Prepared for:
NJDEP Bureau of Marine Water Monitoring
Leeds Point, New Jersey 08220
and
Monmouth County Division of Engineering
Freehold, New Jersey 07728



2014 Wreck Pond Fall Fish Inventory Study with Emphasis on Field Monitoring of Juvenile Alewife and Blueback Herring

Supplemental Report - Fall Sampling Results

Wreck Pond, Spring Lake and Sea Girt, Monmouth County, New Jersey

December 2014

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Supplemental Report - Fall Sampling Results

Prepared By Capt. Alek Modjeski

Reviewed By Tim Dillingham

American Littoral Society
December 2014
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1.0 INTRODUCTION

1.1 PURPOSE AND NEED

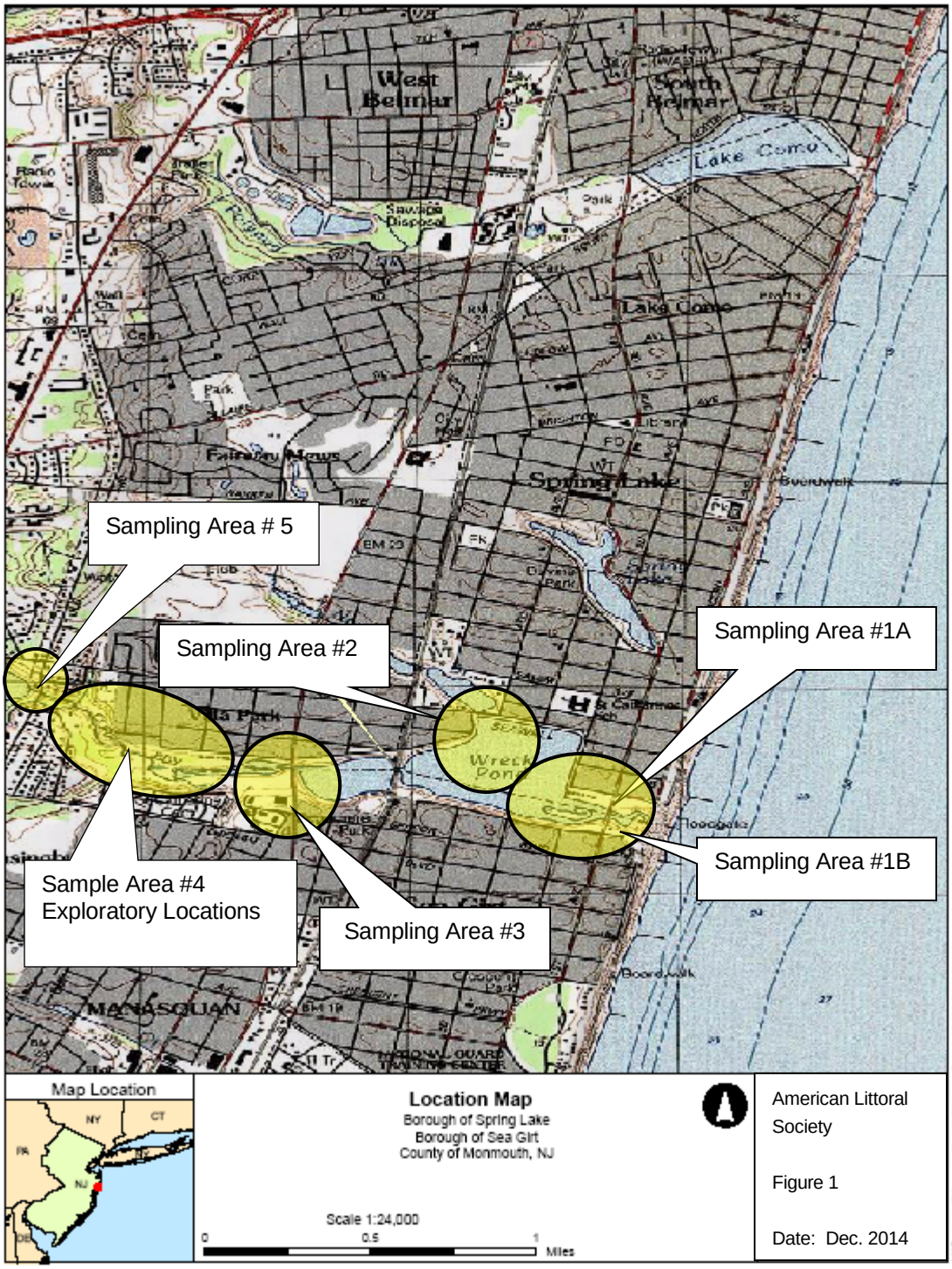
The United States Fish and Wildlife Service (USFWS) was awarded a grant in October 2013 through the Department of Interior (DOI) to reestablish fish passage for anadromous fish to Wreck Pond while also advising on restoring dune and beach habitat used by federally listed threatened wildlife. Currently, the only connection between the Atlantic Ocean and Wreck Pond is an 800 foot long, 84-inch diameter pipe.

As part of the USFWS Wreck Pond Fish Passage and Dune Reconstruction Project ("Project"), a secondary corridor consisting of a five and a half (5.5) foot by eight (8) foot concrete bypass box culvert is proposed to be installed alongside the existing pipe and span approximately 600 feet from the Wreck Pond spillway into the Atlantic Ocean. The completed project would provide improved aquatic connectivity for passage of migratory fish including alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), and American eel (*Anguilla rostrata*), and would be designed to maximize access into and from Wreck Pond and its tributaries during spring immigration and fall emigration. Current velocity and flow through the box culvert would be monitored post-construction and baffles (if needed to adjust for optimal current velocity for fish passage) could be installed to a distance of up to 50 feet from the pond-side outfall opening if needed. Additionally, a water control structure would be installed at the pond-side opening of the culvert to help control the water level within the pond and to close the pipe if water quality along the beach becomes an issue. The Service would also advise on the potential reconstruction of the dune and berm system impacted by Sandy to minimize impact to nesting habitat for the federally-listed threatened piping plover (*Charadrius melodus*) and the state-listed least tern (*Sterna antillarum*). Project construction start date is tentatively scheduled for late spring 2015.

To better determine the success of the USFWS Project, improvement to fish passage through the installation of a bypass culvert, and if herring species are present and spawning; the Wreck Pond Technical Advisory Committee (TAC) recommended that a spring and fall fish inventory be initiated prior to construction. Emphasis would be focused on verifying alewife and blueback herring presence and use at Wreck Pond.

The County of Monmouth, through funding provided by the New Jersey Department of Environmental Protection (NJDEP) Division of Water Monitoring and Standards, contracted the American Littoral Society (ALS) to conduct the baseline fish inventory for the spring and fall of 2014. Collected data from the spring survey confirmed that a viable herring run still exists within Wreck Pond and provided baseline pre-construction migration data to be compared with post-construction survey results. Collected data from the fall seine survey confirmed presence of juvenile and Young-of-Year (YOY) herring and gave evidence of a spawning clupeid population in the Wreck Pond watershed. The spring 2014 survey report is provided in Appendix A (American Littoral Society, 2014) and provides a brief summary of the fall survey methodology, results, and conclusions. This report is a supplement to the spring report and contains the results of the fall 2014 survey. Further detail on survey objectives, site location and history, and herring life history are given in the spring 2014 survey report (Appendix A). Figure 1 gives project location and sampling sites.

Figure 1 - Project Location and Sampling Areas -Wreck Pond



2.0 SURVEY METHODOLOGY AND MATERIALS

The American Littoral Society (ALS) submitted a scientific collections permit application in preparation for the spring and fall 2014 survey in April 2014. A New Jersey Scientific Collections Permit (Permit #1444) was issued on April 16, 2014 (Appendix B). The following describes the sampling locations, equipment, and protocol used to sample for presence/absence of juvenile/YOY clupeid species at Wreck Pond in fall 2014.

2.1 SAMPLING LOCATION

Active sampling was performed at four (4) areas within Wreck Pond with primary focus at two (2) sites (Areas 1A and 1B) located adjacent to the outfall along the Spring Lake and Sea Girt side of the waterbody respectively (Figure 1). Other areas sampled included Area #2 located along the northern shoreline of the main waterbody in Spring Lake along Ocean Road, Area #3 located along the southern shoreline of a Wall Township Open Space Area (Jimmy Burns site) slightly west of the Route 71 bridge, Area #4 between Mill Pond and the Jimmy Burns site, and Area #5 located near the confluence of Hannabrand Brook and Wreck Pond Brook close to Old Mill Pond (Figure 1). Photographs from sampling events are given in Appendix C.

2.2 EQUIPMENT

Dependent on site accessibility and water depth, ALS used either a 30-foot, ¼" nylon mesh bag seine with a 4'x 4' x 4' bag or a 100-foot ¼" nylon mesh bag seine with a 6'x6'x6' bag to actively search for and confirm presence of juvenile river herring. The 100-foot seine net was deployed from the shoreline with the help of a small aluminum 12' skiff (Registration #NJ 8162 HF) powered by a Minn Kota 50lb thrust electric trolling motor. Net mesh size was consistent with that previously used in the 2008 ENSR/AECOM spring study and was chosen in consultation with the Bureau of Marine Fisheries in 2007 and 2008 to ensure effective catch with minimal impact to collected fish.

Water quality measurements (water temperature, dissolved oxygen, pH, salinity, specific conductivity) were taken during each event, with the exception of the first event, with a YSI multi-probed water quality meter and a 650 MDS data logger. Calibration was completed prior to sampling by Monmouth University Urban Coast Institute staff in accordance with the NJDEP Bureau of Marine Water Monitoring laboratory standards located at Leeds Points, New Jersey. Parameters measured included conductivity, specific conductivity, salinity, dissolved oxygen, water temperature, pH, and turbidity.

2.3 SAMPLING METHODS

Sampling methodology was similar to that used in the ENSR/AECOM 2008 sampling where 30 foot and 100 foot seine nets were used. Sampling was conducted five (5) times over a period of five (5) weeks (Table 1).

Table 1 - Sampling Dates

8-Sep
11-Sep
18-Sep
25-Sep
10-Oct

The sampling effort consisted of one to two seine hauls at various locations during each event with net choice dependent on width, depth and openness/accessibility of waterbody. At open water sites, the 100-foot seine net was deployed from the beach with the help of a small aluminum 12' skiff (Registration #NJ 8162 HF) powered by a Minn Kota 50lb thrust electric trolling motor. One or more samplers remained onshore in a stationary position with one end of the net while the remainder of the net was deployed from the vessel's bow into the current with vessel movement away from shore. When about three quarters of the net was deployed, the vessel returned shoreward, creating a semicircular net set that was then hauled ashore manually. In less accessible areas (i.e. Sampling Area #4) where depth was usually less than 4 feet, seining was performed using the 30-foot net. The 30-foot seine net was pulled by two biologists, one at each end, for a predetermined distance (usually 50 to 300 feet in distance) and then hauled ashore upcurrent. In cases where overhanging vegetation, pools, and undercut banks provided retreat habitat outside of the main channel, a third biologist walked ahead of the seine and attempted to flush out any river herring occupying shoreline habitat. On average, sampling and processing took about one (1) hour at each site.

During net retrieval, measures were taken to limit stress to captured species, allow for sample accumulation within the bag at an even pace, and to ensure survivability of species collected. The net retrieval process consisted of hauling the seine net ashore and carefully monitoring the lead-line to ensure it stayed in contact with substrate to minimize catch escape. Once the bag was close to the shoreline, the lead-line and float-line of the bag were pulled ashore simultaneously to ensure that none of the captured species were lost. Species were then removed from the net and placed into buckets/baskets for processing. The net's wings and bag were re-inspected for any species that might have been missed during initial sorting. Species collected during re-inspection were processed with the original sample. During initial sorting, the bag remained partially submerged to increase survivability of collected species.

The processing of sub-sampled fish and invertebrate species collected included confirmation of taxonomic identification, enumeration, individual length determination and individual weight and/or batch weight. Dependent on species; fork length (FL) and/or total length (TL) was recorded. It is important to note that the primary focus of the survey was to find YOY herring and create species inventory list. After the first event on September 8, 2014 when large amounts of bait fish of similar size/age classes were captured per haul (e.g. killifish, sheepshead minnows, silversides, and mummichogs over 4 gallons), it was determined in discussion with NJDEP and USFWS biologists, that a representative sub-sample of species would be processed and volumes estimated in an effort to improve survivability of remaining species. In the event that species were batch weighed, sorting buckets or containers were tared and weights were recorded in grams. In addition, species condition at time of release (i.e., live, fresh dead, or dead) was recorded. To further minimize mortality, fish processing was expedient and did not require a significant amount of time per individual. Once individual processing was complete, live specimens were released downcurrent of the sample site. All data was recorded on updated ALS data sheets (Appendix C).

In further discussion with NJDEP and USFWS, it was also determined that once, and if, YOY herring were captured, no further sampling events would be scheduled. This was decided in an effort to increase survivability of the species in the event that a large school of herring was collected as well as to further ensure potential continued viability of the Wreck Pond population as it is understood that the herring population along the east coast is in decline and the Wreck Pond population does contribute to the overall abundance of the species.

3.0 RESULTS

A total of five sampling events were conducted in Wreck Pond between September 8th and October 10th 2014. Sampling schedule was based on local tide tables for the open Atlantic Ocean in nearshore waters of Belmar, New Jersey and sampling sequence followed either the tide change between flood and ebb or the movement of the outgoing tide. Sampling times were scheduled to coincide as closely as possible to the change between flood and ebb tide. In addition, sampling events were also scheduled (when possible) after a rain event as YOY herring have been known to move downstream after rain events. Tidal information for each event is given in Table 2. Species collected by sampling event are given in Table 4.

Table 2 - 2014 Tide Table for the Atlantic Ocean at Belmar, NJ from September 8 – October 10, 2014

Tide Table for Belmar, New Jersey September 8 – October 10									
Date	**High Tide**	**High Tide**	**Low Tide**	**Low Tide**	**Sunrise**	**Sunset**	**Moonrise**	**Moonset**	**Moon Phase**
9/8/14	07:02 5.6	19:25 6.0	00:51 -0.7	13:13 -0.6	06:30	19:17	18:55	05:52	Full
9/11/14	09:32 5.9	21:56 5.5	03:15 -0.8	15:48 -0.5	06:33	19:12	20:48	09:27	3rd
9/18/14	03:26 4.1	15:46 4.5	09:32 1.0	22:21 0.8	06:40	19:00	01:29	15:50	3rd
9/25/14	08:31 5.1	20:40 4.8	02:20 0.2	14:43 0.2	06:47	18:48	08:02	19:31	New
10/10/14	09:08 5.88	21:36 5.18	02:52 -0.6	15:30 -0.5	07:01	18:23	20:03	09:21	3rd

Water quality measurements (water temperature, dissolved oxygen, pH, salinity, specific conductivity) were taken during each event, with the exception of the first event, with a YSI multi-probed water quality meter and a 650 MDS data logger. Water quality was not taken during the first event because a water quality meter was not available. Water quality data is given in Table 3. Low DO readings may be indicative to probe malfunction.

Two (2) juvenile alewife, one (1) live and one (1) freshly dead, were collected on October 10th, which consequently became the last sampling date. The presence of juvenile alewife coincided with a large run of bay anchovies. No blueback herring were collected. The one live alewife collected was released in a live condition. Individual lengths and species conditions prior to release are given in Appendix D.

