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HENNEPIN MARSH HABITAT RESTORATION PROJECT PRE- CONSTRUCTION FISH MONITORING SUMMARY

The purpose of this summary is to present the fisheries collection data for pre-construction monitoring of the Hennepin Marsh Restoration project. This document will outline the methods used to complete the monitoring and provide a summary of the data collected to date.

Methods

Sampling sites were located in areas around the Hennepin Marsh shoreline and between the proposed habitat shoals and the shoreline (Figure 1) to determine the species present and their utilization of habitats within the project area prior to project construction. Three sampling methods were used: ichthyoplankton net tows (i.e., larval fish and eggs), fyke net sets, and boat electrofishing. Multiple sampling methods were chosen to capture all fish life stages present within the project area.

Ichthyoplankton

Ichthyoplankton sampling was conducted once a month from April to July 2020 at four sampling transects (Figure 1). However, due to the COVID-19 pandemic and state emergency orders prohibiting field work in April, the first round of ichthyoplankton sampling in 2020 occurred the first week of May instead of April. To avoid confusion, the early May sample will be referred to as the April sampling.

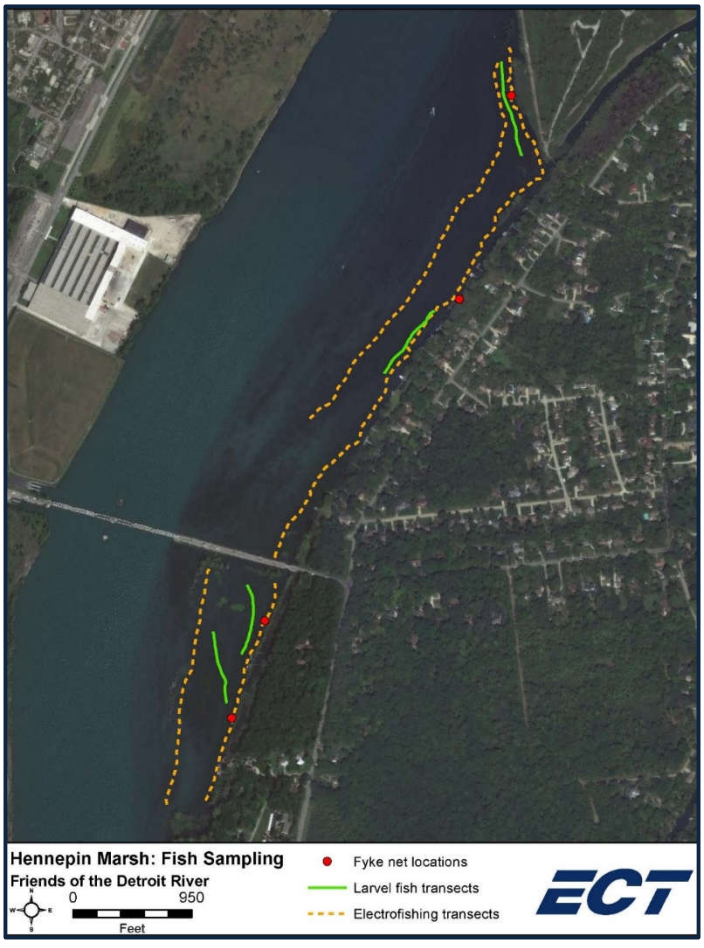

Figure 1. Site Map of Hennepin Marsh Fish Sampling Locations.

Samples were collected using a net deployed approximately 10 m behind the boat. The conical net was equipped with a 0.5 m diameter mouth and 3.0 m body consisting of 500 µm mesh terminating in a 9 cm diameter by 30.4 cm long 500 µm mesh

filtering cod end bucket. The volume of water sampled was approximated by calculating the area of the net opening multiplied by the length of the transect. All sampling transect speeds were conducted at approximately 2 m/s (5 mph).

At the end of each sampling transect, samples were carefully rinsed from the cod end bucket into a pre-labeled Nalgene container using 95% ethanol. Samples were then preserved in 95% ethanol. Container labels (both exterior and interior) contained the following information: date, sampling times (start and end) for each tow, location, collectors, project site, and sample number.

