Oyster Density and Sediment Characterization in the Hudson River from Piermont Pier to Yonkers Final Report

NEIWPCC Job Code: 0100-183-002

Prepared for:

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and

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1.Project Synopsis

This project directly implemented Strategy 1 of the Robust River Habitats Benefit in the New York State Department of Environmental Conservation's (NYSDEC) 2021-2025 Hudson River Action Agenda by mapping American Oyster (*Crassostrea virginica*) presence and characterizing potential habitat in the Hudson River between Piermont Pier and Yonkers, New York. The data collected as part of this effort contributes to the goal of improving 50 acres of oyster habitat by 2030. Understanding where oyster reefs exist, the density of native oysters in the river and identifying suitable habitats is critical to enhancing existing reefs and implementing successful restoration efforts. This project has been funded and overseen by the New England Interstate Water Pollution Control Commission (NEIWPCC) and the Hudson River Estuary Program of NYSDEC.

To achieve this goal, the following objectives were completed for this project:

- Benthic samples were collected at locations along a set of pre-determined transects that were established across the Hudson River from its eastern to western shores in New York.
- From each sample, oysters were counted and measured, and sediment was characterized.
- Sonar data was also collected along each transect.

The tasks, project deliverables, and dates of completion are outlined in Table 1. In April 2025, HDR acquired a NYSDEC Scientific Collector's License. The Quality Assurance Project Plan (QAPP) was finalized in June and updated in July 2025. Field data collection occurred during June and July 2025. The draft data were submitted to NEIWPCC and NYSDEC in August 2025. The draft data report was submitted in September 2025 and the final report submission is anticipated in October 2025.

HDR executed the work for this project with support from our technical partner Billion Oyster Project (BOP). BOP is non-profit restoration and public education organization in New York City, whose mission is to restore oyster reefs in New York Harbor through public education initiatives. For this project, BOP was responsible for reviewing the QAPP and providing feedback on the Draft and Final Report.

Table 1. Project Deliverables and Dates of Completion or Anticipated Date of Submission

Task	Deliverable	Completion Date or Anticipated Date of Submission
A	Draft and Final QAPP	June 2025 – Version 1 July 2025 – Version 2
B	Scientific Collector's License Application to NYSDEC Special Licenses Unit	April 2025
C	Data Collection	June - July 2025
D	Draft Data QC and Submittal	August 2025
E	Draft Report	September 2025
F	Final Report and Data	October 2025

2. Tasks Completed

HDR compiled the draft QAPP for this project (Task A) to establish the proposed sampling plan and timeline. The draft included: locations for transects and sample locations; methods for sediment characterization, oyster measurement and handling; data entry, analysis and reporting; and QA/QC procedures. The draft QAPP was submitted to the NEIWPCC and NYSDEC team for review and was subsequently revised based on comments received. Before field activities commenced, HDR completed the acquisition of a Scientific License to Collect or Possess from the NYSDEC Special Licenses Unit (Task B) by submitting the necessary permit application.

HDR then proceeded with field data collection (Task C), which involved collecting 25 evenly spaced grab samples along eight transects aligned from east to west, perpendicular to the river flow, in New York (Figure 1). Twenty-five samples were collected along each transect, providing a robust dataset of 200 samples for analysis of potential oyster habitat and distribution. Samples were collected on eight days between June 12 and July 24, 2025; one transect was sampled in its entirety on each sampling day (Table 2). No samples were collected within New Jersey territorial waters, as the Scientific License to Collect or Possess only authorized sampling within New York.

Table 2. Transect Data Collection Dates

Transect	Collection Date
A	June 12, 2025
B	June 13, 2025
C	June 17, 2025
D	July 24, 2025
E	June 18, 2025
F	July 3, 2025
G	July 9, 2025
H	July 2, 2025

Grab sample analysis involved counting and measuring all live and dead oysters and assessing sediment texture, as further described in Section 3. Prior to collecting grab samples, side-scan sonar imagery was recorded along each transect to map seabed features and to identify potential areas for targeted sampling. Water quality measurements consisting of salinity, temperature, and dissolved oxygen (DO) were collected at each grab location.

Following data collection, under Task D, the data were processed and validated in compliance with the quality standards outlined in the QAPP. The draft dataset was delivered to NEIWPCC and NYSDEC in Microsoft Excel format and ESRI-compatible geospatial formats to complete Task D.