In addition to processing targeted clupeids, other collected species were measured, enumerated, weighed (when applicable), and identified to the lowest practical taxonomical level (see Appendix C and D, Table 3). For highly abundant non-clupeid species, counts were simply estimated and fish were returned to the pond as quickly as possible to avoid any deaths due to handling time. A total of 22 other fish species were collected during the surveys and included the following: banded killifish (*Fundulus diaphanus*), striped killifish (*Fundulus majalis*), mummichog (*Fundulus heteroclitus*), winter flounder (*Pseudopleuronectes americanus*), summer flounder (*Paralichthys dentatus*), spottail flounder (*Bothus robinsi*), windowpane flounder (*Scopthalmus aquosus*), unknown flounder, Atlantic silverside (*Menidia menidia*), inland silverside (*Menidia beryllina*), bay anchovy (*Anchoa mitchilli*), bluefish (*Pomatomus saltatrix*), sand eel (*Ammodytes tobianus*), northern searobin

(*Prionotus carolinus*), sheepshead minnow (*Cyprinodon variegatus*), northern kingfish (*Menticirrhus saxatilis*), southern kingfish (*Menticirrhus americanus*), northern puffer (*Sphoeroides maculatus*), lined seahorse (*Hippocampus sp*.), yellow perch (*Perca flavescens*), bluegill (*Lepomis macrochirus*), and white sucker (*Catostomus commersoni*). In addition to the fish species listed above, the following invertebrate species were collected: blue crab (*Callinectes sapidus*), lady crab (*Ovalipes ocellatus*), green crab (*Carcinus maenas*), rock crab (*Cancer irroratus*), spider crab (*Libinia emarginata*), white fringed mud crab (*Scylla* sp.), grass shrimp (*Palaemonetes* sp*.)*, sand shrimp (*Crangon septemspinosa*), quahog (*Mercenaria mercenaria*), and moon jelly (*Aurelia aurita*). A list of species processed (by common names) and estimated abundances per sample are given in Table 4.

Table 3 - Wreck Pond Water Quality Data by Event and Sample Location

DateTime	Temp	SpCond	Salinity	DO Conc	DO%	pH
M/D/Y	C	uS/cm	ppt	mg/L	%	
9/11/2014 10:00	21.60	466.0	30.20	1.35	17.6	7.90
9/11/2014 12:22	28.70	333.0	0.16	8.43	95.5	7.87
9/18/2014 10:00	20.30	331.5	21.38	3.76	43.5	7.82
9/25/2014 11:14	19.35	464.1	30.11	ND	ND	8.00
9/25/2014 14:47	19.73	385.0	0.18	6.24	68.5	7.60
10/10/2014 9:45	18.53	495.5	32.46	ND	ND	8.06

ND = no data, error readings

Table 4 - Summary of Species Collected by Sampling Event

Sample ID Number	Alewife	Blueback	Banded killifish	Striped killifish	Mummichog	Winter flounder	Summer flounder	Spotfail flounder	Windowpane flounder	Unknown flounder	Silverside	Bay anchovy	Bluefish	Sand eel	Northern searobin	Sheepshead minnow	Northern kingfish	Southern kingfish	Crevalle jack	Northern puffer	Seahorse	Yellow Perch	Bluegill	White sucker	Blue crab	Lady crab	Green crab	Rock crab	Spider crab	White fringed mud crab	Grass shrimp	Sand shrimp	Quahog	Moon jelly	Unknown
WP090814-1			17	18	3						25+				1	1	25+			4					3											
WP090814-2			1+	7+	1											20+									3									1		
WP091114-1			1	6	1						21					5	6								5											
WP091114-5																						1														
WP091114-5 (attempt)																																				
WP091114-5B (attempt)																																				
WP091814-1A				25+	9+	15					19+				1	1+	32+								6						3	1				
WP091814-1B						5		1	5	9	25+				1	6	25+			8					11	6					2	5				
WP092514-1A				1+	3+				2	1	25+				1	3	14+				1				4+	7		1+	1	1		1				
WP092514-1B						4	3		2	4	25				1		43	1	1	1					5	20										
WP092514-3A			2																				5	43	1	1								1	
WP101014-1A					1	1	1				25	25	4	1			15			1						25	1				1					
WP101014-1B	2					1	5		2	1	9	1+	10		1		25			1						9	8	1								
Total	2	0	2	45+	44+	31	9	1	11	15	174+	26+	14	1	6	36+	185+	1	1	15	1	5	44	1	72+	42	1	11+	1	1	3	10	1	1	1

4.0 CONCLUSION

The objective for the fall 2014 young-of-year (YOY) seine sampling in Wreck Pond was to determine the presence of juvenile and/or YOY alewife or blueback herring (approx. 5cm total length). Presence would help show that an active spawning population exists within the waterbody. Though herring are known to move in "waves," only two (2) juvenile alewife were collected amongst a large school of bay anchovy. A large-scale movement or "wave" of alewife was not observed or documented during this sampling effort. No juvenile blueback were collected. It is possible that more juvenile herring were within the Wreck Pond watershed and the survey could be extended to accommodate a wave in the future. It is also possible that the majority of juvenile herring are migrating at night, or that smaller numbers of herring are migrating with larger schools of bay anchovy to improve survivability and minimize predation prior to and upon entering the ocean.

Sampling for this program targeted early to mid-fall juvenile emigration and was based on our interpretation of the known behavior and life history of juvenile alewife and blueback as well as when the spring adult run was recorded. The spring survey showed adult alewife entered Wreck Pond and moved upstream late April and early May. Blueback herring, though targeted during the spring survey, were not collected which may be the reason we did not collect blueback juveniles in the fall. It is hypothesized that the existing outfall pipe may prevent blueback from entering due to their known photosensitivity but the outfall pipe does not hinder alewife movement. Knowing when the species migrated into Wreck Pond further allowed for an improved estimate of when the juvenile or YOY herring would be mature enough to begin emigration. It was determined that September would be the start of the fall survey and that juvenile herring could potentially begin emigration around that time frame. Our survey was extended in the event that blueback herring may be present, however, since the first alewife individuals were not collected until the October 8th sampling event, it is possible that we missed the migration period of juvenile blueback as juvenile migration of alewife generally occurs about one month earlier than that of blueback herring (Lafrate and Oliveira 2008, Kissil 1974, Loesch 1969). Sampling should be extended at least one month past the first collection of alewife to determine whether blueback are present.

It has been documented in other regions along the east coast that juvenile herring start heading downstream, initiating their first phase of seaward migration, when water temperatures begin to drop in the late summer through early winter (Pardue 1983; Loesch 1987). Preferred temperatures range between 15 and 21ºC (Greene et. al., 2009). The majority of recorded water temperatures during the Wreck Pond fall surveys were between 18 and 21ºC. Herring were collected when the water temperature was 21ºC.

Additionally, juvenile herring may also remain a short while in saline waters before entering the ocean. Sampling was focused on a weekly basis in Areas 1A and 1B where water was brackish and deeper in an effort to maximize catch per unit effort. Migration downstream is also documented to be prompted by changes in water flow, water levels, precipitation, and light intensity (Cooper 1961; Kissil 1974; Richkus 1975a, 1975b; Pardue 1983). We were able to perform one sampling event after a rain event though no herring were collected during that effort.

Overall, the presence of juvenile alewife was documented during the fall seine survey. Though a large run was not observed, it can be concluded that there is active alewife spawning in Wreck Pond. As stated previously, blueback herring were not observed and it is not known if blueback use Wreck Pond to spawn. It is hopeful that with improved aquatic connectivity, blueback may use Wreck Pond in the future and emigration numbers of blueback and alewife may be larger.

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Appendix A

Spring 2014 Wreck Pond Survey Report

Prepared for:
NJDEP Bureau of Marine Water Monitoring
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and
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1.0 Introduction

1.1 PURPOSE AND NEED

The United States Fish and Wildlife Service (USFWS) was awarded a grant in October 2013 through the Department of Interior (DOI) to reestablish fish passage for anadromous fish to Wreck Pond while also restoring dune and beach habitat used by federally listed threatened wildlife. Currently, the only connection between the Atlantic Ocean and Wreck Pond is an 800 foot, 84-inch diameter pipe.

As part of the USFWS Wreck Pond Fish Passage and Dune Reconstruction Project ("Project"), a secondary corridor consisting of a six (6) foot by eight (8) foot bypass box culvert is proposed to be installed alongside the existing pipe and span approximately 500 to 600 feet from the Wreck Pond spillway into the Atlantic Ocean. The completed Project would provide improved aquatic connectivity for fish passage for migratory fish including alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), and American eel (*Anguilla rostrata*) and would be designed to maximize access into and from Wreck Pond and its tributaries during spring migration and fall emigration. The Service would also advise on the potential reconstruction of the dune and berm system impacted by Sandy to minimize impact to nesting habitat for the federally listed threatened piping plover (*Charadrius melodus*) and the state listed least tern (*Sterna antillarum*). Project construction start date is tentatively scheduled for 2015.

Current use and presence/absence of anadromous and catadromous species within Wreck Pond, post Hurricane Sandy, is unknown. The most recent fish surveys were performed each spring from 2006 to 2008 as a condition of NJDEP Permit 1300-04-0010.1 (WFD 040001) and did not provide an adequate, current snapshot of diadromous use or indicate if spawning was taking place. No data has been collected since 2008 that could provide usable data on current habitat quality, diadromous use, spawning activity, fish abundance, and fish biodiversity. To better determine the success of the USFWS Project, improvement to fish passage through the installation of a bypass culvert, and if herring species are present and spawning; the Wreck Pond Technical Advisory Committee (TAC) recommended that a spring and fall fish inventory study be initiated prior to construction. Emphasis would be focused on verifying alewife and blueback herring presence and use at Wreck Pond.

The Monmouth County Division of Engineering, through funding provided by the New Jersey Department of Environmental Protection (NJDEP) Division of Water Monitoring and Standards, contracted the American Littoral Society (ALS) to conduct the baseline fish inventory study. Collected data will confirm if a viable herring run still exists within Wreck Pond and provide baseline pre-construction data to be compared with post-construction survey results. Overall, the study was designed to provide the following:

1) Baseline data for anadromous movement within Wreck Pond during spring migration and fall juvenile emigration;

2) An inventory of aquatic species collected using both passive and active sampling methods at various locations throughout Wreck Pond;

3) A comparison of movement and abundance from past surveys in 2006-2008 to be applied to current data and data to be collected post-construction;

4) Measurements, weights, and enumeration of collected species; and

5) Verification if anadromous spawning is occurring in Wreck Pond.

For the purpose of this report, only 2014 spring sampling will be discussed. A supplemental report summarizing the 2014 fall sampling will be provided under separate cover once sampling has been completed.

1.2 SITE LOCATION AND HISTORY

Wreck Pond is located between the boroughs of Sea Girt and Spring Lake, Monmouth County, New Jersey (Figure 1) and is connected directly to the Atlantic Ocean by an 84-inch diameter, 800-foot long intake/outfall structure (includes 300' extension completed in 2006). Watershed area is approximately 12.8 square miles (8,172 acres) and the Pond has an area of approximately 73 acres. The Pond is considered a shallow waterbody with depths ranging between one (1) to 1.5 feet deep under normal water level conditions (Najarian, 2011).There are three major tributaries in the watershed and include Hannabrand Brook, Wreck Pond Brook, and Black Creek, as well as several other ponds. Land use consists of a mix of wooded areas, agricultural areas, low to medium density residential areas, and mixed-use areas. Drainage into the system originates from its tributary streams and from storm water runoff through storm drains located in surrounding residential areas. As aforementioned, the eastern end of Wreck Pond contains an outfall structure that exchanges water with the Atlantic Ocean. The area where Wreck Pond interacts with near shore waters is classified by the New Jersey Department of Environmental Protection (NJDEP) as "Prohibited for Shellfish Harvest".

Wreck Pond has been identified and documented as a confirmed anadromous spawning ground for alewife (*Alosa pseudoharengus)* and blueback herring (*Alosa aestivalis*) (NJDEP, 2000; Byrne, 1986; Zich, 1978). In 2006, the existing 84-inch diameter, 500-foot long outfall structure that connected Wreck Pond to the Atlantic Ocean was extended seaward an additional 300 feet by the NJDEP Bureau of Coastal Engineering in an effort to improve water quality. Conditions were specifically incorporated into the NJDEP permit to monitor alewife and blueback herring movement post-construction and to determine if the 300 foot extension of the existing 500 foot outfall pipe would physically hinder, obstruct, and/or prevent herring from entering Wreck Pond to spawn. Results from the herring surveys performed each spring between 2006 and 2007 using a fyke net indicated an unhindered, viable run of alewife within Wreck Pond though abundance declined over the three (3) year period. Results were inconclusive in confirming if mass movements of blueback existed. To increase catch probability for blueback, the 2008 survey increased the level of collection effort by incorporating seine netting at numerous locations within the entire watershed. The results of the 2008 sampling program verified a small presence and migration of alewife in Wreck Pond at the beginning of the sampling event, and some juvenile emigration towards the end of the program (June 3, 2008). Declining numbers of alewife over the three year study could have been associated with a number of variables to include gear changes, catch effort, survey timing, the pipe extension, fish photo-sensitivity, and a number of environmental parameters. A blueback run was not observed during any of the sampling events.

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Figure 1 Project Location Map - Wreck Pond

2.0 RIVER HERRING LIFE HISTORY

2.1 DESCRIPTION

Blueback herring (*Alosa aestivalis*) and alewife (*Alosa pseudoharengus*) are euryhaline, anadromous planktivores externally distinguishable by eye diameter and color (when freshly caught) and internally by the color of their peritoneum and number of gill rakers on the lower limb of the first gill arch. Adult bluebacks usually have a black peritoneum, smaller eye diameter, and approximately 44 to 50 gill rakers on the first limb of the first gill arch, whereas alewife have a more white to silvery coloration of the peritoneum, larger eye diameter, and 39 to 41 gill rakers on the first limb of the first gill arch. Alewife also have a slightly deeper body (Odell 1934; Loesch 1987; Robins, Ray, and Douglass, 1986). Though it may appear that species have discernible characteristics, determinations without internal confirmation between the two species are often difficult due to an overlap in habitat (Smith 1970).

2.2 LIFE HISTORY/SPAWNING CHARACTERISTICS

Juvenile, sub-adult, and adult alewife and blueback herring spend the majority of their life in the open ocean, but it has been documented that some alewife populations remain in freshwater. These populations in turn will migrate up sufficient rivers and streams for spawning (Scott & Crossman 1973). It has also been recorded that New Jersey inshore waters to 8km offshore, are an important over-wintering area for juvenile blueback (Bigelow and Schroeder, 2002). The following describes known spawning for blueback and alewife not landlocked in a freshwater system.

Initiation of spawning runs for alewife and blueback is temperature dependent (Bigelow and Schroeder, 2002; Bozeman and Van Den Avyle, 1989; Loesch, 1977). Alewife initiate spawning runs when water temperatures are between 5°-10°C, whereas blueback spawning begins in water temperatures between 10°-15°C (Loesch and Lund 1977). In the mid-Atlantic, alewife may begin spawning in late March early April and continue through May. Blueback initiate spawning runs about a month later, but the spawning peaks can differ by about 2-3 weeks (Hildebrand & Shroeder 1928; Loesch 1987). Ordinarily in New Jersey, there is a three to four week time difference between alewife and blueback spawning runs in sympatric areas (Don Byrne, NJDEP, pers. comm. November, 2005). Spawning times can also extend through August as long as temperatures remain below 27°C. Both species use similar hard ground habitats (gravel, packed sand, stones and sticks) along with relatively swift currents to spawn (Bigelow and Welsh 1925; Marcy 1976b; Loesch and Lund 1977). However when overlap occurs, herring will spawn in the main current flow of a river where the alewife will favor deeper pools and eddies along the shore bank (Loesch and Lund 1977). When eggs are deposited, they remain sticky and adhere to hard substrate up until about 24 hours when the eggs water hardens. Some eggs remain suspended and are dispersed due to a higher current flow. Eggs require an incubation time of 50 hours at 20-21°C (Kuntz & Radcliffe 1917; Jones et al. 1999).