Sample containers were shipped to a taxonomy laboratory for processing and identification to the lowest possible taxonomic level and life stage. Terminology for the life stages included eggs, yolk-sac larvae, post yolk-sac larvae, and juveniles. The criteria for the three latter developmental phases are as follows:

- Yolk-sac larvae – Phase of development from the time of hatch to complete absorption of yolk
- Post yolk-sac larvae – Phase of development from complete absorption of yolk to development of full complement of adult fin rays and absorption of finfold.
- Juvenile – Phase of development from complete fin ray development and finfold absorption to sexual maturity (includes young-of-year fish).

Boat Electrofishing

Boat electrofishing on July 27, 2020 for pre-construction consisted of using a boom-shocker mounted to a 22-ft aluminum welded boat powered by a 75-hp two-stroke outboard motor. The boom shocking equipment was powered by a Smith-Root GPP5.0 electrofisher supplying DC voltage to two boom-mounted electrode arrays manufactured by Oquawka Boats and Fabrications, Inc. The GPP5.0 was set for high-range voltage, between 30% and 40% power and 60 pulses per second, with a pulse width set between 5-6 amps. Boat electrofishing was conducted at near-shore and offshore locations to sample a variety of habitats and depths to gain a comprehensive coverage of the fish habitats and species present (Figure 2). At the end of each

Figure 2. Boat Electrofishing During Pre-Construction Monitoring at the Hennepin Marsh Habitat Restoration Project.

sampling transect, fish were identified to the species level and measured to the inch class. The exception to this is Common Carp *Cyprinus carpio*, which were, in most cases, not sampled but visually counted while sampling occurred. Fish were then released live back into the water.

Fyke Nets

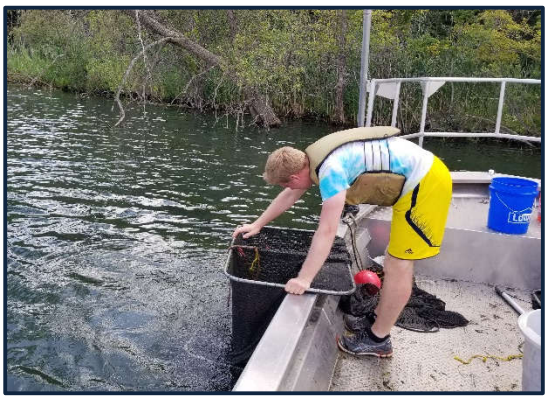

Figure 3. Recovering Fyke Nets During Pre-Construction Monitoring at the Hennepin Marsh Habitat Restoration Project.

Four fyke nets were deployed on and July 28, 2020 for pre-construction monitoring near the shoreline with adequate water depths and suitable substrates (Figure 3). Four mini fyke nets with a mouth opening 0.75 m high × 1.25 m wide constructed with 4 mm delta mesh, with a 1 m by 7.5 m single lead were set so the lead was perpendicular to the shore and the mouth sitting in approximately 1 m of water. Fyke nets were set in the same places for both monitoring events based on GPS coordinates. The nets were set for one crepuscular (overnight) cycle. After the recovery of each net, fish were identified to the species level and measured to the nearest inch class. Fish were then released back into the water.

Data Analysis

Three project performance measures will be assessed (increase or decrease) based on the abundance and densities of young-of-year (YOY) and juvenile fish present within the project area during the pre and post construction monitoring. These metrics will be used as a baseline in NOAA reporting Section B. However, this report will not include a discussion of these measures, since post-construction monitoring has not been completed. The project performance measures are:

- # Larvae/m^3 of water volume
- # YOY and Juveniles per net night
- # YOY and Juveniles per minute of effort

Fish assemblage data for the pre-construction monitoring were assessed for species composition (richness), abundance, and size structure. Size structure for target species was assessed by plotting

size-frequency distributions. Catch per unit effort (CPUE; an indirect measure of abundance) was calculated as:

$$\text{CPUE} = \frac{n}{t}$$

Where n = the number of individuals sampled, and t = the length of the sampling time in minutes.

