



Sand Creek 2013 Survey Report

Prepared by Brian Gunderman

Introduction

Sand Creek begins approximately two miles east of the city of Benton Harbor and flows northwesterly for 3.6 miles to its confluence with the Paw Paw River (Figure 1). The Sand Creek watershed encompasses an area of 3.1 square miles. Michigan's Aquatic Habitat Viewer indicates that 62% of the watershed is covered by urban development. Other major land uses include agriculture (15%) and forests (15%). Sand Creek and its tributaries are classified as Type 1 trout streams.

Steep hills bracket the Sand Creek valley from Euclid Avenue to the entrance of the Paw Paw River floodplain. The average gradient for the creek is 20.4 ft/mile, which is high relative to most other streams in southern Michigan. The headwaters flow through loamy soils over coarse-textured glacial till. The lower 2.5 miles of the creek flows through lacustrine sand and gravel deposits overlaid by sandy loams of the Gilford-Maumee-Sparta series. Darcy groundwater maps indicate low-moderate potential for groundwater inputs to Sand Creek.

The Michigan Department of Conservation (predecessor of the Michigan Department of Natural Resources [MDNR]) completed the first fisheries survey on Sand Creek in August 1967. The sampling station consisted of a 200 ft stream reach immediately upstream of the Crystal Avenue crossing. Mottled sculpins and central mudminnows composed the bulk of the catch. The only other fish collected were two green sunfish (total length = 2 inches). The water temperature was 59 °F at the time of the survey.

Another MDNR electrofishing survey was conducted on a 320 ft stream reach downstream of the Red Arrow Highway crossing in July 1979. Mottled sculpin was the most abundant species, and the only game fish in the catch were two small green sunfish (total length = 2-3 inches). The water temperature was 63 °F. Despite suitable water temperatures, no trout or salmon were observed. The survey crew noted that the culvert at Crystal Avenue was undersized, impounding water upstream and creating a scour pool downstream of the crossing. Dense brush hindered sampling downstream of Crystal Avenue. Mottled sculpins were the only fish observed during a 75 ft electrofishing run.

The Surface Water Quality Division of MDNR completed fish community, macroinvertebrate, and habitat sampling downstream of the Crystal Avenue crossing in September 1994 (Heaton 1995). Once again, mottled sculpin was the most abundant species in the catch. Creek chubs, central mudminnows, and a grass pickerel also were collected during the survey. The macroinvertebrate community was rated as fair and the habitat was rated as poor. The stream carried a large bedload of sand and plumes of shifting sand covered gravel and large woody structure, thus reducing the availability of fish cover and spawning habitat. Heaton (1995) hypothesized that runoff from residential lawns, parking lots, roadways, and the airport was degrading water quality and habitat conditions in Sand Creek.

In May 2004, MDNR conducted a single electrofishing run on a 500 ft stream reach between Euclid Avenue and Red Arrow Highway. The total catch consisted of seven creek chubs, one central mudminnow, and one grass pickerel. Michigan Department of Environmental Quality personnel evaluated habitat in this same stream reach. Overall, the habitat within the stream reach was rated as good (slightly impaired). However, the following aspects of stream habitat within the station were rated as marginal



(moderately impaired): pool substrate, pool variability, sediment deposition, bank stability, vegetative protection, and riparian vegetation zone width.

In 2005, a private consulting firm assessed the fish communities and aquatic habitat at three stations on Sand Creek (Mischuk 2005). Each station was sampled twice: once in mid-April and once in mid-May. Four fish species were collected during these sampling efforts: central mudminnow, creek chub, grass pickerel, and bluntnose minnow. Habitat was rated as marginal at the site upstream of Euclid Avenue and good at two sites on the Southwest Michigan Regional Airport (SWRA) property.

The SWRA had to expand their runway safety area to comply with new Federal Aviation Administration standards. To accomplish this objective, a 2,135 ft reach of Sand Creek was abandoned and the stream was routed into a new 2,070 ft channel (Figure 1). Natural channel design principles were used to construct pools, riffles, and meanders within the relocated stream reach. A 560 ft section of the relocated reach was enclosed within a 24 ft span by 7 ft rise concrete arched culvert. The culvert was oversized to allow the construction of meanders. A series of cross vanes were installed for grade control and the stream banks within the enclosed section were lined with rock riprap to prevent lateral movement of the stream channel. This large-scale relocation project was completed in 2010.

Materials and Methods

An evaluation of fish passage through the SWRA culvert was completed by MDNR in 2013. The initial sampling design for the project was based on the procedures outlined by Coffman (2005). Two marking stations, each 150 ft in length, were established. The first station (M_C) was located immediately downstream of the culvert. The second station (M_{FC}) began 1,310 ft downstream of the culvert and extended upstream. Two recapture stations, each 600 ft in length, also were established. The first recapture station (R_C) was located immediately upstream of the culvert. The second recapture station (R_{FC}) began 560 ft upstream of M_{FC} and extended upstream to the culvert. The survey was designed to include three phases. (1) Capture fish in the two marking stations using a backpack electrofishing unit and mark all fish 2 inches or larger. (2) Conduct electrofishing at the two recapture stations one month after the fish were marked. (3) Compare upstream movement of fish through the culvert (M_C to R_C) to upstream movement of fish through the false culvert section (i.e., a stream section equal in length to the culvert; M_{FC} to R_{FC}) during the same period.