This draft data report is the Task E deliverable. Based on consolidated feedback of the draft report, HDR will finalize the report and data deliverables as part of Task F. The final datasets will include the validated data files, geospatial data, metadata and a data dictionary. Progress reports have also been submitted each quarter to summarize the progression of the project and projected work for the following quarter.

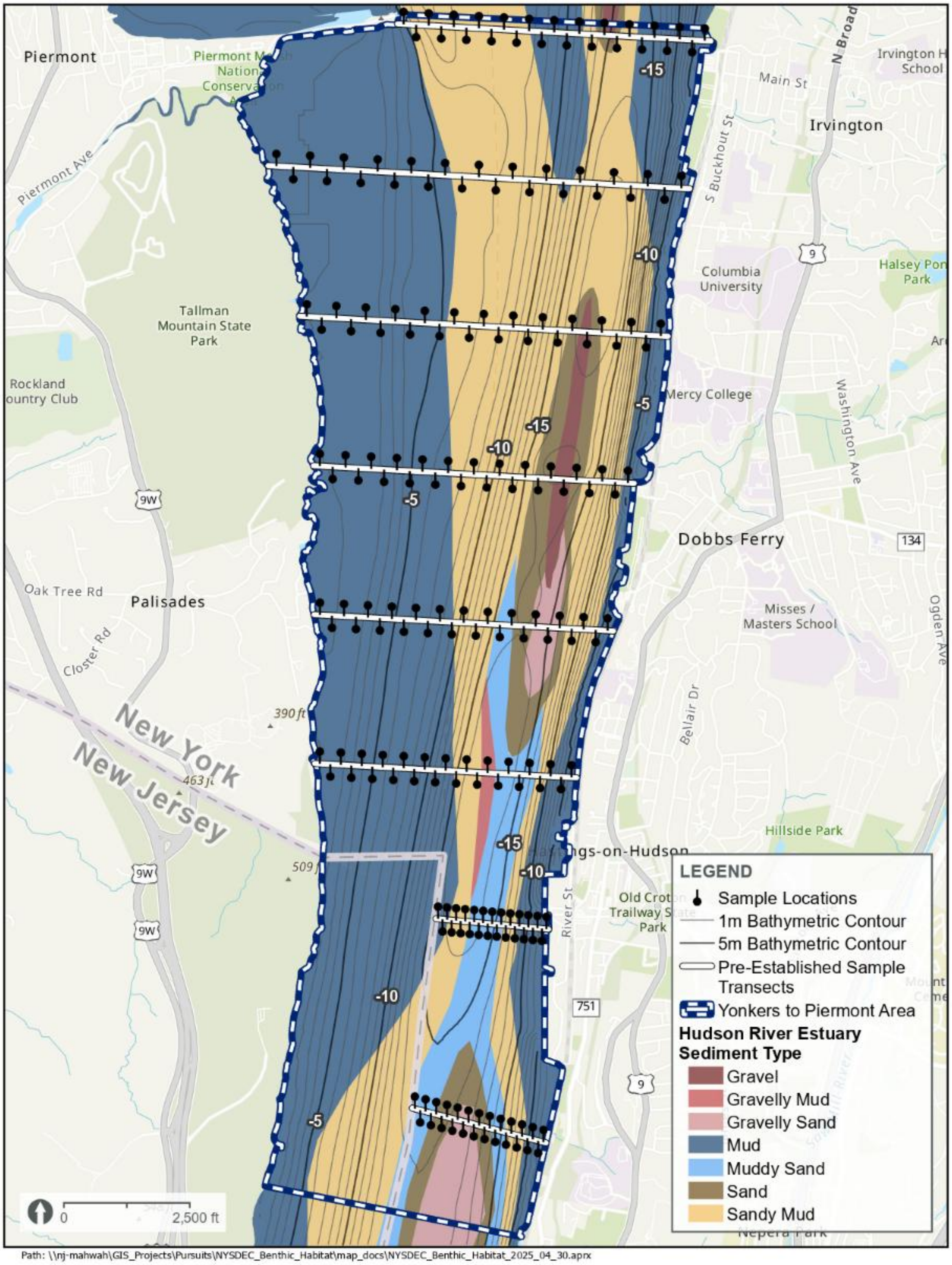

Figure 1. Transects and Sampling Locations

3.Methodology

The following section describes the methodology and quality assurance and quality control measures taken for this project. Additional details can be found in the QAPP.