To show project-wide utilization of the fish assemblage present within the Hennepin Marsh restoration area, sampling units were combined for each of the three sampling gear types. For example, the inside and outside electrofishing transects were combined into one dataset, the four fyke nets were combined into one dataset, and the four larval fish tows were combined into one dataset. For size class distributions, all electrofishing and fyke net data were combined.

Fish species were also grouped based on their ecological or social importance into three categories: game, rough, and forage. Game fish are typically of recreational and commercial importance and are species commonly targeted by anglers. Examples would include Largemouth Bass *Micropterus salmoides* and Yellow Perch *Perca flavescens*. Rough fish are typically species not commonly targeted by anglers or commonly eaten, within a regional context. Examples would include catfish, suckers, and redhorse species. Forage fish are species that are commonly eaten as a prey source for aquatic and/or terrestrial animal species. Examples would include minnows and shiners.

Results - Pre-Construction

Ichthyoplankton

Ichthyoplankton were present during each month of sampling at Hennepin Marsh. Eggs were only present in April, containing only Gizzard Shad *Dorosoma cepedianum* and White Bass/Perch *Morone sp.* eggs (Table 1). May samples had the highest abundance and density of individual ichthyoplankton captured, while June had the highest species richness (Table 1). During the June and July sampling events, only post yolk-sac larvae were present in the samples. Post yolk-sac larvae did not appear in samples until the June sampling event, and eggs were completely absent in the samples by July. Because aquatic vegetation was dense during the later sampling months (June and July), this may have affected the capture efficiency of the net tows.

Table 1. Catch Data from the Larval Fish Sampling Conducted from April-July 2018.

Common Name	Scientific Name	Life Stage	April		May		June		July		Combined	
			No.	Density (Larvae/m^3)	No.	Density (Larvae/m^3)	No.	Density (Larvae/m^3)	No.	Density (Larvae/m^3)	No.	Density (Larvae/m^3)
Bluntnose Minnow	*Pimephales notatus*	PYSL							1	0.006	1	0.002
Common Carp	*Cyprinus carpio*	PYSL							1	0.006	1	0.002
Common Carp	*Cyprinus carpio*	YSL					11	0.071			11	0.018
Emerald Shiner	*Notropis atherinoides*	YSL					15	0.096			15	0.024
Freshwater Drum	*Aplodinotus grunniens*	YSL							3	0.019	3	0.005
Gizzard Shad	*Dorosoma cepedianum*	Egg	1	0.006							1	0.002
Gizzard Shad	*Dorosoma cepedianum*	PYSL					1	0.006	1	0.006	2	0.003
Gizzard Shad	*Dorosoma cepedianum*	YSL			1	0.006					1	0.002
Rock Bass	*Ambloplites rupestris*	Juvenile							1	0.006	1	0.002
Round Goby	*Neogobius melanostomus*	Juvenile							4	0.026	4	0.006
Round Goby	*Neogobius melanostomus*	PYSL					2	0.013	3	0.019	5	0.008
Walleye	*Sander vitreus*	YSL			1	0.006					1	0.002
White Perch/Bass	*Morone sp.*	Egg	1	0.006			2	0.013			3	0.005
White Perch/Bass	*Morone sp.*	YSL			8	0.051					8	0.013
		Total	2	0.013	10	0.064	31	0.199	14	0.090	57	0.092

Fyke Nets

Upon recovery of one of the nets, a large hole was discovered in the cod end of the crib. That net only contained three fish and likely did not fish effectively due to the hole. However, those data are still included in the dataset.

Thirteen species and 56 individuals were captured in fyke nets recovered on July 29, 2018 (Table 2). Over 80% of the species captured were in the Centrarchidae (sunfish) family. However, the dominant species captured in the fyke nets were Rock Bass *Ambloplites rupestris*, followed by Largemouth Bass *Micropterus salmoides*, and Bluegill *Lepomis macrochirus*. Species other than those in the Centrarchidae family were captured in very low abundances (two or fewer).

Table 2. Fish Assemblage Data from Deployed Fyke Nets, Conducted at Hennepin Marsh in 2020 for Pre-Construction Monitoring.