A backpack electrofishing unit was used to capture fish at the two marking stations on July 22, 2013. Total length was recorded for each fish captured. Weights for all fish species were calculated using the length-weight regression coefficients compiled by Schneider et al. (2000). All fish 2 inches or larger were marked with a fin clip. Fish captured in M_C were given a dorsal caudal clip, whereas fish captured in M_{FC} were given a ventral caudal clip.

In both marking stations, an insufficient number of fish larger than 2 inches was collected to facilitate evaluation of upstream movement. Due to this circumstance, an alternative strategy was adopted to gather information on fish movement and utilization of the culvert. A backpack electrofishing unit was used to capture fish in another station (station C) which began at the downstream end of the culvert and extended 162 ft upstream into the culvert. Total lengths were recorded for all fish captured in station C, and weights for each species were calculated using length-weight regression coefficients (Schneider et al. 2000).

Results



Three fish species were captured at the M_C station (Table 1). Mottled sculpins ($n = 632$) composed the bulk of the catch. Only five fish 2 inches or larger were collected at this station.

Four fish species were captured at the M_{FC} station (Table 2). Creek chubs ($n = 99$) and mottled sculpins ($n = 56$) made up 97% of the catch (by number). Five fish 2 inches or larger were collected at this station.

Five fish species were captured in station C (Table 3). The number of fish captured at this station was lower than at the other stations. However, the average size of the fish was larger and the total biomass of the catch exceeded the combined biomass from the two marking stations. Creek chub, mottled sculpin, and central mudminnow were the most abundant species in station C.

Analysis and Discussion

Due to the paucity of large fish downstream of the SWRA culvert, it was not possible to assess upstream movement of fish through the culvert. The size structure of the fish community in Sand Creek primarily was determined by the available habitat. Small fish were able to hide among the rocks in the relocated stream reach, but deep pools and cover for larger fish (e.g., undercut banks or large woody structure) were lacking. The largest fish encountered during the survey were collected within the culvert. This reach provided shade, relatively deep pools, and riprap for fish cover.

The water temperature at the time of the 2013 survey was 62 °F. Although this is only one measurement, it suggests that Sand Creek is a coldwater stream. The species composition of the fish community provides further support for this classification. Only two warmwater fish (a brown bullhead and a bluegill) were collected, compared to 874 fish from the coldwater and transitional thermal classes (Lyons et al. 2009).

Fisheries data from the 2013 survey and previous surveys do not support the existing classification of Sand Creek as a Type 1 trout stream. Shallow riffles and log jams in the creek downstream of Red Arrow Highway apparently preclude upstream migrations of salmon during the fall spawning season. Steelhead may be able to ascend the creek during the high flow period in the spring. However, there is no evidence of natural reproduction of steelhead in this system. Given the small size of the creek, the species composition of the fish community, and the lack of public access, fishing activity on this stream likely is minimal.

Management Recommendations

Two fisheries management goals have been developed for Sand Creek. Goal 1: Adjust fishing regulations to reflect the species composition of the fish community. Goal 2: Protect existing fish habitat in Sand Creek and the Paw Paw River.

Sand Creek should be removed from the designated trout stream list in Fisheries Order 210. This action will help visiting anglers concentrate their efforts on streams with trout populations and will reduce the temptation to trespass on private land. This regulation change also will allow riparian landowners to fish for suckers during the spring spawning run (if such a run exists) and will remove the seasonal restriction on minnow harvest.

Land use within the Sand Creek watershed influences water quality in the Paw Paw River (which supports popular fisheries for a variety of species). Fisheries Division personnel will continue to review MDEQ



permit applications for potential effects on aquatic resources. If a proposed project is likely to degrade the aquatic habitat, Fisheries Division staff will object to the proposal and suggest feasible alternatives.

