temperature, and 62.829 = the slope intercept.

Substituting the mean monthly July air temperatures for y in the equation and solving the equation for x allowed us to calculate the mean July water temperature in the Lower Main Branch of the creek, for any year prior to 2009. For example, if $y = 72.6^{o}$F, as for 2008 in Table 1, then $1.9912x = 72.6 + 62.829$, and $x = 67.96 = 68.0\ ^{o}$F.

The mean July air temperatures in 2001-2009 varied from 67.8 to 76.2 ^{o}F and was 72.5 ^{o}F for July 2001-2009 and also for July 1950-2009 (Table 1). The mean July water temperature calculated from these air temperatures for 2001-2009 varied from 65.6 to 69.8 ^{o}F and averaged 68.0 ^{o}F for July 2001-2009 and also for July 1950-2009.

We used a recently published habitat classification system based on stream temperature and associated stream fish assemblages (Lyons et al. 2009) to interpret the water temperatures in Table 1. 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 (Fig. 4). 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 (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.

The mean July water temperatures in Table 1 indicate that the creek would have been classified as cold-transitional habitat in 2009 and as warm-transitional habitat in 2001-2008. In 2001-2009 and also in 1950-2009, when the mean July water temperature averaged 68.0 ^{o}F, the creek would have been considered warm-transitional habitat.

Annotating the blue curve in the Lyons et al. (2009) model graphic (Figure 5) to better show the potential of Mill Creek's Lower Main Branch to have supported stocked trout in 2001-2009 reveals abundance could have been about 84% of maximum in 2009; about 45-56% in 2003, 2004, and 2007; about 37-40% in 2001

and 2008; about 22% in 2005; about 12% in 2006; and in 2002, trout probably would not have survived unless thermal refugia were available. In 2001-2009 and also in 1950-2009 the potential abundance of stocked trout in Mill Creek would have averaged about 40% of maximum.

If maximum abundance of trout in Michigan streams is about 100 fish per 100 m of stream length, as suggested by data presented by Wehrly et al. (2007), then the abundance scale in Figure 4 can also be read as numbers of trout per 100 m of stream. Thus, the mean potential abundance of stocked trout in Mill Creek for the period of record would have been about 40 per 100 m of stream, which falls near the upper end of the range of stocked trout abundance in Michigan streams, 4-50 per 100 m (Wehrly et al. 2007).

Conclusion

From the foregoing analysis it is reasonable to conclude that if streams in Michigan that carry 4-50 stocked trout per 100 m of stream support fisheries that are attractive enough to be managed for trout, then Mill Creek should also warrant stocking and management as a trout fishery. This conclusion is further supported by the MDNRE's 2008 electro-shocking survey data for the creek, which show the fish community biomass in the creek's Main Branch between Lima Center Road and Shield Road is strongly dominated by non-game, cold-transitional fishes (Edsall 2010), and also by an earlier report (Seelbach and Wiley 1996) recommending the stocking of brown trout in the creek's Main Branch.

References

AATU (Ann Arbor Area Chapter of Trout Unlimited). 2007. A proposal to develop a trout fishery in Mill Creek, Washtenaw County, Michigan. Unpublished report submitted to the Board of Directors, AATU, November 23, 2007; 5 pages.

AATU. 2006. Huron River and Mill Creek water temperature study, June-September 2006. Unpublished report submitted to the Board of Directors, AATU, September 22, 2006, by T. A. Edsall; 9 pages.

Arscott, A. 2009. Wind energy and a possible trail system. Planning Commission Update. Page 4. In: Scio Township Community Report. Fall 2009. Ann Arbor, Michigan.

Edsall, T. A. 2010. Analysis of MDNRE July 23, 2008 electro-fishing survey data for Mill Creek. A memorandum submitted to AATU by the Mill Creek Fishery Development Committee, February 5, 2010; 3 pages.

Edsall, T.A. and W.E. Phillips. 2009. Summer water temperatures in Mill Creek: A report to the Ann Arbor Area Chapter of Trout Unlimited; 5 pages.

Hay-Chmielewski, E.M., P.W. Seelbach, G.E. Whelan, and D.B. Jester, Jr. 1995. Huron River Assessment . Fisheries Division Special Report. Michigan Department of Natural Resources, Lansing; 138 pages.

Latimore, J.A. 2007. Stream quality Assessment of Mill Creek, Washtenaw County, Michigan, a tributary of the Huron River, 2004-2006. Unpublished report to the Huron River Watershed Council, June 2007; 29 pages.

Lyons, J.L., T. Zorn, J. Stewart, P. Seelbach, K.Wehrly, and L. Wang. 2009. Defining and characterizing coolwater streams and their fish assemblages in Michigan and Wisconsin USA. North American Journal of Fisheries Management 29:1130-1151

NCDC-NOAA. 2009. NCDC.NOAA.gov website. The University of Michigan weather station in Ann Arbor.