3.0 SURVEY METHODOLOGY AND MATERIALS

Prior to initiating herring sampling, the American Littoral Society (ALS) identified an in-house supervisory fish biologist and forwarded primary surveyor qualifications and monitoring methodology to the Bureau of Marine Water Monitoring and Monmouth County Division of Engineering. In conjunction with the Bureau and County review, ALS submitted a scientific collections permit application in preparation for a May 1, 2014 sample start date. A New Jersey Scientific Collections Permit (Permit #0144) was issued on April 16, 2014 (Appendix A). Wreck Pond herring sampling was completed during three (3) lunar cycles from May 13th to June 13th, 2014. Sample event scheduling was based on the confirmed presence of clupeids in nearshore waters adjacent to Wreck Pond, presence of species based on 2006 - 2008 results, attainment of inshore water temperatures optimal for herring spawning, and the increased probability of herring movement relative to spring tide levels.

The following describes the sampling location, equipment, and protocol used to sample for presence/absence of clupeid species at Wreck Pond in 2014.

3.1 SAMPLING LOCATION

Sampling was performed in the same location as the 2006 and 2007 ENSR/AECOM surveys (Figure 1). The sampling site was located underneath the railroad bridge located directly west of the First Avenue Bridge and east of Route 71 in Spring Lake, New Jersey (Figure 1 and Appendix B). Adjacent shoreline perpendicular to the sampling site consisted of sand, riprap, large woody debris (LWD) and some vegetation. Shoreline underneath the railroad bridge consisted mostly of riprap and was bounded by the railroad bridge tiers (Appendix B). Water depth varied between two (2) to four (4) feet dependent on tide level and substrate consisted of large rocks and riprap associated with railroad and bridge construction. The channel located underneath the railroad bridge was approximately 25 to 30 feet in width and it was estimated that there was a tidal difference of approximately four (4) hours between Belmar Atlantic Ocean and the Wreck Pond Railroad Bridge.

3.2 EQUIPMENT

To remain consistent with the 2006 and 2007 surveys, ALS used the same sampling equipment employed in the ENSR/AECOM 2006 and 2007 Wreck Pond fish surveys. Gear employed included a fifteen (15) foot long fyke net with a four (4) foot by four (4) foot opening. The fyke net consisted of a series of five (5) hoops with two (2) funnel-shaped throats with one (1) inch stretch mesh. The net was attached to two 25-foot leaders/wings that were used to guide the fish into the mouth of the net and its throats. Prior to use, the fyke net was inspected for tears and untied throats and repaired accordingly.

Water quality at the sampling station was obtained each sampling event with a multi-probed YSI Environmental Monitoring System and a 650 MDS data-logger. Calibration was completed weekly by the NJDEP Bureau of Marine Water Monitoring laboratory at Leeds Points, New Jersey. Parameters measured included conductivity, specific conductivity, salinity, dissolved oxygen, water temperature, pH, and turbidity.

3.3 SAMPLING METHODS

As stated previously, initiation of spawning runs for alewife and blueback is temperature dependent (Bigelow and Schroeder, 2002; Bozeman and Van Den Avyle, 1989; Loesch, 1977). Alewife initiate spawning runs when water temperatures are between 5°-10°C, whereas blueback spawning begins in water temperatures between 10°-15°C (approximately 3-4 weeks after initiation of alewife migration in sympatric areas). ALS monitored water temperatures and preliminary movement of alewife daily along the New Jersey coast via local

Internet sites, interactions with the ALS Fish Tagging Department, reports from Atlantic coast anglers from multiple states, and through marine forecasts.

3.3.1 Preliminary Gear Investigations

On May 6th, 2014, ALS performed a preliminary gear set to ensure that the equipment was in proper working condition and to confirm that there were no major structural changes at the sample site. The fyke net was staked and set against the outgoing tide with the wings extending nearly the entire width of the channel beneath the bridge. A gap of roughly (two) 2 feet on either side of the wings was left open to ensure waterfowl and mammal access underneath the bridge. This shoreline gap was located above the mean low tide line and therefore only passable by aquatic organisms during high tide. The integrity of the net's exterior and wings, to include floats, lead-line, mesh, cod end security, and anchoring were inspected in-water. Gear was secure and net integrity was satisfactory. The fyke net was removed off-site after preliminary gear investigations were complete.

3.3.2 Physical Herring Sampling and Processing

Sampling protocol and processing for the 2014 survey replicated methodology used in 2006 and 2007. Sample event duration in 2014 was conducted one day before, the day of, and the day after the new or full moons. The first sampling event in 2014 (Sample Event 1) was initiated on the evening of May 12th, 2014 at 17:54 and concluded on May 16th, 2014. The remaining two events were performed May 27th - May 30th (Sample Event 2) and June 10th - June 13th (Sample Event 3). Signage, provided by the NJDEP Bureau of Marine Water Monitoring was posted on the northern and southern shorelines of the sample site to inform local residents and anglers about the sampling and to give contact information in the event that net tampering during the sampling event was witnessed (Appendix B).

The fyke net was positioned beneath the railroad bridge located immediately west of the First Avenue Bridge and east of Route 71 (Figure 1). During all three, three to four day sampling events, the net sampled continuously, 24 hours a day, except when catch was being processed. The net was deployed, retrieved for processing, and redeployed every 12 hours during each event. For each event, the fyke net was positioned and staked in the same manner as the preliminary gear investigation and the ENSR/AECOM 2006/2007 surveys.

The net retrieval process consisted of untying the cod-end of the net from its stationary stake, swinging the southern most wing northward in a counter-clockwise direction, and then pulling the net to the northern shore for fish processing. Once within a foot or two of the shoreline, the net was carefully lifted one hoop at a time to allow for sample accumulation within the cod end and to limit stress to captured species. Both the net's interior and wings were re-inspected for any remaining species that may have been missed during initial net retrieval. Species collected during re-inspection were processed with the original sample. During sorting, the cod end remained partially submerged to increase survivability of collected species. Herring were removed from the cod end first and transferred into partially submerged fish sorting baskets for processing (Appendix B). Sorting gloves were worn by processors to prevent further damage to the fish and remaining specimens were sorted by species, placed in either fish baskets or buckets according to size, and processed accordingly.

The processing of all fish and aquatic species collected included confirmation of taxonomic identification, enumeration, individual length determination and individual weight and/or batch weight. To show representative size of collected assemblages and assist in determining possible age class, fork length (FL) and total length (TL) were recorded for herring species and TL was recorded for all other species (dependent on caudal fin morphology). Since very few catches exceeded 25 individuals per species, length measurements to the nearest centimeter (cm) and individual weights to the nearest 0.1 gram (when applicable) were recorded for all processed species. In the event that species were batch weighed, sorting baskets or buckets were tared and weights were recorded in kilograms. In addition, species condition at time of release (i.e. live, fresh dead, or dead) was recorded. To minimize mortality, fish processing was expedient and did not require a significant

amount of time per individual. Once individual processing was complete, live specimens were released upstream of the sample site. When necessary, individuals were revived by gently passing water through their gills. All data was recorded on updated ALS data sheets (Appendix C).

4.0 RESULTS

A total of three fyke net sampling events lasting between three (3) and four (4) days in duration were conducted in Wreck Pond on May 13th-16th (Sampling Event 1), May 27th-30th (Sampling Event 2), and June11th – 13th (Sampling Event 3). Net deployment/retrieval times were based on local tide tables for the open Atlantic Ocean in the nearshore waters of Belmar, New Jersey. Due to the landward distance of the sampling site from the outfall, the timing of the ebb and flood tides were found to lag considerably from the published local tide charts (approximately 3-4 hours). Net deployment/retrieval times were amended (when applicable) to compensate for this tidal difference. Tidal information for each event is given in Table 1. Upon completion of species processing, nets were redeployed and retrieved until that particular sampling event was concluded.

Table 1- 2014 Tide Table for Atlantic Ocean Belmar, NJ (Sampling Dates)

Sampling Event 1								
Day	**High**	**Low**	**High**	**Low**	**High**	**Moon**	**Sunrise**	**Sunset**
Tue 5/13	-	12:45 AM EDT/ 0.0 ft	6:47 AM EDT/ 4.6 ft	12:51 PM EDT/ 0.1 ft	7:10 PM EDT/ 5.5 ft		5:42 AM EDT	8:03 PM EDT
Wed 5/14	-	1:33 AM EDT/ -0.2 ft	7:31 AM EDT/ 4.7 ft	1:36 PM EDT/ 0.0 ft	7:51 PM EDT/ 5.7 ft	Full Moon	5:41 AM EDT	8:04 PM EDT
Thu 5/15	-	2:20 AM EDT/ -0.3 ft	8:16 AM EDT/ 4.7 ft	2:23 PM EDT/ -0.1 ft	8:34 PM EDT/ 5.7 ft		5:40 AM EDT	8:05 PM EDT
Fri 5/16	-	3:06 AM EDT/ -0.4 ft	9:03 AM EDT/ 4.7 ft	3:09 PM EDT/ -0.1 ft	9:22 PM EDT/ 5.7 ft		5:39 AM EDT	8:06 PM EDT
Sampling Event 2								
Tue 5/27		12:50 AM EDT/ -0.1 ft	6:53 AM EDT/ 4.7 ft	12:49 PM EDT/ -0.1 ft	7:13 PM EDT/ 5.6 ft		5:31 AM EDT	8:16 PM EDT
Wed 5/28		1:37 AM EDT/ -0.2 ft	7:40 AM EDT/ 4.7 ft	1:35 PM EDT/ 0.0 ft	7:56 PM EDT/ 5.5 ft	New Moon	5:31 AM EDT	8:16 PM EDT
Thu 5/29		2:23 AM EDT/ -0.2 ft	8:25 AM EDT/ 4.6 ft	2:18 PM EDT/ 0.1 ft	8:37 PM EDT/ 5.4 ft		5:30 AM EDT	8:17 PM EDT
Fri 5/30		3:05 AM EDT/ -0.1 ft	9:10 AM EDT/ 4.5 ft	3:00 PM EDT/ 0.3 ft	9:18 PM EDT/ 5.2 ft		5:30 AM EDT	8:18 PM EDT
Sampling Event 3								
Tue 6/10	5:22 AM EDT/4.3 ft	11:30 AM EDT/0.2 ft	5:53 PM EDT/5.3 ft	-	-		5:26 AM EDT	8:25 PM EDT
Wed 6/11	-	12:18 AM EDT/0.0 ft	6:16 AM EDT/4.5 ft	12:19 PM EDT/0.0 ft	6:41 PM EDT/ 5.6 ft		5:26 AM EDT	8:26 PM EDT
Thu 6/12	-	1:09:00 AM EDT/-0.2 ft	7:07 AM EDT/ 4.7 ft	1:11 PM EDT/ -0.1 ft	7:29 PM EDT/ 5.9 ft	Full Moon	5:26 AM EDT	8:26 PM EDT
Fri 6/13	-	1:59 AM EDT/ -0.5 ft	7:57 AM EDT/ 4.8 ft	2:02 PM EDT/ -0.2 ft	8:17 PM EDT/ 6.0 ft		5:26 AM EDT	8:26 PM EDT

In total, the fyke net was deployed 19 times for an approximate soak time of 227 hours. A total of 103 alewife were collected over the three (3) events. No blueback herring were collected during any of the three events. Table 2 gives number and type of fish caught by event. Clupeid species collected during sampling were all released alive and incurred a 0% mortality rate over the three sampling events as a result of delicate handling and reviving of each fish. Individual lengths and species conditions prior to release are given on the data sheets in Appendix C.

Table 2- Summary of Species Collected by Event

Sample ID Number	Alewife	Blueback	Banded Killifish	Golden Shiner	Striped Killifish	Atlantic Silverside	American eel	Largemouth Bass	Unknown Sunfish	Brown Bullhead	Pumpkinseed	Bluegill	Black Crappie	Blue Crab	White Sucker	Common Carp	White Perch	Yellow Perch	Gizzard Shad	Painted Turtle	Snapping Turtles	Total Per Event
WP051314AM	5				2	3							2		8	1	13		13		1	48
WP051314PM						1															1	2
WP051414AM	45						1		2			1	1				9		2		1	62
WP051414PM															3		4		2			9
WP051514AM	21								1						5	1	6		5			39
WP051514PM															1		2					3
WP051614AM	25						21					1	2	2	21		11	2	7			92
WP052714PM							2				2			1			1	1				7
WP052814AM			1				1		3	1				1	1		1				1	10
WP052814PM	1						1							1								3
WP052914AM	6						3					1		1	1		2	1				15
WP052914PM															9		3					12
WP053014AM							3	1	1						9		1	1	1			17
WP061114AM							2						1		4		5	1	1	1		18
WP061114PM									7								1					9
WP061214AM							3								1				5			10
WP061214PM			1						1										1		1	5
WP061314AM														1				1				2
WP061314PM																						
Total	***103***	***0***	***1***	***2***	***4***	***36***	***2***	***6***	***8***	***10***	***3***	***6***	***7***	***2***	***63***	***2***	***59***	***7***	***37***	***1***	***5***	***363***

As shown in Table 2, ALS processed, enumerated, weighed (when applicable), measured, and identified all other collected species to the lowest practical taxonomical level (Appendix C). A total of 16 other fish species excluding alewife, were collected during the surveys and include the following: banded killifish (*Fundulus diaphanus*), striped killifish (*Fundulus majalis*), Atlantic silverside (*Menidia menidia*), American eel (*Anguilla rostrata*), white perch (*Morone americana*), black crappie (*Pomoxis nigromaculatus)*, golden shiner (*Notemigonus crysoleucas)*, pumpkinseed (*Lepomis gibbosus*), brown bullhead (*Ameiurus nebulosus*), bluegill (*Lepomis macrochirus*), large-mouth bass (*Micropterous salmoides),* white sucker (*Catostomus commersonii*), yellow perch (*Perca flavescens*), gizzard shad (*Dorosoma cepedianum*), common carp (*Cyprinus carpio*), and unknown lepomid sunfish. In addition to the above-listed species, seven (7) blue crab (*Callinectes sapidus*), one (1) painted turtle (*Chrysemys picta picta*), and five (5) snapping turtles (*Chelydra serpentina serpentina*) were collected. Total species count per net retrieval and species list by common name is given in Table 2.

During each event, individual water quality measurements were taken near the cod-end of the net with a YSI multi-probed water quality meter and a 650 MDS data logger. Water Quality Data for each individual sampling event is given in Table 3.