Common Name	Species Name	Pre-Construction
Black Bullhead	*Ameiurus melas*	1
Bluegill	*Lepomis macrochirus*	11
Bowfin	*Amia calva*	1
Brown Bullhead	*Ameiurus nebulosus*	2
Channel Catfish	*Ictalurus punctatus*	1
Freshwater Drum	*Aplodinotus grunniens*	1
Green Sunfish	*Lepomis cyanellus*	10
Largemouth Bass	*Micropterus salmoides*	12
Rock Bass	*Ambloplites rupestris*	13
Round Goby	*Neogobius melanostomus*	1
Tubenose Goby	*Proterorhinus semilunaris*	1
Yellow Bullhead	*Ameiurus natalis*	1
Yellow Perch	*Perca flavescens*	1
	Total	**56**

Electrofishing

Electrofishing surveys yielded a total of 25 species among 10 families, and 333 individuals. The dominant species captured were Yellow Perch, Common Carp, and Goldfish *Carassius auratus* (Table 3). Yellow Perch accounted for 65% of the total catch and were the most abundant species (approximately 3 Yellow Perch per minute of sampling time). The species captured were typical of large river assemblages, but also included species that are found in calmer waters with abundant vegetation (e.g., Longnose Gar *Lepisosteus osseus* (Figure 4), Western Banded Killifish *Fundulus diaphanous*, and bullheads).

Figure 4. Longnose Gar Captured During Electrofishing Surveys at Hennepin Marsh in 2020 for Pre-Construction Monitoring.

Table 3. Fish Assemblage Data from Electrofishing Surveys, Conducted at Hennepin Marsh in 2020.

Common Name	Species Name	Pre-Construction	
		Number	CPUE (fish/min.)
Black Bullhead	*Ameiurus melas*	7	0.10
Bluntnose Minnow	*Pimephales notatus*	9	0.13
Bowfin	*Amia calva*	5	0.07
Brook Silverside	*Labidesthes sicculus*	1	0.01
Brown Bullhead	*Ameiurus nebulosus*	2	0.03
Common Carp	*Cyprinus carpio*	22*	0.31
Common Shiner	*Luxilus cornutus*	8	0.11
Emerald Shiner	*Notropis atherinoides*	7	0.10
Freshwater Drum	*Aplodinotus grunniens*	3	0.04
Golden Redhorse	*Moxostoma erythrurum*	1	0.01
Golden Shiner	*Notemigonus crysoleucas*	1	0.01

Common Name	Species Name	Pre-Construction	
		Number	CPUE (fish/min.)
Goldfish	*Carassius auratus*	18	0.26
Green Sunfish	*Lepomis cyanellus*	1	0.01
Hornyhead Chub	*Nocomis biguttatus*	1	0.01
Largemouth Bass	*Micropterus salmoides*	15	0.21
Longnose Gar	*Lepisosteus osseus*	2	0.03
Pumpkinseed	*Lepomis gibbosus*	2	0.03
Rock Bass	*Ambloplites rupestris*	2	0.03
Smallmouth Bass	*Micropterus dolomieu*	1	0.01
Spottail Shiner	*Notropis hudsonius*	1	0.01
Spotted Sucker	*Minytrema melanops*	2	0.03
Striped Shiner	*Luxilus chrysocephalus*	2	0.03
Western Banded Killifish	*Fundulus diaphanus*	1	0.01
Yellow Bullhead	*Ameiurus natalis*	1	0.01
Yellow Perch	*Perca flavescens*	218	3.11
	Total	333	4.75
	Effort (min.)	70.1	

*Estimated abundances, as most Common Carp were visually counted and not netted.

Size Trends and Performance Metrics

The baseline performance metrics that will be used to compare to post-construction monitoring are included in Table 4. Small size classes were abundant for fish captured around Hennepin Marsh during the electrofishing and fyke net surveys (Figure 5).

Table 4. Performance Metrics to be Used in NOAA Reporting Section B.

Performance Metric	Value
# Larvae/m^3	0.092
# YOY and Juveniles per net night	37
# YOY and Juveniles per minute of effort	3

While larger adults were captured for many species, many of the sport fish captured during the survey were juveniles. This is evident with Largemouth Bass and Yellow Perch. (Figure 5). Because of the trend of fishes captured that were young-of-year or juveniles, the data indicate that littoral habitats around Hennepin Marsh are being utilized by numerous species for spawning and nursery habitat.