Seelbach, P.W., and M.J. Wiley. 1996. An assessment of the potential for ecological rehabilitation and restoration in Mill Creek. Unpublished report to the Huron River Watershed Council, November 17, 1996; 14 pages.

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. THE MILL CREEK SYSTEM

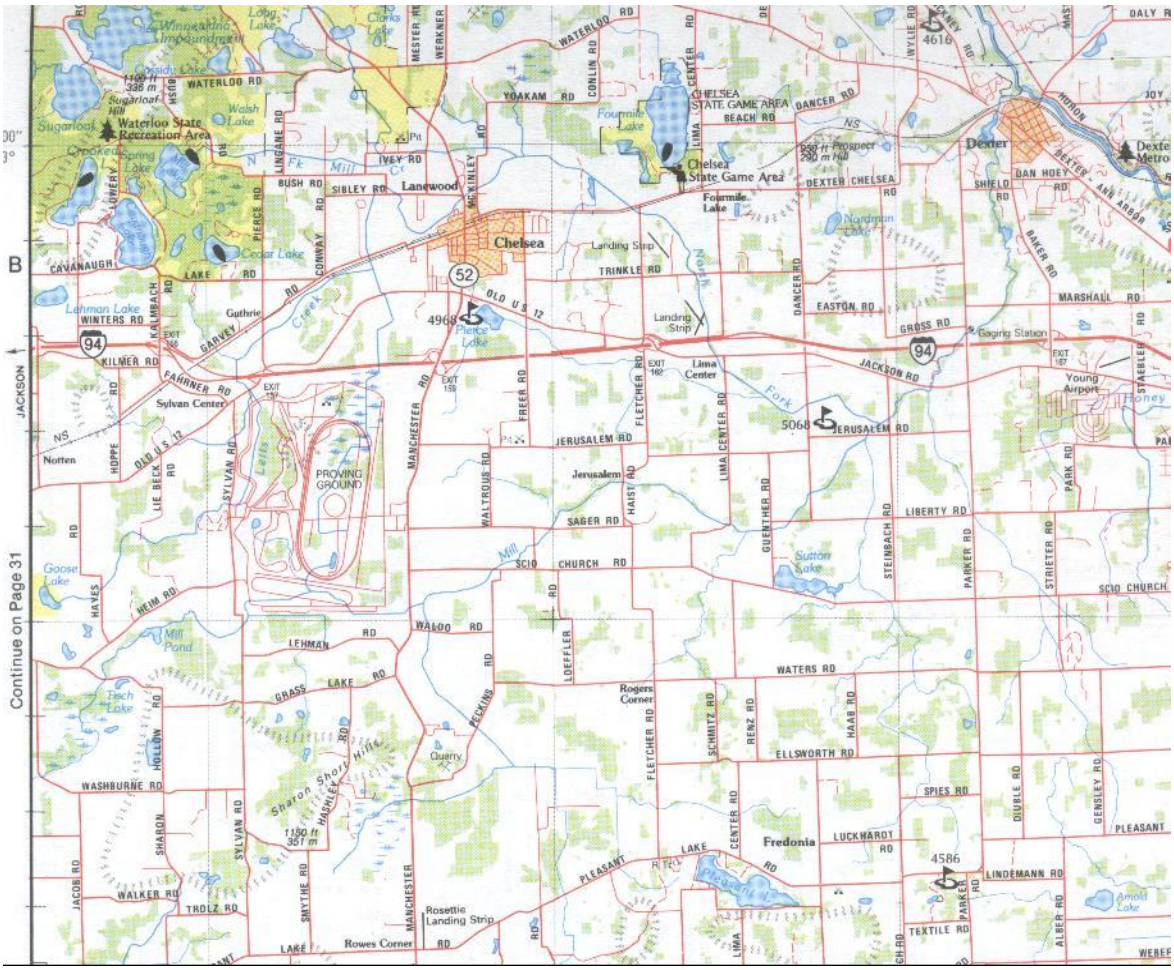

FIGURE 2. MILL CREEK PUBLIC ACCCESS

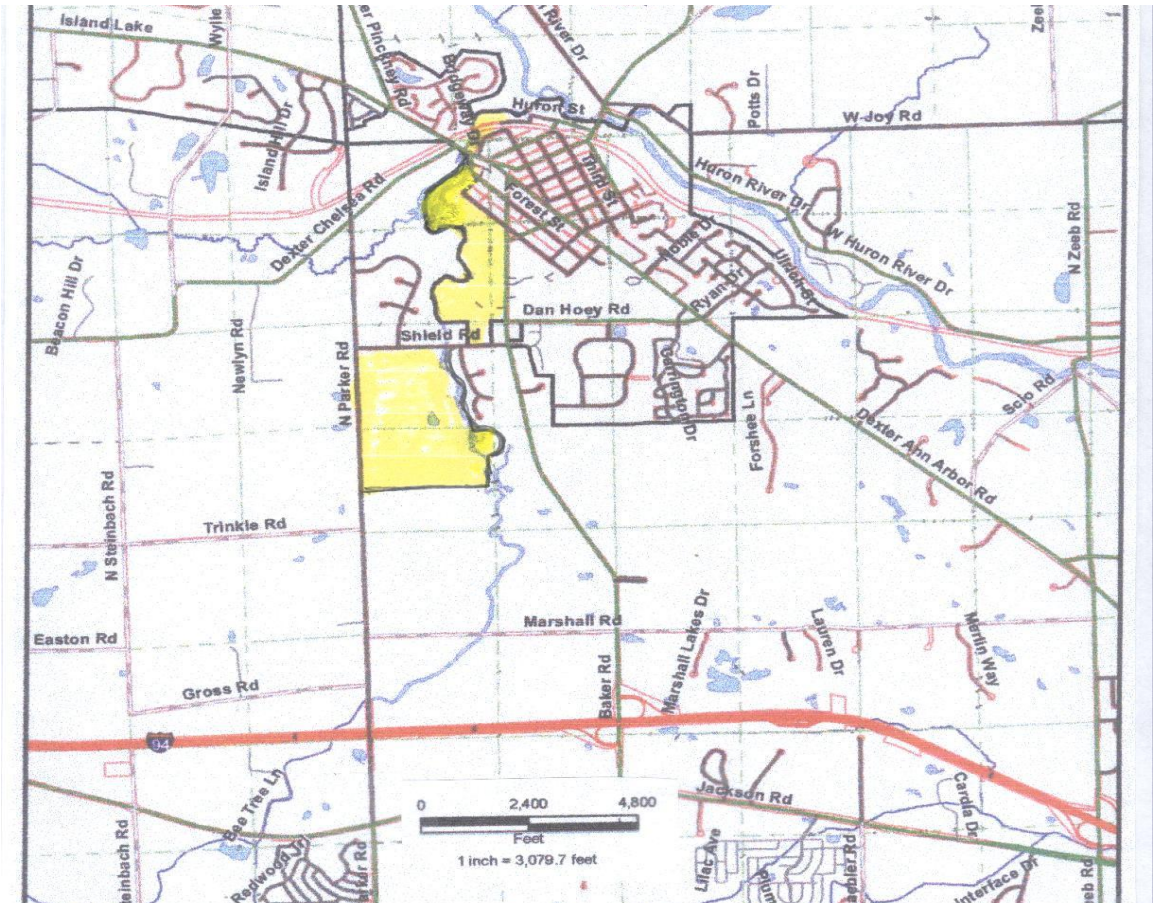