Table 3- Wreck Pond Water Quality Data for Each Sampling Event

Sample ID Number	Date/Time M/D/Y	Temp C	SpCond uS/cm	Salinity ppt	DO Conc mg/L	DO% %	pH	Turbidity Secchi (cm)
Preliminary set	5/12/2014 17:54	25.10	NA	3.65	6.77	87.50	7.00	NA
WP051314AM	5/13/2014 6:10	20.50	0.54	0.26	6.65	75.10	6.93	91.00
WP051314PM	5/13/2014 18:08	21.20	3.73	1.98	7.62	87.20	7.41	92.00
WP051414AM	5/14/2014 6:09	17.20	0.97	0.48	6.62	64.50	7.20	91.00
WP051414PM	5/14/2914 18:15	17.80	0,79	0.34	6.98	72.60	6.95	61.00
WP051514AM	5/15/2014 6:15	16.10	0.75	0.37	7.02	71.40	6.77	80.00
WP051514PM	5/15/2014 18:05	19.00	0.43	0.21	7.37	79.50	6.79	99.00
WP051614AM	5/16/2014 6:15	17.50	0.45	0.22	6.91	72.10	6.79	109.00
Preliminary set	5/27/2014 6:10	20.30	1.50	0.75	8.41	90.90	7.54	110.00
WP052714PM	5/27/2014 18:06	25.50	2.62	1.28	6.19	76.20	7.19	72.00
WP052814AM	5/28/2014 6:00	21.00	3.39	1.78	5.44	58.80	7.20	72.00
WP052814PM	5/28/2014 18:00	18.40	3.48	1.82	5.61	61.60	7.04	80.00
WP052914AM	5/29/2014 6:10	15.10	1.43	0.72	7.31	73.00	7.11	72.00
WP052914PM	5/29/2014 18:25	20.10	1.46	0.74	7.60	83.60	7.15	61.00
WP053014AM	5/30/2014 6:15	17.00	0.66	0.32	6.99	72.40	7.15	102.00
Preliminary set	6/10/2014 18:00	NA	NA	NA	NA	NA	NA	NA
WP061114AM	6/11/2014 0618	20.90	3.93	0.19	5.75	65.20	7.52	60.50
WP061114PM	6/11/2014 18:10	20.00	3.06	1.44	7.45	84.70	7.31	61.00
WP061214AM	6/12/2014 6:15	18.50	2.53	1.33	6.37	69.20	7.26	60.50
WP061214PM	6/12/2014 18:22	21.90	3.62	1.60	7.72	90.20	7.14	62.00
WP061314AM	6/13/2014 7:04	20.10	3.70	1.90	6.84	77.21	7.18	75.00
WP061314PM	6/13/2014 18:12	24.50	0.93	0.42	7.97	93.80	7.07	75.00

5.0 CONCLUSION

As summarized in Section 1.0, the objective for the 2014 Wreck Pond fish survey was to confirm if a viable herring run still exists within Wreck Pond and provide baseline pre-construction data to be compared with post-construction survey results. Overall, the primary goals of the spring survey were to provide the following:

1) Baseline data for anadromous movement within Wreck Pond during spring migration;

2) An inventory of aquatic species collected using passive sampling methods at one location located underneath the existing railroad bridge where previous studies using same gear were performed;

3) A comparison of movement and abundance from past surveys in 2006-2008 to be applied to current data and data to be collected post-construction; and

4) Measurements, weights, and enumeration of collected species; and

Fall survey objectives have been provided in Section 1.0, but have been omitted from the aforementioned.

Results of the 2014 survey are somewhat comparable to results of 2006 and 2007. Each of the surveys used the same gear, relative level of catch effort, and were stationed in the same geographic area. Sampling duration of 227 hours and level of effort in 2014 was comparable with 204 sample hours in 2006 and 217 hours in 2007. As previously mentioned in the Results section, the 2014 sampling effort collected 103 alewife and no blueback; whereas 229 alewife and one (1) blueback were collected in 2006 and 49 alewife and two (2) blueback were collected in 2007. Results of each survey verify the inshore/offshore passage of adult clupeid species through the existing outfall. Even though results suggested a viable run for alewife, it is uncertain if the fluctuation in alewife numbers from each survey reflects if the run is reestablishing, declining, or stabilizing.

The repetitive low number of blueback collected relatively at the same time in 2006 and 2007 and the lack of blueback in 2014 tends to show that a viable blueback run does not exist in Wreck Pond. Based on 2006 results, the NJDEP recommended that the 2007 events be scheduled roughly 3 to 4 weeks after the initiation of alewife migration to better target blueback movement and determine if a viable run of blueback existed in Wreck Pond. The 2014 survey was scheduled to reflect those 2006 recommendations and spanned over the proposed blueback spawning window. A viable run of blueback herring was not observed in the 2006 through 2008 surveys or in 2014. Possible reasons for the absence of blueback in 2014 and the small number of blueback collected in 2006 and 2007 could be associated with the following:

1. A viable run of blueback does not exist in Wreck Pond and therefore, this waterbody can no longer be categorized as a confirmed spawning ground for blueback. Historically designated as confirmed spawning for blueback many years ago, stressors, over time, may have either diminished the population or caused the Wreck Pond spawning population to go elsewhere. Diminished populations may be attributed to overfishing, water quality degradation, lack of aquatic connectivity, and loss of spawning habitat. Unlike alewife, blueback prefer to spawn in swifter waters. Upstream habitat investigations may assist in determining if satisfactory spawning grounds are still present for blueback. Habitat assessments pre- and post-construction will be performed as part of the 2014 USFWS grant and should provide data pertaining to spawning habitat suitability.

2. Blueback herring are hindered by the extended outfall structure and cannot access natal spawning grounds. Clupeids are affected by light. In North Carolina, an extensive gill net survey indicated that river herring (blueback herring and alewife) no longer existed in streams where bridges have been replaced by pipes or box culverts (Moser and Terra 1999). Herring are also reluctant to enter pipes due to shadowing (Hendricks, 2006). Even though alewife may access Wreck Pond and are subject to

the same light limitations, blueback are known to be slightly more sensitive to light (Don Byrne, NJDEP, pers. comm. April, 2007) which may indicate a low presence. The proposed bypass culvert will be shorter in length than the existing pipe and should be designed to allow light to penetrate.

3. Other anthropogenic and chemical barriers are deterring blueback movement. It is a known fact that water quality in Wreck Pond needs improvement. In addition, development has been expanding. It is possible that natal qualities recognized historically no longer exist. Introduction of the bypass culvert may allow for improved water quality, tidal mixing, and a more attractant flow.

Overall, the 2014 survey did provide baseline data on anadromous movement within Wreck Pond during spring spawning migration. A total of 103 alewife were collected which could be indicative of a run. This number is approximately half of what was collected in 2006 and more than double the number collected in 2007. In comparison to results of the 2006 and 2007 spring sampling events using same survey methodology and gear, the 2014 spring survey further verified the continued presence and movement of alewife within Wreck Pond and most likely the unhindered inshore/offshore passage through the extended outfall. Even though results suggested a viable run for alewife, it is uncertain if the fluctuation in alewife numbers from each survey reflects if the run is reestablishing, declining, or stabilizing. However, results of the 2014 and 2006 through 2008 surveys did indicate that the majority of alewife were more predominant late April to mid-May in Wreck Pond; therefore, it is possible that the major alewife run in Wreck Pond starts in late April and ends in mid-May (temperature dependent).

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APPENDICES

Appendix A

New Jersey Scientific Collection Permit

Date Issued: 04/16/14
MFA-SCP No.: 1444

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

Division of Fish and Wildlife
Mail Code 501-03
PO Box 420
Trenton, NJ 08625-0420
David Chanda, Director
njfishandwildlife.com
609-292-2965

04/16/14 to 12/31/014

SCIENTIFIC COLLECTING PERMIT

TO WHOM IT MAY CONCERN:

Under provisions of New Jersey Statutes Annotated Title 23:4-52, permission is hereby given to:

Captain Aleksandr C. Modjeski, American Littoral Society, 18 Hartshorne Drive, Highlands, NJ 07732 to conduct a Fish Inventory Study with emphasis on field monitoring of alewife and blueback herring in Wreck Pond, Monmouth County. Spring sampling, late April – June, will focus on adult migratory runs and collection will be done using a 15' deep, 4' high—modified fyke net (25' wings and 1" stretch mesh). There will also be a Fall sampling program, September - October to confirm presence of YOY herring and will use a 30' (1/4" nylon mesh bag seine with a 4'x4'x4' bag) and a 100' (1/4" nylon mesh bag seine with a 6'x6'x6' bag). Sampling will be done at various locations within the Wreck Pond Watershed. A small aluminum 12' skiff will be used to help deploy nets from the beach.

This permit is subject, but not limited to, the following conditions:

1. The person(s) named herein shall have this permit in their possession when collecting scientific specimens in marine, fresh, or estuarine waters of the State and must present it upon request to any official or citizen.

2. **The holder of this permit shall notify the Marine Law Enforcement Region Office of his/her scientific collecting activities in any of the State's marine, fresh, or estuarine waters at least 24 hours in advance of their activities. Notification can be made in writing to the Marine Enforcement Office, P.O. Box 418, Port Republic, NJ 08241, or by calling 609-748-2050.**

3. A **report** of the organisms collected (species, numbers, specific location where taken, dates of sampling) or a final report for the study for which the permit is requested shall be sent to the Administrator, Marine Fisheries, P.O. Box 400, Trenton, NJ 08625, within four (4) weeks of the expiration date or upon request for permit renewal, whichever is earlier.

4. This permit does not authorize the collection of any species listed by the United States Government as endangered. Special provisions may apply for endangered species. It is the permittee's responsibility to obtain, from the United States Government, any required permits to interact with any Federally listed endangered species.

5. This permit does not convey the right to trespass.

6. Violation by the permittee or subsidiary permit holders of any condition of the permit or any state law or regulation promulgated pursuant to N.J.S.A. 23 or 50 or N.J.A.C. 7:25 or 7:25A shall render this permit null and void and subject all parties to prosecution in addition to permit revocation upon conviction. Applications for future permits may also be denied.

7. The holder of this Scientific Collecting Permit is also required to have in his/her possession a "Special Permit for Research" from the Division of Watershed Management, Bureau of Marine Water Monitoring, P.O. Box 405, Leeds Point, NJ 08220, prior to the taking of shellfish (clams, oysters, mussels) for scientific purposes from the marine or estuarine waters of the State that are designated "Prohibited," "Special Restricted," or "Seasonal Special Restricted" (N.J.S.A. 58:24-3, and N.J.A.C. 7:12-2). A chart of these designated waters may be obtained from the Bureau of Marine Water Monitoring or by visiting www.nj.gov/dep/wms/bmw.

Brandon Muffley, Administrator
Marine Fisheries Administration

bd
c: Capt. Dominick Fresco, Chief, Bureau of Law Enforcement-Marine Enforcement Region Office
Capt. Dennis Tully, NJ State Police-Marine Services Bureau
Deborah Watkins, Bureau of Marine Water Monitoring

Subsidiary Student or Employee Permit Holders:
Jesse Ebert
Julianne Schumacher
Jeff Derment
Stevie Thorensen
Megan Molok

Appendix B

Photograph Log

Photo 1: View facing southeast along shoreline of the first pond in the Wreck Pond watershed closest to the ocean. The outfall structure connected to the Atlantic Ocean is located to the left of the photo. Photo taken in 2008.

Photo 2: View facing east towards the New Jersey Transit railroad bridge and fyke net location. Photo taken in 2008.

Photo 3: Water Quality Monitoring was performed using handheld YSI multi-probed sonde supplied by the NJDEP. Photo taken in 2014 during Sampling Event 1.

Photo 4: Net set under railroad bridge showing centralized location and how wing was secured to the structure. Photo taken in 2014 during Sampling Event 1.

Photo 5: View looking south towards the signage provided by NJDEP. Poly-ball and wooden stake were used to identify net and anchor fyke. Processing was performed along the northern shoreline. Photo taken in 2014 during Sampling Event 1.

Photo 6: Typical fish sorting set-up that consisted of semi-submerged fish baskets that kept fish in water during processing. Photo taken in 2014 during Sampling Event 1.

Photo 7: Gloves were worn during sorting and fish handling. Fish were individually transferred to submerged fish baskets to promote survivability. Herring were processed first and released upstream..

Photo 8: Fish ready for immediate processing. There was 100% survivability for herring during each sampling event. Photo taken in 2014 during Sampling Event 1.

Photo 9: Processing of herring. Gloves were worn to reduce risk of injury and mortality to collected species. Photo taken in 2014 during Sampling Event 1.

Photo 10: A basket of gizzard shad and white perch ready for processing and release. Photo taken in 2014 during Sampling Event 1.

Photo 11: A basket of American eel showing average length and abundance. Photo taken in 2014 during Sampling Event 1.

Appendix C

Data Sheets

5/13 AM

2nd net set - 0800
1 snapper

Page 1 of 1

Herring Project Data Sheet

Location: RR Bridge Field Crew JD, AM NM Date: 5/13/14 Water Quality Taken (circle) (Y) N

Sample Number: WP051316-AM Weather Clear @ 60°F

Net Deployment time: 5/12/16- 1754 Net Retrieval time: 0615 Time Net collecting: 12:21

Tides (time /ft) - Low 1209 AM High 0652 Precipitation in Last 24 hrs (circle) (Y) N

Number of species: 7 Total Number of Individuals 48 T&E Species Collected (circle)? Y (N)

Data Recorder: NM Signature: [signature]

	SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
1	Alewife	150g		25/27	242	L	24/24.2	236	L	25.5/28.4	248	L	24/27.5	202	L	24/27	170	L
2	Silver S.			1.5/2	.10	L	1.5/2	.10	FD									
	S. Killi			9.2	.07	L	11/11.5	.13	L									
white sucker	[illegible]			35/38	587	L	37.3/40.2	783	L	34.8/37	544	L	37/41.2	775	L	35/38.1	655	L
	G. Shad			41/45.5	11.71	L	40.8/45.2	10.5	L	30.5/40.5	6.64	L	34.5/39	6.14	L	33/36.5	4.78	L
5	G. Shad			[illegible]/24.5	2.48	L	31/35.1	432	L	34.4/40.7	699	L	35/39.4	634	L	39/43.8	986	
6	W. Perch			24.4/25.6	238	L	25.6/27.5	303	L	34/36	756	L	33.6/35.3	662	L	34.5/36.1	827	
7	B. crap			26/27	315	L	25/26	268	L									
	W. Perch			26.6/27.8	302	L	24/25	214	L	23/24.1	211	L	34.4/38.6	1144	L	33/35	429	
	G. Shad			48/58	1547	L	29.6/31	508	L	38/43	978							
	G. Carp			48/52	1380	L												
	W. Suck			33/36	490	L	39.7/42.5	815	L	34.5/36.5	593	L						
mike	W. Perch			27.4/28.5	345	L	23.8/25.2	231	L	29/31	447	L						

Lesion

*****CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

5/13 PM

1 Snapper

Herring Project Data Sheet

Location: RK Bridge Field Crew JE, JL, AM Date: 5/13/14
Sample Number: WP-051314-PM Weather Clear, windy E-15-20mph Water Quality Taken (circle) (Y) N
Net Deployment time: 0906 Net Retrieval time: 1815 Time Net collecting: 10:09
Tides (time /ft) - Low 1256 PM High 1914 Precipitation in Last 24 hrs (circle) (Y) N
Number of species: 1 Total Number of Individuals 2 T&E Species Collected (circle)? Y (N)
Data Recorder: AM Signature:

NET SET 1930

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
AM Silverside			11.5 11.7		11	FD																

T 21.2C
DO% 87.2
DO M/L 7.62
SPC 3.73
Sal 1.98
PH 7.41

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

5/14 AM

FULL MOON

Net set time 0712

Herring Project Data Sheet

Location: RR Bridge WP Field Crew AM TL, KD, SS Date: 5/14/14
Sample Number: WP-051414-AM Weather 51°F, wind 5mph, overcast Water Quality Taken (circle) (Y) N
Net Deployment time: 1950 5/13 Net Retrieval time: 0614 Time Net collecting: 10:04
Tides (time /ft) - Low 0136 AM High 0736 AM Precipitation in Last 24 hrs (circle) Y (N)
Number of species: 7 Total Number of Individuals 61 T&E Species Collected (circle)? Y (N)
Data Recorder: KB Signature:

Lesions 43 Are 9 wl

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
Alewife	243		25/28	293	L	25/28.5	240	L	22/24.5	151	L	23/26	138	L	24.5/27.2	265	L
Alewife			26/29	248	L	24/27.8	206	L	24/27	197	L	25/28.2	234	L	22.5/26	169	L
Alewife			23/26	182	L	24/26.8	167	L	23/26.5	163	L	(22.5/25.5)	149	L	24/27	160	L
Alewife			24/27	153	L	24/27	209	L	23/20.3	158	L	23/26.2	170	L	25/27.5	204	L
Alewife			24/28	200	L	23/25	155	L	23/26	138	L	23.5/26.5	214	L	26/29	242	L
Alewife			27/30.3	249	L	24/27	186	L	26/30	251	L	23/26	140	L	23/26.5	134	L
Alewife			25/28	174	L	24/27	149	L	23.5/26.5	178	L	24/27	180	L	23.5/26.5	175	L
Alewife			22/25	135	L	22.5/29	159	L	24/27	171	L	23.5/26.5	181	L			
White Perch			23/[illegible]	209	L	26/29	324	L	36/38.5	842	L	29/30.4	434	L	30/31.8	466	L
White Perch			26/28	293	L	25/26	742	Milky	33/35.5	638	L	29/31	491	L			
Black Crappie			25/26.5	270	L												
Bluegill			13.5	136	L												

WQ
Temp - 17.2
DO% - 64.5
DO mg/l - 6.62
SPC - .197
Sal - .48
pH - 7.2

one alewife escape
one snapping turtle Medium

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

B-52
5/14/14

Herring Project Data Sheet

Location: Rt Bridge Wash Pond Field Crew Ann, KD, TL, SS Date: 5/14/14
Sample Number: WP05/14/14-Ann Weather see 1 sheet Water Quality Taken (circle) (Y) N
Net Deployment time: 1950/5/13 Net Retrieval time: 0614 Time Net collecting: 10:24
Tides (time /ft) - Low Pg1 High Pg1 Precipitation in Last 24 hrs (circle) (Y) N
Number of species: Pg1 Total Number of Individuals Pg1 T&E Species Collected (circle)? Y (N) (See page 1)
Data Recorder: KD Signature:

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
Brown bullhead			24	252	L	~~34~~ 35			678	L												
Gizzard shad			~~34~~ 33	538	L	~~44~~ 49			OV 1540	L												
LM Bass			29 31	428	L																	

Herring Data Collection Form 2007

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

5/14 PM

next net set: 1250

4:49
6:20
10:28 = 11:08

Herring Project Data Sheet

Location: RR Bridge Wreck Pond Field Crew AM, TL Date: 5/14/14

Sample Number: WP05141 4PM Weather 54° misting & foggy Water Quality Taken (circle) (Y) N

Net Deployment time: 0712 Net Retrieval time: 1955 1827 Time Net collecting: 11:08 hr

Tides (time /ft) - Low 1341 High 1955 Precipitation in Last 24 hrs (circle) (Y) N - misting now

Number of species: 3 Total Number of Individuals 9 T&E Species Collected (circle)? Y (N)

Data Recorder: TL Signature:

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (D) Dead (FD)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (D) Dead (FD)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (D) Dead (FD)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (D) Dead (FD)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (D) Dead (FD)
Gizzard Shad	5		39 44.5	1,030	L	41 45.5	1260	L									
Wht Sucker			39 42	790	L	36 39	610	L	36 39	630	L						
Wht Perch			29 31	460	L	33 35	760	L	30 32	490	L	30 31.5	450	L			

WQ
Time: 1815
Temp: 17.8C
DO% 72
DO mg/L 6.98
SpC .79
Sal - 0.34
pH - 6.95
Secchi - 24"

...TH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT*******

WP 0515 AM
New Net set — 0715

21 - Alewife (1 escape)
6 - W perch
5 - Gz Shad
1 carp
5 wh sucker
1 - B Bull

Herring Project Data Sheet

Location: RR Bridge WP Field Crew AM, JD Date: 5/15/04
Sample Number: WP051514 AM Weather 60°F, Foggy muh W - 7 mph Water Quality Taken (circle) (Y) N
Net Deployment time: 1850/5/14 Net Retrieval time: 0630 Time Net collecting: 11.40
Tides (time /ft) - Low 0223 High 0820 Precipitation in Last 24 hrs (circle) (Y) N Mist
Number of species: 7 Total Number of Individuals 39 T&E Species Collected (circle)? Y (N)
Data Recorder: AM Signature: [signature]

1 alewife escaped - add to total

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
(1) Alewife			25 / 27	190	L	21.5 / 23.5	143	FD	24.5 / 26.5	139	L	23.5 / 26.5	178	L	24.5 / 26	180	L
"			23 / 25.5	181	L	23.5 / 26.5	175	L	23.5 / 26	153	L	25.5 / 28	216	L	25.5 / 27.5	199	L
"			23.5 / 26	163	L	25.5 / 27.5	169	L	26.5 / 28.5	220	L	24.5 / 27	192	L	23.5 / 25.5	175	L
"			25.5 / 28	145	L	25 / 28	199	L	24.5 / 27	195	L	24.5 / 27.5	193	L	21.5 / 24	125	L
(2) White perch			[illegible] / 32.5	502	L	33 / 34.5	668	L	29 / 31	423	L	25 / 26.5	246	L	37 / 39.5	1096	L
(3) Gizzard shad			31 / 35	403	L	43 / 45	1011	L	43 / 47	1070	L						
(4) Blk crappie			- / 27	314	L	- / 26	249	L									
(3) G. shad			30 / 33	430	L	30 / 34	366	L									
(5) C. carp			43 / 49	1820	L												
(2) W. Perch			23 / 24.5	231	L												
(6) W sucker			35 / 39	556	L	40 / 44	971	L	34 / 36.5	591	L	34 / 36.5	491	L	33 / 35	500	L
(7) Br. Bullhead			- / 31	520	L												

onsite - pss
offsite.
W/G

Time: 0615
Temp: 16.1°C
DO % - 71.4
DO mg/L - 7.02
spc - 0.75
sal - 0.37
pH - 6.77
Secchi - 31.5
÷ 2.54 =
cm

Herring Data Collection Form 2007

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

onsite - 1752 next net set @ - 1939

Herring Project Data Sheet

Page 1 of 1

Location: RR Bridge Wreck Pond Field Crew AM JD MM Date: 5/15/14
Sample Number: WPJ051514-PM Weather 62°F, overcast wind calm humid Water Quality Taken (circle) (Y) N
Net Deployment time: 0715 Net Retrieval time: 1830 Time Net collecting: 10:45 min
Tides (time /ft) - Low 1427 High 2038 Precipitation in Last 24 hrs (circle) (Y) N mist, fog, drizzle
Number of species: 2 Total Number of Individuals 3 T&E Species Collected (circle)? Y (N)
Data Recorder: TL Signature:

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
Wht Perch			38 / 39	1080	L	35 / 36	730	L									
Dwf Sucker			40 / 42.5	880	L												

WQ - 1805
Time: -1810
Temp: 19 C
DO % -79.5
DO mg/l -7.37
SPC ms -.431
Sal - 0.21
pH - 6.79
Secchi - 39" x25"

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

Herring Project Data Sheet

Location: RR Bridge West Pond Field Crew AM, JD, TL, KD Date: 5/16/14
Sample Number: WP-051614-AM Weather 63°F, 15mph wind, overcast Water Quality Taken (circle) (Y) N
Net Deployment time: 1830 Net Retrieval time: 0630 Time Net collecting: 12 hrs
Tides (time /ft) - Low 0309 High 0907 Precipitation in Last 24 hrs (circle) (Y) N Drizzle periodic
Number of species: 8 Total Number of Individuals 90 T&E Species Collected (circle)? Y (N)
Data Recorder: J. D Signature:

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
Alewife			25 / 31		140	L	26 / 33		150	L	24 / 27		190	L	24 / 27		200	L	25 / 28		190	L
Alewife			24 / 28		190	L	25 / 28		160	L	25 / 28.5		190	L	27 / 30.5		220	L	24 / 27		110	L
Alewife			23 / 25		110	L	24 / 27		130	L	23 / 25		100	L	24 / 26		100	L	25 / 28		160	L
Alewife			25 / 28		160	L	26 / 29		210	L	26 / 29.5		230	L	24 / 27		180	L	24 / 27		200	L
Alewife			28 / 30.5		260	L	24 / 27		160	L	24 / 27		160	L	25 / 28.5		130	L	26 / 29		210	L
W. Perch			35 / 37.5		710	L	27 / 31		430	L	33 / 34.5		650	L	13 / 14		40	L				
G. Shad			33 / 37.5		540	L																
G. Shad			37 / 42		840	L	36 / 40.5		620	L	44 / 49		1620	L	44 / 51		1300	L	37 / 41.5		790	L
W. Sucker			34 / 38		600	L	37 / 40		690	L	40 / 45		910	L	32 / 34		450	L	38 / 41		720	L
Blk Crappie			23 / 26		240	L	25.5		240	L												
Blue Crab (male)			64		≈10	L	13		110	L												
W. Sucker			41 / 44.5		890	L	34 / 37		530	L	36 / 38.5		620	L	41.5 / 45		1000	L	38 / 41		770	L
W. Sucker			33 / 36		550	L	40 / 43		860	L	55 / 58		580	L	37 / 39.5		680	L	36.5 / 39.5		640	L
W. Sucker			42 / 45.5		870	L	35 / 37.5		650	L	39 / 42		840	L	34 / 36		580	L	36 / 39		600	L
W. Sucker			39 / 42		830	L																

WQ
Time: 06:15
Temp: 17.5C
DO %: 77.1%
DO mg/L: 6.91
SPC: .454 mS/cm
Sal: 0.27
pH: 6.79
Secchi: 43" x 2.54

Bluegill = Lost
Yellow Perch (sm) = Lost

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

Herring Project Data Sheet

Location: RR Bridge WP Field Crew AM, JD, TR, KD Date: 5/16/14
Sample Number: WP051614 AM Weather ________ Water Quality Taken (circle) Y N
Net Deployment time: ______ Net Retrieval time: ______ Time Net collecting: ______
Tides (time /ft) - Low ______ High ______ Precipitation in Last 24 hrs (circle) Y N
Number of species: ______ Total Number of Individuals ______ T&E Species Collected (circle)? Y N
Data Recorder: ______ Signature: ______

See pg 1

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
W. Perch			27 / 29	350	L	34 / 36	700	L	35 / 38	750	L	33 / 35.5	630	L	23 / 24.5	120	L
W. Perch			30 / 32	530	L												
Y. Perch			26 / 27	260	L												
A. Eel	7980	21	– / 47			– / 60			– / 45			– / 52					

Basket = 1720
Total = 7980 g Eel wt.
(−1 Lost Eel)
No sub ct but batch weight

2 A. Eel Lost Total Eel = 21 (Total Length) = 52 cm − 58 cm = 19 eels between these

Herring Data Collection Form 2007

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

temp: 20.3
DO: 9.0 ?
mg/L - 8.41
spc - 7.52
sal: 0.75
pH: 7.54

Herring Project Data Sheet

Page 1 of 1

Location: Wreck Pond Field Crew: Meg + Al Date: 5/27/14
Sample Number: WP052714AM Weather: 78° F, Sunny, calm, NA Water Quality Taken (circle) (Y) N
Net Deployment time: 0620 Net Retrieval time: NA Time Net collecting: NA
Tides (time /ft) - Low: 1253 AM High: 0658 Precipitation in Last 24 hrs (circle) Y (N)
Number of species: NA Total Number of Individuals: NA T&E Species Collected (circle)? Y N
Data Recorder: ______ Signature: ______

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)

NET SET

WQ
Temp -
Time - 0610
DO % -
DO mg/L -
Spc -
sal -
pH -
secchi - 110

Herring Data Collection Form 2007

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

del set. 1845

Herring Project Data Sheet

Location: WRECK POND RR Bridge Field Crew AM, TL, KD Date: 5/27/14
Sample Number: WP052714PM Weather 85°F, NW 10mph, overcast Water Quality Taken (circle) Y N
Net Deployment time: 0620 Net Retrieval time: 1820 Time Net collecting: 12 hrs
Tides (time /ft) - Low 1253 High 1917 Precipitation in Last 24 hrs (circle) Y (N)
Number of species: 5 Total Number of Individuals 10 T&E Species Collected (circle)? Y (N)
Data Recorder: KD Signature:

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FC)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
White Perch		1	24 / 24.5	220	L												
Yellow Perch		1	27.5 / 28.5	368	L												
Pumpkinseed		2	14 / 14.5	75	L	12.7 / 13	49										
Eel		2	26	67	L	42	(141)										
Blue Crab	escaped																

1806
Secchi 72cm
Temp 25.5°C
do % 76.2
do mg/L 6.19
Spc 2.62
Sal 1.28
Ph 7.19
last small blue crab
0 Lesions

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

Mt SA: 0700

Herring Project Data Sheet

Page 1 of 1

Location: Wharf Pond RL Field Crew AM, JS, KD Date: 5/28/14
Sample Number: WP052814 AM Weather 0648 57°F E 10mph, overcast Water Quality Taken (circle) (Y) N
Net Deployment time: 1924 Net Retrieval time: ↙ Time Net collecting: 10:48
Tides (time /ft) - Low 0141/6.21 High 0744/4.73 Precipitation in Last 24 hrs (circle) Y (N)
Number of species: 7+turtle Total Number of Individuals 9+turtle T&E Species Collected (circle)? Y (N)
Data Recorder: KD Signature:

SPECIES	Total wt/sub	Total Count/sub ct.	FL/TL Length (cm)	FL/TL Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	FL/TL Length (cm)	FL/TL Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	FL/TL Length (cm)	FL/TL Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	FL/TL Length (cm)	FL/TL Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	FL/TL Length (cm)	FL/TL Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
Banded Killi		1	8	10	FD												
White Sucker		1	41 ~~43~~	704	L												
White Perch		1	33 35	634	L												
American Eel		1	84	891	L												
Pumpinseed		1	12.5 13	76	L												
Brown Bullhead		3	28	313	L	25	220	L	25	190	L						
Blue Claw		1	10		Male L	~~25~~											

1 snapping turtle

Secci - 72 cm
T 21 C
DO% 58.8
DO 5.44 mg/l
Conductivity 3.39
salinity 1.78
pH 7.2

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

Net st - 1245

Herring Project Data Sheet

Location: Weir Pond RR Bridge Field Crew AM, TL, KD, Lisa Date: 5/28/14
Sample Number: WP052814PM Weather 58°F, Overcast, wind 12mph Water Quality Taken (circle) (Y) N
Net Deployment time: 0700 Net Retrieval time: 1805 Time Net collecting: 10:55
Tides (time /ft) - Low 1:34/0.01 High 7:59/5.37 Precipitation in Last 24 hrs (circle) (Y) N
Number of species: 3 Total Number of Individuals 3 T&E Species Collected (circle)? Y (N)
Data Recorder: KD Signature: [signature]

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
alewife		1	22.7 / 20.0	128	L												
		2															
american eel		1	31	(54)	L												
Blue Crab		1	[illegible] Molt		D												

48cm
18.4C
@ 51.6 % D.O
P 05.61 mg/l
@ 3.437
1.82 sal
7.04 PH
0 leasions
crabmale

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

Netset 6:50 am

Herring Project Data Sheet

Location: WP RR Bridge Field Crew: AM, TL, KD, ~~[illegible]~~ Date: 5/29/14
Sample Number: WP-052914 AM Weather: 52°F, overcast, 9 mph NE Water Quality Taken (circle) (Y) N
Net Deployment time: 1345 Net Retrieval time: 0615 Time Net collecting: 16 1/2 hr
Tides (time /ft) - Low ______ High ______ Precipitation in Last 24 hrs (circle) (Y) N
Number of species: 7 Total Number of Individuals ~~16~~ 15 T&E Species Collected (circle)? Y N
Data Recorder: KD Signature: [signature]

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
alewife		6	24/28.5	236	L	25/29	184	L	24/26.5	148	L	23/28	198	L	24/27.5	178	L
alewife		[illegible]	25/28	163	L												
~~blueback~~																	
BlueGill		1	23/24	312	L												
White Perch		2	27/31	438	L	23.5/25	204	L									
White Sucker		1	34.5/37.5	604	L												
Yellow Perch		1	24/25	193	L												
Spiderw Crab		1	7		L												

M

Secchi - .72
Time 0614
Temp 15.7°C
Do % 73
Do mg/L 7.31
SPC 1.43
Sal 0.72
Ph 7.11

Herring Data Collection Form 2007

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

Herring Project Data Sheet

Location: _____ Field Crew _____ Date: _____
Sample Number: _____ Weather _____ Water Quality Taken (circle) Y N
Net Deployment time: _____ Net Retrieval time: _____ Time Net collecting: _____
Tides (time /ft) - Low _____ High _____ Precipitation in Last 24 hrs (circle) Y N
Number of species: _____ Total Number of Individuals _____ T&E Species Collected (circle)? Y N
Data Recorder: _____ Signature: _____

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
Pc		3	27		32	L	60		340	L	57		294	L								

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

LISA OBERFELITER
Net pull 6 05

Herring Project Data Sheet

Location: WP RR Bridge Field Crew LO, TL, KD, AM Date: 5/29/14
Sample Number: WP052914PM Weather Clear, 59°F, E w 5mph Water Quality Taken (circle) (Y) N
Net Deployment time: 1045 Net Retrieval time: 10 05 Time Net collecting: 11 1/2 hr
Tides (time /ft) - Low 222 / 0.12 High 2040 / 5.44' Precipitation in Last 24 hrs (circle) (Y) N
Number of species: 2 Total Number of Individuals 12 T&E Species Collected (circle)? Y (N)
Data Recorder: KD Signature:

NET 1835

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
white perch		3	34.5/35.5	331	L	34/35	275	L	31.5/33.5	476	L						
white suckers		9	40/44	1044	L	39/42.5	853	L	35/38	619	L	41.5/44	946	L	39/43	1030	L
white suckers		~~[illegible]~~	34/42	799	L	32/36	565	L	34/37	549	L	34/37	603	L			

Secci 61 cm
T - 20.1 C
DO% 83.6 %
DO mg/l 7.6 mg/l
Spc 1.46
Sal 0.74
pH 7.15
Time: 18:35

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

1 lost white sucker.