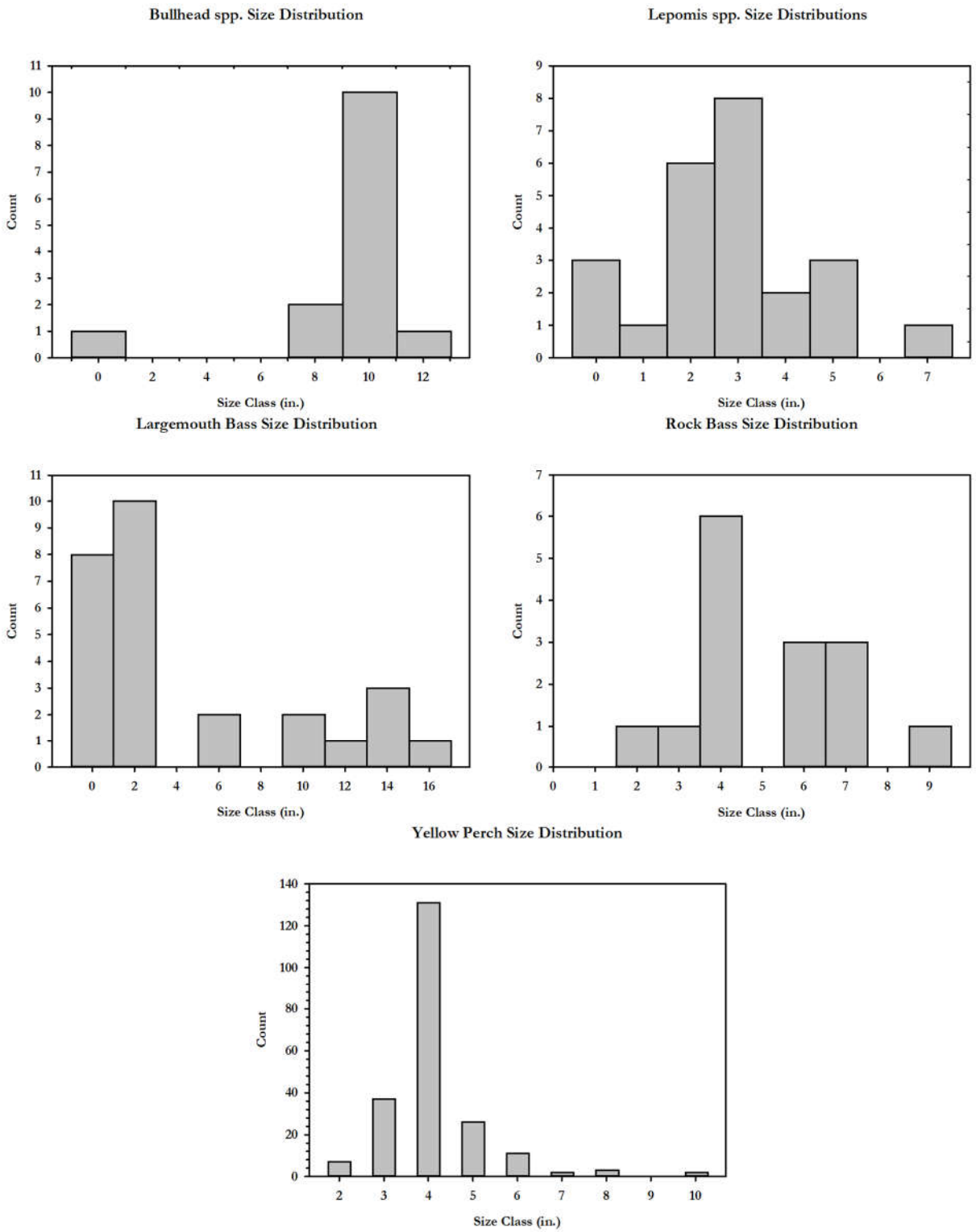

Figure 5. Size Class Distributions for Fish Captured During Electrofishing and Fyke Net Sampling Around Hennepin Marsh During the Pre-Construction Collections.