FIGURE 3. RELATION BETWEEN DAILY AIR AND WATER TEMPERATURES, MILL CREEK, WARRIOR PARK, DEXTER, JULY 2009

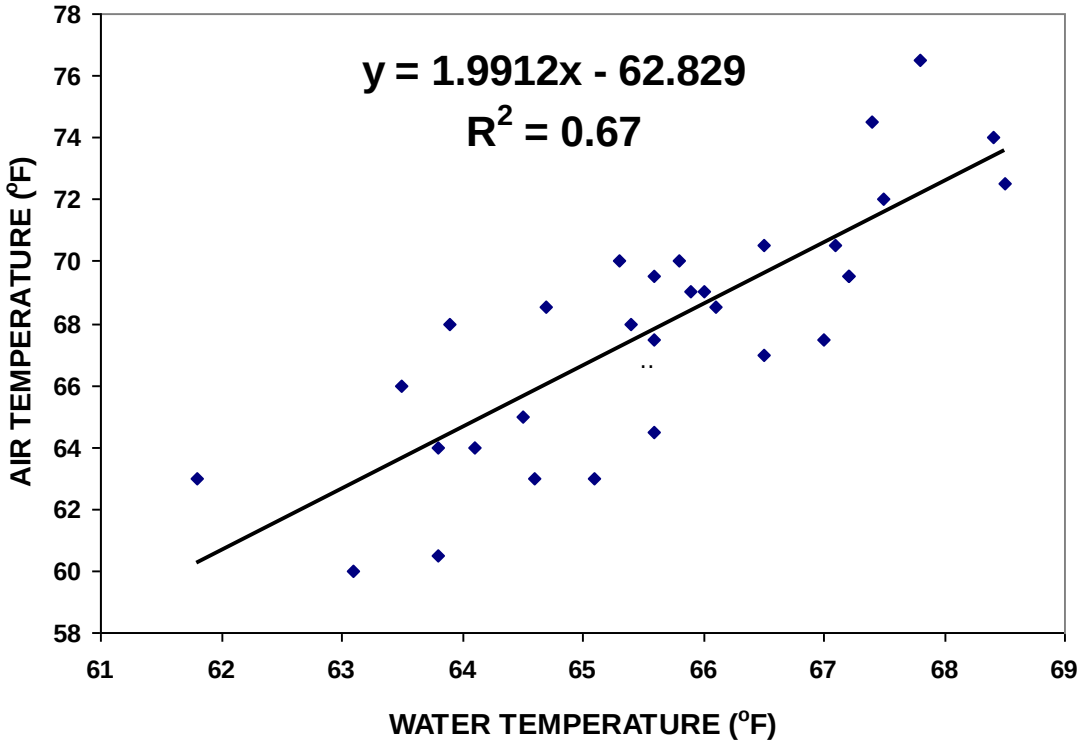

FIGURE 4. STREAM TEMPERATURE HABITAT MODEL (AFTER: LYONS ET AL. 2009). COLDWATER = <63.5°F; COOLWATER OR TRANSITIONAL= CT + WT; CT = COLD-TRANSITIONAL = 63.5- 67.1°F; WT = WARM-TRANSITIONAL = 67.1- 69.8°F; WARMWATER = >69.8°F.

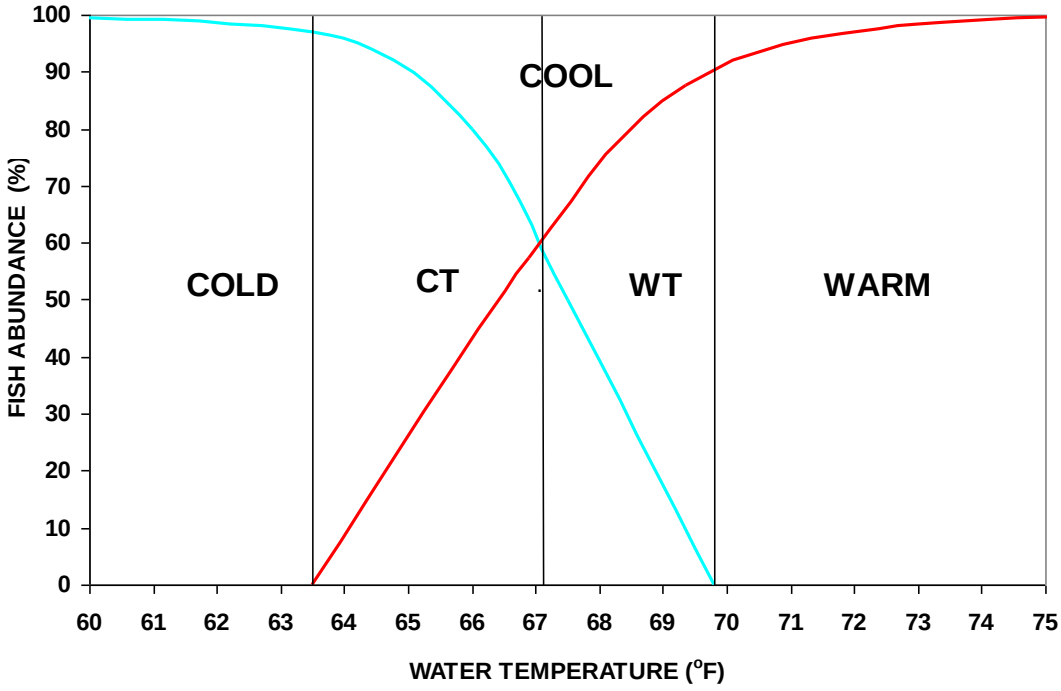

TABLE 1. MEAN JULY ANN ARBOR AIR AND MILL CREEK WATER TEMPERATURES, AND STREAM TEMPERATURE HABITAT CLASS, 2001-2009.

YEAR	AIR	WATER	CLASS
2009	67.8	65.6	CT
2008	72.6	68	WT
2007	71	67.2	WT
2006	74.8	69.1	WT
2005	74.4	68.9	WT
2004	71.2	67.3	WT
2003	71.8	67.6	WT
2002	76.2	69.8	WT
2001	73	68.2	WT

CT = COLD-TRANSITIONAL = 65.3-67.1oF
WT = WARM-TRANSITIONAL = 67.1-69.8oF
W = WARMWATER = >69.8oF

FIGURE 5. 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.