Page 1 of 1

Herring Project Data Sheet

Location: WPRR Bridge Field Crew: AM, TL, JD, KD Date: 5/30/14
Sample Number: WP053014AM Weather: 54°F, overcast, calm Water Quality Taken (circle): (Y) N
Net Deployment time: 1835 Net Retrieval time: 0600 Time Net collecting: 11.25 hr
Tides (time /ft) - Low 0309 / 0.15' High 0914 / 4.55' Precipitation in Last 24 hrs (circle): Y (N)
Number of species: 7 Total Number of Individuals: 17 T&E Species Collected (circle)? Y (N)
Data Recorder: KD Signature: [signature]

SPECIES	Total wt/sub	Total Count/sub ct	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
White sucker		3	38/40	716	L	38/41	759	L	37/40	833	L	33/35	461	L	34/36	466	L
			38/41.5	742	L	(37/40)	656	L	34/37	427	L						
Gizzard Shad		1	40/45	1158	L												
White Perch		1	29/31	395	L												
American		3	51.5	602	L	33	57	FD	68	~~890~~ 900	L						
Eel																	
Largemouth		1	33/34	453	L												
Bass																	
Yellow		1	23.5/24	196	L												
Perch																	
Brown Bull		1	27	248													

T 17.0
DO% 72.4%
DO 6.99 mg/l
spc 0.66
sal 0.32
ph 7.15
Secci - 102 cm
O abnd lession
lost 1 white sucker

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

NET SET - NO fish DATA

Herring Project Data Sheet

Location: WP RR Bridge Field Crew TL, MM Date: 6/10/14
Sample Number: WP - 061014 - NET SET Weather _____ Water Quality Taken (circle) Y (N)
Net Deployment time: 1900 Net Retrieval time: NA Time Net collecting: NA
Tides (time /ft) - Low 1130/ 0.2' High 1753/ 5.3' Precipitation in Last 24 hrs (circle) Y N
Number of species: _____ Total Number of Individuals NA T&E Species Collected (circle)? Y (N)
Data Recorder: _____ Signature: _____

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)

NET SET

WQ
Time:
Temp:
DO%:
DOmg/L:
SPC:
Sal:
Secchi disk:

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

NET RESET – 1800 on 6/10/14

Herring Project Data Sheet

Location: Water Pond RR Bridge Field Crew TL, KD, MM, JS Date: 6/11/14
Sample Number: WP061114 - AM Weather Water Quality Taken (circle) (Y) N
Net Deployment time: 1900 Net Retrieval time: 0615 Time Net collecting: 12:15
Tides (time /ft) - Low 12:18 / 0.0' High 0616 / 4.5' Precipitation in Last 24 hrs (circle) Y N
Number of species: Total Number of Individuals T&E Species Collected (circle)? Y N
Data Recorder: KD Signature:

SPECIES	Total wt/sub	Total Count/Sub ct.	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
White Sucker		4	35 38		614	L	35 37		551	L	24 25		235	L	33.5 36		581	L			
White Perch		5	29 30.5		498	L	34 35		719	D	38 40		1144	D	33 34.5		509	D	23 24	210	D
Orbicular Shad		1	31.5 33.5		470	L															
U Sunnies		3				D				D				D							
Black Crappie		1	25.5 26.5		341	L															
Yellow Perch		1	15.5 16.5		124	L															
AM Eel		2	50		302	L	25		(80)	L											

WQ
Time: 6:18
Temp: 20.9
DO%: 65.2
DO mg/L: ~~50.7~~ 5.79
SPC: .393
sal: .19
pH: 7.52
secchi disk -24 60.5

3 Dead Sunnies Eel has chuck missing

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

NET RESET = 1836

Page 1 of 1

Herring Project Data Sheet

Location: Wreck Pond RR Bridge Field Crew TL, KD, JE, LO Date: 6/11/14
Sample Number: WP061114-PM Weather Overcast Water Quality Taken (circle) (Y) N
Net Deployment time: 1915/6/11 Net Retrieval time: 1810 Time Net collecting: 11:55
Tides (time /ft) - Low 1219/0.0' High 1841/5.6' Precipitation in Last 24 hrs (circle) (Y) N
Number of species: 3 Total Number of Individuals 9 T&E Species Collected (circle)? Y N
Data Recorder: Kathleen Deering Signature:

SPECIES	Total wt/sub	Total Count/sub ct	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
white perch		1	11.28		275	L																
Pumpkinseed Sunfish		5	14.5			L	12.8 12.2		46	L	15.4 15.9		98	L	12.3 12.7		50	L	11.2 11.5		38	L
pumpkinseed		4	12.8 12.6		48	L	11.9 12.2		38	L												
~~WMK~~ sunfish		1	11.9 12.6		40	L																

WQ
Time: 18:10
Temp: 20°C
DO%: 84.7
DO mg/L: ~~7.3~~
SPC: 745
Sal: ~~1.~~ 1.4
pH: 7.31
Secchi dist: 61 cm
763.3 barpre

Herring Data Collection Form 2007

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT*******

Herring Project Data Sheet

Sheri Shifren NJDEP

Location: Wreck Pond RR Bridge Field Crew TL, KD, MM, JD Date: 6/12/14
Sample Number: WP061214-AM Weather Overcast
Net Deployment time: 1836 Net Retrieval time: 6:20 Time Net collecting: 11:44 Water Quality Taken (circle) (Y) N
Tides (time /ft) - Low 0109/-0.2' High 0707/ 4.7' Precipitation in Last 24 hrs (circle) Y N
Number of species: 5 (turtle too) Total Number of Individuals 12 (inc turtle) T&E Species Collected (circle)? Y N
Data Recorder: Kathleen Devine Signature: Kathleen Devine

SPECIES	Total wt/sub	Total Count/Sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
gizzard shad		5	31.5 / 34.6	437	L	32.5 / 37.35	577	L	43.5 / 47	(1314)	L	33 / 37.5	510	L	25.5 / 28.5	236	L
white sucker		1	34.75 / 38	537	L												
UNK																	
pumpkinseed sunfish		1	17.75 / 18.5	140	L												
Am eels		3	48	210	D	48		L	37		L						

WQ
Time: 06:15
Temp: 18.5°C
DO%: 69.2
DO mg/L: 6.37
SPC: 2.53
Sal: 1.33
Secchi disk: 24" 60.5
762.6
pH: 7.26
lost 1 plate size snapping turtle

has extremely Large snapping turtle

Herring Data Collection Form 2007

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

FULL MOON NET RESET (PM)

Herring Project Data Sheet

Location: Water Pond Rd Bridge Field Crew KD, JD, LO Date: 12 JUNE 2014
Sample Number: WP-061214-PM Weather overcast cloudy Water Quality Taken (circle) (Y) N
Net Deployment time: 0655 Net Retrieval time: 1810 Time Net collecting: 11h15
Tides (time /ft) - Low 1311/-0.1' High 1929/5.9' Precipitation in Last 24 hrs (circle) (Y) N
Number of species: 4 Total Number of Individuals 4 T&E Species Collected (circle)? Y N
Data Recorder: Jeff Dement Signature: [signature]

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
Goldenshiner		1	13.8 / 15	37	L												
Gizzard shad		1	31 / 25.5	450	L												
UNK ~~Banded sunfish~~		1	9.3 / 9.8	Escaped	L												
Brown bullhead catfish		1	25	181	L	26.5	222	L	24.5	213	L						

WQ
Time: 18:22
Temp: 21.9°C
DO%: 90.2
DO mg/L: 7.72
SPC: 3.62
Sal: 1.60
pH: 7.14
Secchi disk: .62
Pre 76.6

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

NET RESET -

Herring Project Data Sheet

Location: WP RR Bridge Field Crew KD, MM, JE, LS Date: 6/13/14
Sample Number: WP-061314-AM Weather Water Quality Taken (circle) Y N
Net Deployment time: 1940 Net Retrieval time: 0620 Time Net collecting: 11:40
Tides (time /ft) - Low 0159 / -0.5' High 0757 / 4.8' Precipitation in Last 24 hrs (circle) Y N
Number of species: 1 Total Number of Individuals 1 T&E Species Collected (circle)? Y N
Data Recorder: KM Signature:

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
Blue Claw		1	7.1		35	L																
			7.5		27	L																

Time 7:04
Temp: 20.1c
DO% ~~7055~~ 77.2
D.O. mg/L 6.84
SPC: 3.7
Sal 1.9
Secchi Disk: 75 in
Ph: 7.18

Herring Data Collection Form 2007

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

NET RETRIEVED OFFSITE

Not retrieved Quickly due to T-storms

TM

Herring Project Data Sheet

Page 1 of 1

Location: WP RR Bridge Field Crew TL, JS, JD Date: 6/13/14

Sample Number: WP061314-PM Weather Water Quality Taken (circle) Y N

Net Deployment time: 0620 Net Retrieval time: 1910 Time Net collecting: 11:50

Tides (time /ft) - Low 1402 / -6.2' High 2017 / 6.6' Precipitation in Last 24 hrs (circle) Y N

Number of species: 1 Total Number of Individuals 1 T&E Species Collected (circle)? Y N

Data Recorder: JD Signature:

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
Yellow Perch		1	-	-	L Escaped												

Time: 18:12

Temp: 24.5C

Press: 755.0

DO%: 95.8

DO mg/L: 7.9

SPC: .93

Sal: .42

Secchi Disk 75c

PH: 7.07

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

Appendix B

New Jersey Scientific Collection Permit

Date Issued: 04/16/14
MFA-SCP No.: 1444

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

Division of Fish and Wildlife
Mail Code 501-03
PO Box 420
Trenton, NJ 08625-0420
David Chanda, Director
njfishandwildlife.com
609-292-2965

04/16/14 to 12/31/014

SCIENTIFIC COLLECTING PERMIT

TO WHOM IT MAY CONCERN:

Under provisions of New Jersey Statutes Annotated Title 23:4-52, permission is hereby given to:

Captain Aleksandr C. Modjeski, American Littoral Society, 18 Hartshorne Drive, Highlands, NJ 07732 to conduct a Fish Inventory Study with emphasis on field monitoring of alewife and blueback herring in Wreck Pond, Monmouth County. Spring sampling, late April – June, will focus on adult migratory runs and collection will be done using a 15' deep, 4' high—modified fyke net (25' wings and 1" stretch mesh). There will also be a Fall sampling program, September - October to confirm presence of YOY herring and will use a 30' (1/4" nylon mesh bag seine with a 4'x4'x4' bag) and a 100' (1/4" nylon mesh bag seine with a 6'x6'x6' bag). Sampling will be done at various locations within the Wreck Pond Watershed. A small aluminum 12' skiff will be used to help deploy nets from the beach.

This permit is subject, but not limited to, the following conditions:

1. The person(s) named herein shall have this permit in their possession when collecting scientific specimens in marine, fresh, or estuarine waters of the State and must present it upon request to any official or citizen.

2. **The holder of this permit shall notify the Marine Law Enforcement Region Office of his/her scientific collecting activities in any of the State's marine, fresh, or estuarine waters at least 24 hours in advance of their activities. Notification can be made in writing to the Marine Enforcement Office, P.O. Box 418, Port Republic, NJ 08241, or by calling 609-748-2050.**

3. A **report** of the organisms collected (species, numbers, specific location where taken, dates of sampling) or a final report for the study for which the permit is requested shall be sent to the Administrator, Marine Fisheries, P.O. Box 400, Trenton, NJ 08625, within four (4) weeks of the expiration date or upon request for permit renewal, whichever is earlier.

4. This permit does not authorize the collection of any species listed by the United States Government as endangered. Special provisions may apply for endangered species. It is the permittee's responsibility to obtain, from the United States Government, any required permits to interact with any Federally listed endangered species.

5. This permit does not convey the right to trespass.

6. Violation by the permittee or subsidiary permit holders of any condition of the permit or any state law or regulation promulgated pursuant to N.J.S.A. 23 or 50 or N.J.A.C. 7:25 or 7:25A shall render this permit null and void and subject all parties to prosecution in addition to permit revocation upon conviction. Applications for future permits may also be denied.

7. The holder of this Scientific Collecting Permit is also required to have in his/her possession a "Special Permit for Research" from the Division of Watershed Management, Bureau of Marine Water Monitoring, P.O. Box 405, Leeds Point, NJ 08220, prior to the taking of shellfish (clams, oysters, mussels) for scientific purposes from the marine or estuarine waters of the State that are designated "Prohibited," "Special Restricted," or "Seasonal Special Restricted" (N.J.S.A. 58:24-3, and N.J.A.C. 7:12-2). A chart of these designated waters may be obtained from the Bureau of Marine Water Monitoring or by visiting www.nj.gov/dep/wms/bmw.

Brandon Muffley, Administrator
Marine Fisheries Administration

bd
c: Capt. Dominick Fresco, Chief, Bureau of Law Enforcement-Marine Enforcement Region Office
Capt. Dennis Tully, NJ State Police-Marine Services Bureau
Deborah Watkins, Bureau of Marine Water Monitoring

Subsidiary Student or Employee Permit Holders:
Jesse Ebert
Julianne Schumacher
Jeff Derment
Stevie Thorensen
Megan Molok

Appendix C

Photograph Log

Photo 1: Volunteers/Students and staff processing fish captured in seine net on 9/18/2014. Fish were handled with care and processed as quickly as possible to avoid any mortality due to handling.

Photo 2: Volunteers/Students from Monmouth University identifying and counting fish captured during seining on 9/18/2014.

Photo 3: Volunteers/Students pulling in seine net on 9/18/2014 at Area 1A.