References

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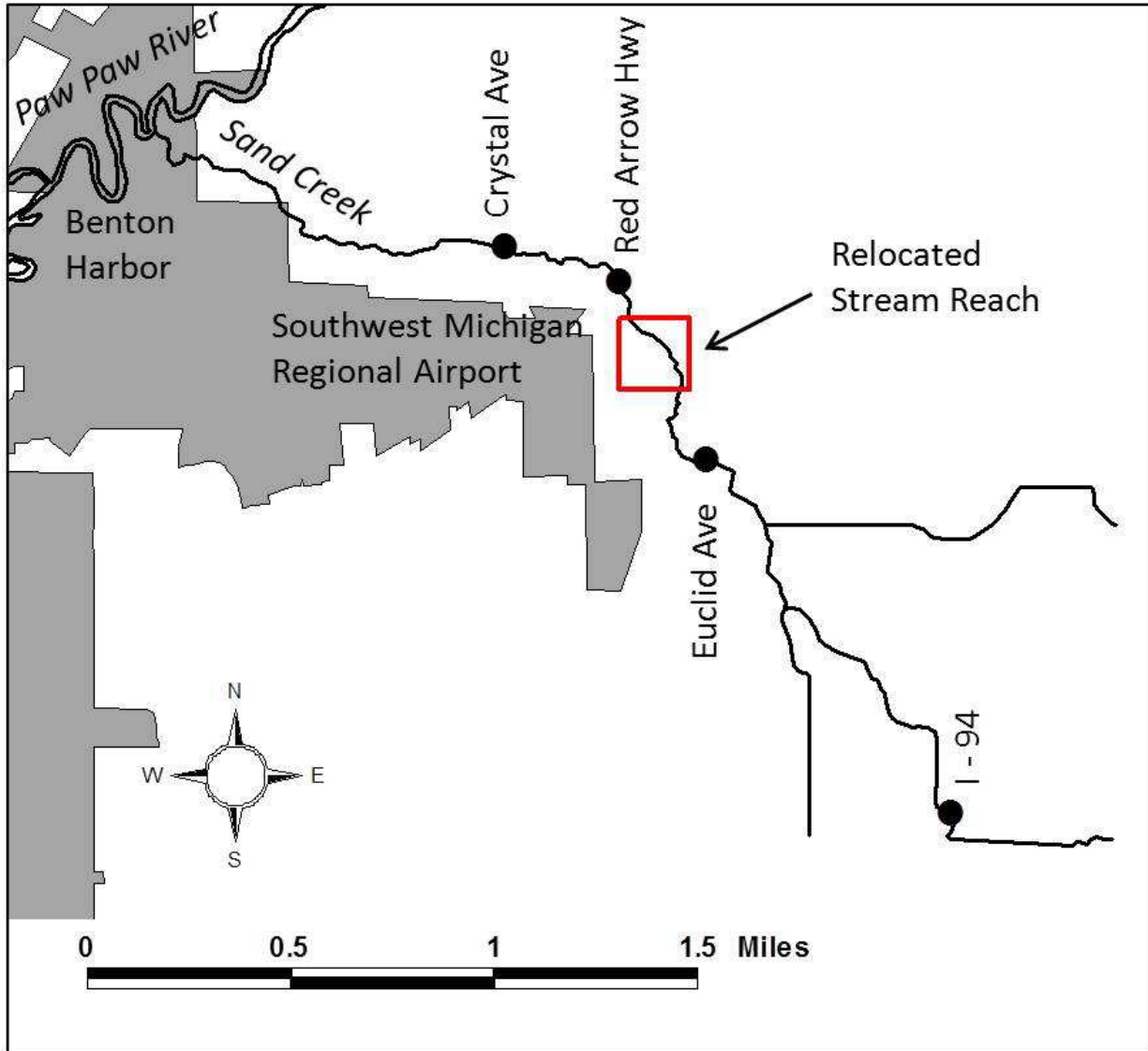


Figure 1.-Select road crossings (circles) and the relocated stream reach on Sand Creek, Berrien County. The shaded area is within the Benton Harbor city limits.



Table 1.—Numbers, calculated weights, total lengths, and thermal classifications for fish species collected at the M_C electrofishing station on Sand Creek on July 22, 2013. Thermal classifications from Lyons et al. (2009).

Species	Number	Percent by number	Weight (lb)	Percent by weight	Total length range (inches)	Thermal classification
Mottled sculpin	632	96.5	1.01	85.6	1-3	Coldwater
Creek chub	18	2.7	0.13	11.0	1-6	Transitional
Central mudminnow	5	0.8	0.04	3.4	1-4	Transitional
Total	655		1.18			

Table 2.—Numbers, calculated weights, total lengths, and thermal classifications for fish species collected at the M_{FC} electrofishing station on Sand Creek on July 22, 2013. Thermal classifications from Lyons et al. (2009).

Species	Number	Percent by number	Weight (lb)	Percent by weight	Total length range (inches)	Thermal classification
Creek chub	99	62.3	0.13	37.1	1-1	Transitional
Mottled sculpin	56	35.2	0.09	25.7	1-2	Coldwater
Central mudminnow	3	1.9	0.06	17.1	2-4	Transitional
White sucker	1	0.6	0.07	20.0	5	Transitional
Total	159		0.35			

Table 3.—Numbers, calculated weights, total lengths, and thermal classifications for fish species collected at electrofishing station C on Sand Creek on July 22, 2013. Thermal classifications from Lyons et al. (2009).

Species	Number	Percent by number	Weight (lb)	Percent by weight	Total length range (inches)	Thermal classification
Mottled sculpin	27	43.5	0.39	21.4	1-3	Coldwater
Creek chub	18	29.0	0.99	54.4	4-6	Transitional
Central mudminnow	15	24.2	0.29	15.9	1-4	Transitional
Brown bullhead	1	1.6	0.14	7.7	6	Warmwater
Bluegill	1	1.6	0.01	0.5	2	Warmwater
Total	62		1.82			