



To: Dr. Rick Rediske
From: Dr. Carl Ruetz
Date: 12 December 2017
RE: Effects and timing of mill debris on lake sturgeon in Muskegon Lake

The Muskegon River supports a genetically-distinct spawning run of lake sturgeon (DeHaan et al. 2006; Homola et al. 2012). The lake sturgeon population associated with the Muskegon River is a remnant of its historical size (e.g., Harris et al. 2017), which is not unique because the lake sturgeon is considered threatened throughout much of its range (Peterson et al. 2007). Thus, lake sturgeon conservation is a priority for the Muskegon River population.

Lake sturgeon (both adults and juveniles) associated with the Muskegon River population are known to use Muskegon Lake. The lake serves as an important nursery habitat for juvenile lake sturgeon throughout the year (Altenritter et al. 2013) and a staging area for adults prior to their spawning run in the river (Harris et al. 2017). Additionally, preliminary results from an ongoing telemetry study in Muskegon Lake suggest adults use the lake throughout the year, although use may be highest when staging for their spawning run (Ruetz, unpublished data). Given that lake sturgeon is primarily a benthic (bottom-dwelling) species (Peterson et al. 2007), targeted restoration of benthic habitats in Muskegon Lake should benefit lake sturgeon. For example, restoration that resulted in greater abundance and “healthier” assemblages of benthic macroinvertebrates should benefit lake sturgeon via improved foraging areas.

Research in Muskegon Lake suggests that juvenile lake sturgeon use depths ≥ 7.5 m (7.5 m ≈ 24.6 ft.) and avoid areas with dense beds of aquatic macrophytes (Altenritter et al. 2013), so portions of the areas target for dredging to remove mill debris should be in habitats that are frequented by lake sturgeon. Altenritter et al. (2013) found that seasonal patterns in spatial and depth distribution of juvenile lake sturgeon in Muskegon Lake. Juveniles tended to use shallower (mean = 7.5 m) areas near where the north branch of the Muskegon River enters Muskegon Lake during summer (i.e., when the lake is thermally stratified), moving to the deepest part of Muskegon Lake (mean = 15.8 m ≈ 51.8 ft.) once the lake turns over (i.e., loss of thermal stratification during autumn), and remaining in the deeper area until the lake becomes thermally stratified in early summer (Altenritter et al. 2013). Thus, dredging should be targeted during times of the year when juvenile lake sturgeon are less likely to be disturbed. In my opinion, dredging during summer when the lake is thermally stratified should minimize the disturbance to lake sturgeon (see Figure 2a in Altenritter et al. 2013).

References:

- Altenritter, M.E.L., A.C. Wieten, C.R. Ruetz III, and K.M. Smith. 2013. Seasonal spatial distribution of juvenile lake sturgeon in Muskegon Lake, Michigan USA. *Ecology of Freshwater Fish* 22:467-478.
- DeHaan, P.W., S.V. Libants, R.F. Elliott, and K.T. Scribner. 2006. Genetic population structure of remnant lake sturgeon populations in the Upper Great Lakes basin. *Transactions of the American Fisheries Society* 135:1478-1492.
- Harris, B.S., C.R. Ruetz III, A.C. Wieten, M.E. Altenritter, and K.M. Smith. 2017. Characteristics of lake sturgeon *Acipenser fulvescens* Rafinesque, 1817 in a tributary of Lake Michigan, USA: status of the Muskegon River population. *Journal of Applied Ichthyology* 33:338-346.
- Homola, J.J., K.T. Scribner, R.F. Elliott, M.C. Donofrio, J. Kanefsky, K.M. Smith, and J.N. McNair. 2012. Genetically derived estimates of contemporary natural straying rates and historical gene flow among Lake Michigan lake sturgeon populations. *Transactions of the American Fisheries Society* 141:1374-1388.
- Peterson, D.L., P. Vescei, and C.A. Jennings. 2007. Ecology and biology of the lake sturgeon: a synthesis of current knowledge of a threatened North American Acipenseridae. *Reviews in Fish Biology and Fisheries* 17:59-76.