Photo 4: Seining Area 1B (sluice gates to 200' Sea Girt side). The outfall structure connected to the Atlantic Ocean is located in the center of the photo, taken on 9/25/14.

Photo 5: Equipment used to sample water quality and process fish captured in seine nets (9/18/14).

Photo 6: Capt. Al Modjeski (ALS) shows sampling crew where to set net on 9/18/2014. Also shown is the skiff used to set nets in Wreck Pond.

Photo 7: Measuring fish captured in seine nets on 9/18/14. Fish were measured with care to the nearest mm (fork length or total length depending on species).


Photo 8: Juvenile spottail flounder (*Bothus robinsi*) captured in seine net on 9/18/2014.

Photo 9: Juvenile northern kingfish (*Menticirrhus saxatilis*) captured in seine net on 9/18/2014.

Photo 10: A juvenile winter flounder (*Pseudopleuronectes americanus*) captured in seine net on 9/18/2014.

Photo 11: Juvenile alewife (*Alosa pseudoharengus*) captured during the final sampling event on October 10, 2014 as compared to a penny.

Appendix D

Data Sheets

S. Side of WP in Spring Lake
@ 50-70' from outfall

¼ mesh

Herring Project Data Sheet

Page 1 of 2

Location: STATION #1 (OUTFALL) Field Crew JD, AM Date: 9/8/14
Sample Number: WP-090814-1 Weather 20-25 MPH onshore, cloudy 80°F Water Quality Taken (circle) Y (N)
Net Deployment time: 1300 Net Retrieval time: 1305 Time Net collecting: 5
Tides (time /ft) - Low 1313/-0.6 High 0702/5.6 Precipitation in Last 24 hrs (circle) Y (N)
Number of species: ____ Total Number of Individuals ____ T&E Species Collected (circle)? Y N
Data Recorder: A. Mudzaki Signature: ____

25 N. kings = 205 grams
1st Batch
substrate

SPECIES	Total wt/sub	Total Count/sub ct	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
N. kingfish			8		L	10		L	9		L	8		L	9		L
Blue crab (M)			9 M	75	L	4.5 M			8 M	38							
N. king			8		L	7		L	8		L	7		L	6		L
A. silverside			8 9		L	8 9		L	6.5			5			7		L
N. king			8		2	7		L	11			8		L	8		L
N. king			4		L	10		L	7		L	8			8		
N. king			11		L	9		L	8		L	6			9		L
A. silverside			8			8			7			5			6		
A. silverside			8			8			7			5			6		
A. silverside			8			7			6			8			8		
A. silverside			7			7			8			5			7		
F. majalis			7	7		5	3		3	1		4	1		2	<1	
N. puffer			3	2		2	1		2	1		3	2				
F. heteroclitus			5	3		3	1		5	3		4	1		4	1	
F. majalis			7	6		3	1		4	2		5	1		8	9	

Total wt. of kingfish 1st Batch = 688 g
2nd Batch N. kingfish = 532 g
Total wt. Atlantic silversides = 580 g

S. side of WP in Spring Lake @ 50-70' from outfall

Herring Project Data Sheet

Location: Station #1 (outfall) Field Crew JD, AM Date: 9/8/14

Sample Number: WP-090814-1 Weather 20-25mph onshore, cloudy Water Quality Taken (circle) Y (N)

Net Deployment time: 1300 Net Retrieval time: 1305 Time Net collecting: 5 min. 80°F

Tides (time /ft) - Low 13:31-0.6 High 07:02/5.6 Precipitation in Last 24 hrs (circle) Y (N)

Number of species: _____ Total Number of Individuals _____ T&E Species Collected (circle)? Y N

Data Recorder: AJ Modjeski Signature: _____

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm)	FL/TL Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
W. Flounder			8	9		6	5		7	6							
F. majalis			3	1		4	1		3	>1		3	>1		3	1	
N. scabbin			4	1													
F. Heteroclitus			5	2		4	1		6	4		5	1		6	2	
F. Heteroclitus			4	1		4	2		4	2		3	1		5	3	
F. Heteroclitus			4	1													
Threespined minnow			2	>1													
F. majalis			4	1		2	>1										
F. Heteroclitus			3	1		4	2										

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

Herring Project Data Sheet

Central N. Bank 1st from east

Location: STATION 2 Field Crew JD AM Date: 9/8/14 Water Quality Taken (circle) Y (N)
Sample Number: WR-090814-2 Weather OVERCAST - 20-25 E WIND
Net Deployment time: 1420 Net Retrieval time: 1430 Time Net collecting: ____
Tides (time /ft) - Low 1313 / -0.6 High 1925 / 6.1 Precipitation in Last 24 hrs (circle) Y N
Number of species: ____ Total Number of Individuals ____ T&E Species Collected (circle)? Y N
Data Recorder: A Modjeski Signature: [signature]

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
F. Heteroclitus			4	2	L	4	2	L	5	2	L	7	8	L	9	6	L
Sheepshead minnow			3	1	L	3	1	L	3	1	L	3	1	L	3	1	L
Sheepshead min			5	3	L	3	1	L	2	1	L	3	1	L	3	1	L
Sheepshead m			3	1	L	3	1	L	3	1	L	3	1	L	3	1	L
Sheepshead m.			3	1	L	3	1	L	3	1	L	3	1	L	3	1	L
Sheepshead minnow																	
F. Majalis			9	7													
Blue claw crab			5 m	28	L	12	49	L	2	1	L						
F. Heteroclitus			9	13													
Winter Flounder			11	18													
palaemonetes			2	1													
shrimp																	
Moon Jelly			1 moon jelly														

mostly mummis is sheepshead

Approx. 4 lbs of mummichog sheepshead kill. mix

Did not weigh since did not want to kill all

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

Herring Project Data Sheet

Location: Station 1 Field Crew Al, Megan, Kathleen, Sherri Date: 9/11/14
Sample Number: WP091114-1 Weather No rain, Sunny Water Quality Taken (circle) (Y) N
Net Deployment time: 10 00 Net Retrieval time: _____ Time Net collecting: _____
Tides (time /ft) - Low 1548/-0.5 High 0932/5.9 Precipitation in Last 24 hrs (circle) Y (N)
Number of species: _____ Total Number of Individuals _____ T&E Species Collected (circle)? Y N
Data Recorder: Kathleen Devine Signature: Kathleen Devine

Full moon

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
silverside	~~30%~~		11.3	14.5	
			9	5	
mummichog	10%		6	5	
			4	2	
blue claw crab			9cm	59g	Male 3rd+
winter flounder	1		9cm	15g	L
sheepshead minnow	5%		3	2	
northern King fish	2%		6cm	5g	
			5	2	
striped killi	5%		8	9	
silverside			7	4	
			4	1	

SPECIES	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
silverside	9	7	
	5	2	
mummichog	4cm	2g	
blue claw crab	5cm	40g	Male
winter flounder			
sheepshead minnow	3	2	
northern King fish	3cm	2g	
striped killi			
silverside	5	1	
	5	2	

SPECIES	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
silverside	8	8	
	9	6	
mummichog	5	2g	
blue claw crab	1cm	1g	
winter flounder			
sheepshead minnow	3	2	
northern King fish	4cm	5g	
striped killi			
silverside	5	2	
	5	1	

SPECIES	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
silverside	9	8	
	6	2	
mummichog	7	6	
blue claw crab	4cm	41g	
winter flounder			
sheepshead minnow	3	2	
northern King fish	4	3	
striped killi			
silverside	5	2	
	5	2	

SPECIES	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
silverside	8.5 ~~8~~	6	
	5	2	
mummichog	7	8	
blue claw crab	4cm	41g	
winter flounder			
sheepshead minnow	~~7~~	1	
northern King fish	5	2	
striped killi			
silverside	6	3	
	5	2	

Water Quality
T 21.6 C
DO ~~4.6~~ 1.35 mg/l
pH 7.9
salinity ~~4.6~~ 30.2
DO% - 17.6
sp 46.6

Secci
10 pieces of tap

1/2 gallon fish

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

Herring Project Data Sheet

~~250ft below Area 5~~ Station 1

Location: ~~Area 5b~~ Field Crew Megan, Al, Kathleen Sherri Date: 9/11/14

Sample Number: _____ Weather Clear Water Quality Taken (circle) Y N

Net Deployment time: 1000 Net Retrieval time: _____ Time Net collecting: _____

Tides (time /ft) - Low 1548 / -0.5 High 0932 / 5.9 Precipitation in Last 24 hrs (circle) Y (N)

Number of species: _____ Total Number of Individuals _____ T&E Species Collected (circle)? Y N

Data Recorder: Kathleen Devine Signature: _____

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
Silverside			5		2																	

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

250 ft below Old Mill Dam ~100 ~~mill~~ ft pull

Herring Project Data Sheet

Page 1 of [illegible]

Location: Area 5 Field Crew: Megan, Al, Kathleen, Sherri Date: 9/11/14

Sample Number: WP091114-2 Weather: Clear Water Quality Taken (circle) Y N

Net Deployment time: ______ Net Retrieval time: ______ Time Net collecting: ______

Tides (time /ft) - Low 1548/-0.5 High 0932/5.9 Precipitation in Last 24 hrs (circle) Y (N)

Number of species: 1 Total Number of Individuals ______ T&E Species Collected (circle)? Y N

Data Recorder: Kathleen Devine Signature: Kathleen Devine

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
Blue gill		1	4	3g													

12:22
T 28.7C
DO 8.43
DO% 95.5
pH 7.87
Salinity .16
Con. 333
Clarity 6" to bottom

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

Attempt

Herring Project Data Sheet

Location: Area 5 Field Crew Megan, Ali, Kathleen, Sherri Date: 9/12/14

Sample Number: _____ Weather _____ Water Quality Taken (circle) Y N

Net Deployment time: _____ Net Retrieval time: _____ Time Net collecting: _____

Tides (time /ft) - Low _____ High _____ Precipitation in Last 24 hrs (circle) Y (N)

Number of species: _____ Total Number of Individuals _____ T&E Species Collected (circle)? Y N

Data Recorder: Kathleen Devine Signature: Kathleen Devine

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

250 ft below Area 5 Attempt

Page 1 of 1

Herring Project Data Sheet

Location: Area 5b Field Crew Megan Al Kathleen Date: 9/11/14

Sample Number: _____ Weather Clear Water Quality Taken (circle) Y N

Net Deployment time: _____ Net Retrieval time: _____ Time Net collecting: _____

Tides (time /ft) - Low 1548 / -0.5 High 0932 / 15.9 Precipitation in Last 24 hrs (circle) Y (N)

Number of species: _____ Total Number of Individuals _____ T&E Species Collected (circle)? Y N

Data Recorder: _____ Signature: _____

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)

Herring Data Collection Form 2007

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT*******

pg____of____

Spring Lake sub @ 200' west

Herring Project Data Sheet

Location: Wreck Pond Outfall Field Crew AM, MM Date: 9/18/14
Sample Number: WP-0918-1A Weather Clear, Slight wind Water Quality Taken (circle) (Y) N
Net Deployment time: 1000 Net Retrieval time: _____ Time Net collecting: _____
Tides (time /ft) - Low 9:32 AM / 1.0 High 15:46 / 4.5 Precipitation in Last 24 hrs (circle) Y (N)
Number of species: _____ Total Number of Individuals _____ T&E Species Collected (circle)? Y N
Data Recorder: Katie Conrad Signature: _____

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
N. Kingfish			9.4		7.0	L	8.5		5.0	L	7.7		4	L	9.2		8	L	8.5		6	L
N. Kily			8.6		6	L	7.5		4	L	7.2		3	L	10.4		10	L	10.0		9	L
N. Kily			7.3		3	L	8.2		5	L	6.6		3	L	7.9		5	L	5.6		2	L
Silverside			9.2		4	L	6.4		1	L	9.6		3	L	9.4		5	L	5.4		<1	L
N. Kily			9.5		5	L	9.1		7	L	6.8		4	L	7.0		4	L	6.5		3	L
Mummichog			4.6		1	L	3.6		<1	L	3.1		<1	L	4.1		<1	L	3.6		<1	L
N. King			7.2		3	L	9.6		8	L	13.4		23	L	7.8		4	L	9.1		7	L
N. King			8.4		5	L	9.1		7	L	8.3		5	L	7.1		3	L	8.4		5	L
Sea robin			4.6		1																	
Quahog			1.7		1																	
N. King			4.8		7		9.6		8													
N. Flounder			5.5		<1	L	4.7 J		1	L	6.9		2	L	4.9		<1	L	6.1 J		2	L
N. Flounder			6.0		2	L	4.1		<1	L	6.6		3	L	4.3		6	L	5.9		2	L
N. Flounder			9.6		9	L	9.7		9	L	9.4		8	L	9.0		7	L	6.6		2	L
Shrimp			4.1		<1	L	4.4		<1	D	4.3		<1	L								
Crangon																						

WQ
Temp - 20.26°
DO% - 43.5%
DO mg/l - 3.76
Sal - 21.38
pH - 7.82

Left in net
45% mummy/killi
40% silverside
10% longfish
5% sheepshead
33.15 sp Ca

Feb

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

mummichog
silverside 5

Herring Project Data Sheet

Location: Wreck Pond Outfall Field Crew AM, MM Date: 9/18/2014
Sample Number: WP-0918-1A Weather clear, 5 mph wind Water Quality Taken (circle) (Y) N
Net Deployment time: 1000 Net Retrieval time: _____ Time Net collecting: _____
Tides (time /ft) - Low 0432 / 1.0 High 1546 / 4.5 Precipitation in Last 24 hrs (circle) Y (N)
Number of species: _____ Total Number of Individuals _____ T&E Species Collected (circle)? Y N
Data Recorder: Katie Conroy Signature: _____

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
silverside			7.1	3	L	6.4	1	L	5.8	1	L	6.6	2	L	6.2	1	L
killifish			7.4	5	L	5.7	2	L	5.1	1	L	4.7	1	L	5.4	1	L
mummichog			3.6	<1	L	3.5	<1	L									
killifish			5.9	3	L	4.9	1	L	4.5	1	L	4.7	<1	L	4.6	<1	L
killifish			4.4	<1	L	4.5	<1	L	4.4	<1	L	5.1	1	L	3.5	<1	L
silverside			4.1	<1	L	4.2	<1	L	9.4	5	L	5.8	1	L	9.4	5	L
mummichog			3.0	<1	L	3.7	<1	L									
killifish			4.3	1	L	4.6	1	L	3.5	<1	L	5.5	2	L	8.9	9	L
killifish			8.4	6	L	6.7	5	L	8.8	10	L	4.8	1	L	5.6	2	L
silverside			7.5	3	L	7.7	3	L	6.1	1	L	4.4	<1	L			
* claw blue crab			90	51	L	65	19	L	63	16	L	35	3	L	21	2	L
blue crab claw			27	1	L												

Herring Data Collection Form 2007

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT*******

pg____of____

Herring Project Data Sheet

slave sails to 200' seasort

Location: Wheeler Point #1B Field Crew MM, AM, KC + M UMd +2 Date: 9/18/04
Sample Number: WP-91804-1B Weather SCE sheet #1A Water Quality Taken (circle) (Y) N
Net Deployment time: 1130 Net Retrieval time: 1145 Time Net collecting: 10 min
Tides (time /ft) - Low SCE 1A 0932/1.0 High SCE 1A 1544/4.5 Precipitation in Last 24 hrs (circle) Y (N)
Number of species: _____ Total Number of Individuals _____ T&E Species Collected (circle)? Y N
Data Recorder: Katie Conrad Signature: _____

AS 1A
batteries dead

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm)	F/L/T/L	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	F/L/T/L	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	F/L/T/L	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	F/L/T/L	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	F/L/T/L	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
ladycrab			2.7 J	—	L	2.5 J	—	L		19	—	L	47	—	L	45	—	L				
jellyfish			6	—	L	169	—	L	29	—	L	30	—	L	61	—	L				
blue claw			2.0	—	L	7.5	—	D	1.5	—	L	27	—	L	17	—	L				
killyfish			34 J	—	L	76	—	L	105	—	L	80	—	L	91	—	L				
killyfish			71	—	L	89	—	L	75+	—	L	51	—	L	114	—	L				
ladycrab			34	—	L																	
killyfish			96	—	L	98	—	L	95	—	L	85	—	L	116	—	L				
blueclaw			26	—	L	24	—	L	23	—	L	15	—	L	17	—	L				
killyfish			69	—	L	92	—	L	80	—	L	99	—	L	102	—	L				
blueclaw			19																			
silverside			7.5+	—	L	84	—	L	67	—	L	73	—	L	86	—	D				
silverside			92	—	L	76	—	L	72	—	L	48	—	L	77	—	L				
N. puffer			43	—	L	56	—	L	51	—	L	57	—	L	33	—	L				
silverside			55	—	L	77	—	L	56	—	L	93 a	—	L	66	—	L				
puffer			54	—	L	49	—	L	50	—	L											

Net remain
80% silverside
20% N. Killyfish
@ 500 ml

TOTAL VOLUME of catch 750 ml

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

Herring Project Data Sheet

Location: Weck pond #1B Field Crew: MM, AM, KC, +MU+7 Date: 9/18/14

Sample Number: WP-91814-1B Weather: see sheet 1A# Water Quality Taken (circle) (Y) N

Net Deployment time: 1130 Net Retrieval time: ____ Time Net collecting: 10 min

Tides (time /ft) - Low: see 1A High ____ Precipitation in Last 24 hrs (circle) Y N See 1A

Number of species: ____ Total Number of Individuals ____ T&E Species Collected (circle)? Y N

Data Recorder: Katie Conrad Signature: [signature]

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
silverside			64	—	L	66	—	L	59	—	L	46	—	L	74	—	L
silverside			72	—	L	75	—	L	95	—	L	60	—	L	55	—	L
N. searobin			55	—	L												
kingfish			[illegible]														
spot tail flounder			5[illegible]	—	L												
windowpane flounder			95	—	L	75	—	L	91	—	L	72	—	L	55	—	L
winter flounder			106	—	L	116	—	L	95	—	L	104	—	L	85	—	L
unk flounder			54	—	L	53	—	L	48	—	L	56	—	L	45	—	L
unk flounder			44	—	L	44	—	L	45	—	L	44	—	L			
sheepshead minnow			35	—	L	36	—	L	34	—	L	33	—	L	31	—	L
~~[illegible]~~ shrimp sheepshead			28	—	L												
shrimp palaemonidae			38	—	L	37	—	L									
sand shrimp			49	—	L	44	—	L	48	—	L	37	—	L	34	—	L

33 additional kingfish not measured

50 additional dead silversides

20 live silversides not measured

Herring Data Collection Form 2007

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

Herring Project Data Sheet — N side culvert

Page 1 of 2

Location: Wreck Pond 1A Field Crew _____ Date: 9/25/14
Sample Number: WP092514 1A Weather _____ Water Quality Taken (circle) Y (N)
Net Deployment time: 1300 Net Retrieval time: _____ Time Net collecting: _____
Tides (time /ft) - Low 1443 / 0.2 High 0831 / 5.1 Precipitation in Last 24 hrs (circle) Y N
Number of species: _____ Total Number of Individuals _____ T&E Species Collected (circle)? Y N
Data Recorder: _____ Signature: _____

tide turned 1230.

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
Grass shrimp (1)																	
sea robin			7	2													
mantis shrimp			7	2													
seahorse			8	2													
N. kingfish			8	5		12	14		12	20		14	27		11	10	
			11	10		10	10		9	7		9	6		5	4	
↓			6	2		7	2		5	4		4	1				
mummichug			5	2		7	4		8	6							
silversides			11	9		7	2		11	7		7	2		9	6	
			6	1		7	2		9	3		7	3		3	3	
			6	2		4	2		7	2		7	1		5	3	
			8	3		8	3		8	3		5	3		8	3	
↓ (+3)			8	3		8	3		8	3		8	3		8	3	
winter flounder			7	2		7	2										
sheepshead minnow			3	4		3	2		2	4							

Secchi - 19"

mix tossed
85% silverside
1/4 gallon
5% crab-rock below fencing
8% kingfish
2% mummichug/killifish

Herring Data Collection Form

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

pg____of____

Herring Project Data Sheet

Location: Wreck and 1A Field Crew _____ Date: 9/25/14
Sample Number: WP092514 1A Weather _____ Water Quality Taken (circle) Y N
Net Deployment time: 1300 Net Retrieval time: _____ Time Net collecting: _____
Tides (time /ft) - Low _____ High _____ Precipitation in Last 24 hrs (circle) Y N
Number of species: _____ Total Number of Individuals _____ T&E Species Collected (circle)? Y N
Data Recorder: _____ Signature: _____

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
Blue crab			14		119	Fem.	10		60	MAL	7		28	MAL	2		1	UNK				
Lady crab			4		12	mal.	4		11	mal.	3		5	mal.	2		2	mal.	2		2	mal.
↓			2		2	mal.	2		2	mal.												
rock crab			2		<1	mal.																
Spider crab			2		<1	unk.																
White fingered mud crab			<1		<1	unk																

Herring Data Collection Form

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

seagirt side - 100' span from sluice to beach on seagirt side

Herring Project Data Sheet

Location: Wreckpond 1B Field Crew AM, SS, KC, KD Date: 9/25/14
Sample Number: WP092514-1B Weather Water Quality Taken (circle) (Y) N
Net Deployment time: 11 AM Net Retrieval time: 11 AM Time Net collecting: Ø
Tides (time /ft) - Low 1443 / 0.2 High 0831 / 5.1 Precipitation in Last 24 hrs (circle) (Y) N
Number of species: Total Number of Individuals T&E Species Collected (circle)? Y N
Data Recorder: ~~Ka~~ Kathleen DeVine Signature: Kathleen DeVine

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
Silverside		50+	not measured																			
silverside			10	6			9	6			8	5			8	4			9	5		
			7	4			8	4			7	3			6	3			6	2		
			7	3			9	6			7	3			4	2			7	3		
			7	3			6	2			6	2			5	2			6	2		
			10	6			6	2			6	2			5	1			6	2		
northern puffer			9	20																		
northern kingfish			11	11			12	15			5	1			10	11			10	13		
			10	9			13	21			10	10			7	3			10	9		
southern kingfish			11	13																		
northern kingfish			11	13			14	13			8	6			8	6			8	6		

YSI
Time 11:14
T 19.35
Cond 46.41
MS/CM
Sal 30.11
DO — green tape
pH 8.0

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

Herring Project Data Sheet

Location: Weckpond 1B Field Crew AM, SS, KC, KD Date: 9/25/14
Sample Number: WP 9 25 14 - 1B Weather Water Quality Taken (circle) (Y) N
Net Deployment time: 11 AM Net Retrieval time: 11 AM Time Net collecting: 0
Tides (time /ft) - Low High Precipitation in Last 24 hrs (circle) Y N
Number of species: Total Number of Individuals T&E Species Collected (circle)? Y N
Data Recorder: Kathleen Devine Signature:

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	
northern kingfish			8		6		8		6		8		6										+ 25
Crabs			12		29																		
jac																							
Blue claw			10		61	M	9		40	M	15		130	F Eggs	11		67	SM	2		1		
Lady crab			6		22	SM	3		4		5		11	M	4		6	M	5		8	M	+6
			6		14	M	4		6		35		4		4		5	M	3		4	M	
			4		7		5		6	M	4		3		3		4						
northern sea robin			8		4	D																	

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

Herring Project Data Sheet

Location: Wreck pond 1B Field Crew AM, SS, KC, KD Date: 9/25/14
Sample Number: WP092514-1B Weather Water Quality Taken (circle) (Y) N
Net Deployment time: 11:14am Net Retrieval time: 11:40am Time Net collecting: 26
Tides (time /ft) - Low High Precipitation in Last 24 hrs (circle) Y N
Number of species: Total Number of Individuals T&E Species Collected (circle)? Y N
Data Recorder: Kathleen Denne Signature:

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
Summer Flounder			7		3		5		1		5.5		3									
Winter Flounder			10		9		11		12		10		12		7		4					
Windowpane Flounder			7		5		5		1													
Winter Flounder			5		2		5		2		5		4									
~~Unknown~~ Unknown			4		2																	
Mixed																						

Herring Data Collection Form 2007

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

Herring Project Data Sheet

Jimmie Burns property N of bridge

Location: Wreck Pond 3A Field Crew _____ Date: 9/25/14

Sample Number: WP-092514-3A Weather _____ Water Quality Taken (circle) (Y) N

Net Deployment time: 1445 Net Retrieval time: _____ Time Net collecting: _____

Tides (time /ft) - Low 1493 / 0.2 High 2040 / 4.8 Precipitation in Last 24 hrs (circle) Y N

Number of species: _____ Total Number of Individuals _____ T&E Species Collected (circle)? Y N

Data Recorder: _____ Signature: _____

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
Blue crab			9	50													
White sucker			11	13													
Banded Killifish			5	1		6	2										
unknown			6	7													
Yellow perch			4	10		8	11		8	9		8	9		8	8	
Bluegill			5	2		5	2		5	2		5	2		5	2	
↓			5	2		5	2		5	2		5	2		5	2	
			5	2		5	2		5	2		5	2		5	2	
			5	2		5	2		5	2		5	2		5	2	
↓ +18			5	2		5	2		5	2		5	2		5	2	

WQ

Time: 1447

Temp: 19.73°C

Sp. Cond: 0.385 mS/cm

sal: 0.18

DO %: 68.5%

DO mg/L: 6.24

pH: 7.6

*******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT*******

Springlake side (1A)

Herring Project Data Sheet

Location: Wreck Pond Field Crew See HASP SHEET Date: 10/10/14
Sample Number: WP-101014-1(1A) Weather cloudy · 60°F · Light wind Water Quality Taken (circle) (Y) N
Net Deployment time: _____ Net Retrieval time: _____ Time Net collecting: 09:45
Tides (time /ft) - Low 1530 / -0.50 High 0908 / 5.88 Precipitation in Last 24 hrs (circle) Y (N)
Number of species: 8 Total Number of Individuals _____ T&E Species Collected (circle)? Y N
Data Recorder: Shea Shaben Signature: _____

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
Atlantic silverside			8	4	FD	7	6	FD	4	<1	FD	6	1	L	5	1	L
"			6	2	L	5	1	L	5	1	L	5	1	L	5	2	L
"			6	3	L	7	2	L	6	2	L	5	2	L	5	3	FD
"			4	<1	FD	4	<1	FD	6	1	FD	5	<1	L	5	1	L
"			6	1	L	5	1	FD	10	9	L	4	<1	L	8	4	L
Blue Fish			15	39	L	13.5	25	L	14	33	L	10	12	L			
King Fish			13	40	L	11	19	L	9	11	L	13	29	L	10	14	L
"			11	20	L	11	21	L	9	10	L	10	15	L	10	21	L
"			9	10	L	8	5	L	11	16	L	7	5	L	9	8	L
sand eel			12	3	L												
bay anchovie	30	25	6			5			5			6			5		
summer flounder			30	344	L												
bay anchovie			5			6			5			5			6		
"			5			5			6			5			5		
"			6			5			5			6			5		

WQ

18.53: temp
32.46: salinity
xDO%: -9.8 error
xDO mg/L: -1.03 error
Depth: 0.32
pH: 8.06
49.55: conductivity

*******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT*******

Spring Lake side

Herring Project Data Sheet

Location: Wreck Pond Field Crew see HASP Sheet Date: 10/10/14
Sample Number: WP-101014-1 Weather cloudy - 60°F Water Quality Taken (circle) Ⓨ N
Net Deployment time: ______ Net Retrieval time: ______ Time Net collecting: 09:45
Tides (time /ft) - Low ______ High ______ Precipitation in Last 24 hrs (circle) Y N
Number of species: ______ Total Number of Individuals ______ T&E Species Collected (circle)? Y N
Data Recorder: Sheri Shifren Signature: Sheri Shifren

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
bay anchovie			5			6			5			5			6		
winter flounder			7	5	L												
puffer			6	5	L												
mummy chog			6	4	L												
blue crabs			2	2	L	2	2	L	2	2	L	2	2	L	2	2	L
"			2	2	L	2	2	L	2	2	L	2	2	L	2	2	L
"			2	2	L	2	2	L	2	2	L	2	2	L	2	2	L
"			2	2	L	2	2	L	2	2	L	2	2	L	2	2	L
"			2	2	L	2	2	L	2	2	L	2	2	L	2	2	L
lady crab			6	12	L												

crangon shrimp

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

Sea Girt side (13)

Herring Project Data Sheet

Location: Wreck Pond Field Crew see HASP sheet Date: 10/10/14
Sample Number: WP-101014-1A (13) Weather cloudy 60°F light wind Water Quality Taken (circle) (Y) N
Net Deployment time: _____ Net Retrieval time: _____ Time Net collecting: 10:50
Tides (time /ft) - Low _____ High _____ Precipitation in Last 24 hrs (circle) Y (N)
Number of species: _____ Total Number of Individuals _____ T&E Species Collected (circle)? Y N
Data Recorder: Sheri Shifren Signature: _____

1 on spring Lake side

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm) FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
Alewife			5	2	L	5	2	FD									
Bluefish			11		L	12		FD	10		FD	15		L	12		L
Northern King fish			5		L	9		L	9		L	9	10	L	9		
Window pane flounder			[redacted] 9		L	7	7	L									
winter flounder			7		L												
puffer			8		L												
Bluefish			11		L	11	18	FD	14	32	FD	10	13	FD			
Kingfish			7	4	L	5	1	L	11	23	L	5	1	L	9	11	L
summer flounder			5	<1	L	6	4	L	4	1	L	6	2	L			
kingfish			7	4	L	10	14	L	10	10	L	11	23	L	10	15	L
bluefish			12	24	L												
kingfish			10	13	L	11	20	L	10	13	L	9	10	L	6	2	L
northern sea robin			7	7	L												
summer flounder			6	1	L												
kingfish			5	1	L	10	8	L	7	4	L	7	5	L	9	8	L

½ gallon bay anchovies

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT******

Sea girt side

Herring Project Data Sheet

Location: Wreck Pond Field Crew see HASP sheet Date: 10/10/14
Sample Number: WP 101014-1A Weather cloudy 60° light wind Water Quality Taken (circle) (Y) N
Net Deployment time: _____ Net Retrieval time: _____ Time Net collecting: 10:50
Tides (time /ft) - Low _____ High _____ Precipitation in Last 24 hrs (circle) Y (N)
Number of species: _____ Total Number of Individuals _____ T&E Species Collected (circle)? Y N
Data Recorder: Sheri Shifren Signature: Sheri Shifren

Spring lake side

SPECIES	Total wt/sub	Total Count/sub ct.	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)	Length (cm)	FL/TL	Weight (g)	Live (L) Fresh Dead (FD) Dead (D)
silverside			10		7	L	10		5	L	10		6	L	8		4	L	8		4	L
unk flounder			6		2	L																
silverside			8		2	L	6		2	L	7		3	L	9		4	L				
blue crab ♀			3		1	L	11		6	L	12			L	12			L	2			L
"			3			L					3			L	3			L	3			L
lady crab			3			L	5			L	3			L	4			L	4			L
"			4			L	3			L	4			L								
green crab			4			L																

******CIRCLE LENGTH(S) OF SPECIES WITH ABNORMALITIES AND DESCRIBE IN SPACE TO RIGHT*******