3.1 Data Generation and Acquisition

Samples were collected along eight transects aligned from east to west shores and spaced approximately 1.5 miles apart (Figure 1). Before collecting grab samples, sonar imagery was recorded along each transect, using a Humminbird Helix 9 MSI+ GPS G4N sonar, to map seabed features, and to identify potential areas for targeted sampling. Sonar data were processed using PINGMapper software which is a Python interface for reading and processing side-scan sonar datasets

Sediment samples were collected using a Petersen dredge (Figure 2) with a sample area of 1.0 ft^2 and an approximate weight of 70 pounds. Twenty-five evenly spaced samples were collected along each transect, for a total of 200 samples for analysis of oyster habitat suitability and distribution. At each sample location, the Petersen dredge was lowered from the side of the boat to collect a sediment grab sample. A GNSS position was recorded as the dredge reached the river bottom to mark the location of the grab, using an Emlid Reach RX, RS3. After the dredge was triggered closed, it was raised above the water surface to drain excess liquid before being brought on-board the vessel. The dredge was emptied into a container marked with 75 percent of the sample volume. If the contents of the dredge material were below this mark, the grab was retained in a bin and another grab was collected. Up to three attempts were made at achieving a 75 percent sample at each location. The first sample greater than 75 percent, or the sample with greatest percent recovery of the three attempts was processed. Data collected from samples with less than 75 percent recovery were used to calculate oyster density but not used to characterize sediment because of potential loss of sediment fines and biasing the sediment type in a coarser direction. Section 5 presents more details about the use of the data collected at these stations. The number of attempts and percent recovery was recorded at all locations before moving to the next location. Water depth was also recorded at each sample location.

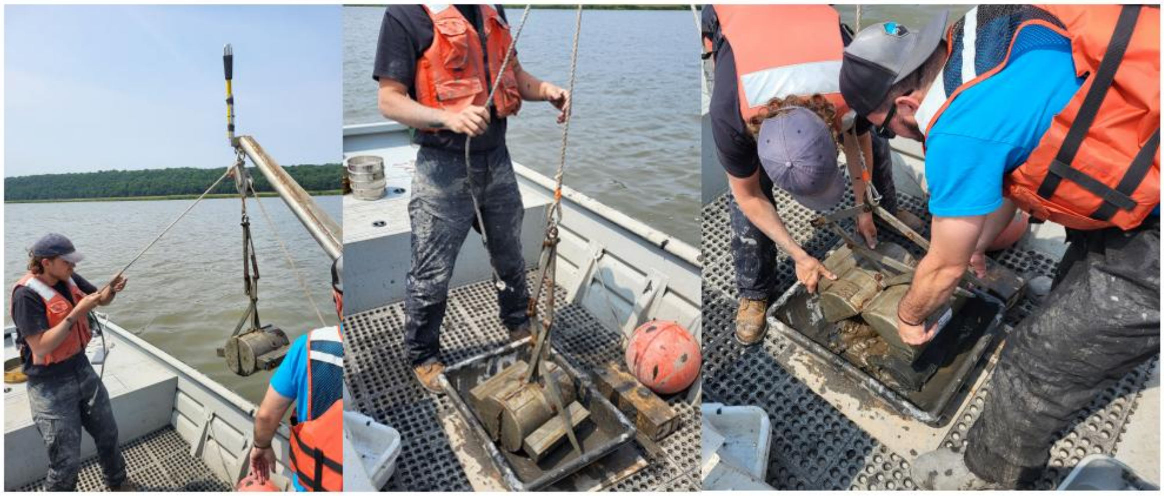

Figure 2. Field Photos of the Petersen Dredge Operation

Sample processing involved characterizing sediment and counting and measuring all oysters collected (live and dead). To maintain consistency with the previous oyster sampling work in the Hudson River, the sediment texture was classified visually and tactilely using the Natural Resource Conservation Service (NRCS) Field Book for Describing and Sampling Soils (Schoeneberger et al. 2012) and placed into one of the nine NYSDEC Benthic Mapping Project categories presented in (NYSDOS 2024). Sediment comprising more than 50 percent of the sample was assigned as the dominant sediment type. If another sediment type comprised between 15 and 35 percent of the sample, it was assigned as the modifier. For example, sandy mud describes a sample dominated by mud, with between 15 and 35 percent sand. Detailed notes were also taken further describing each sample, including the visual estimation of percentage of shell hash or other unique sample contents. A picture was taken to visually document each grab sample (Figure 3).

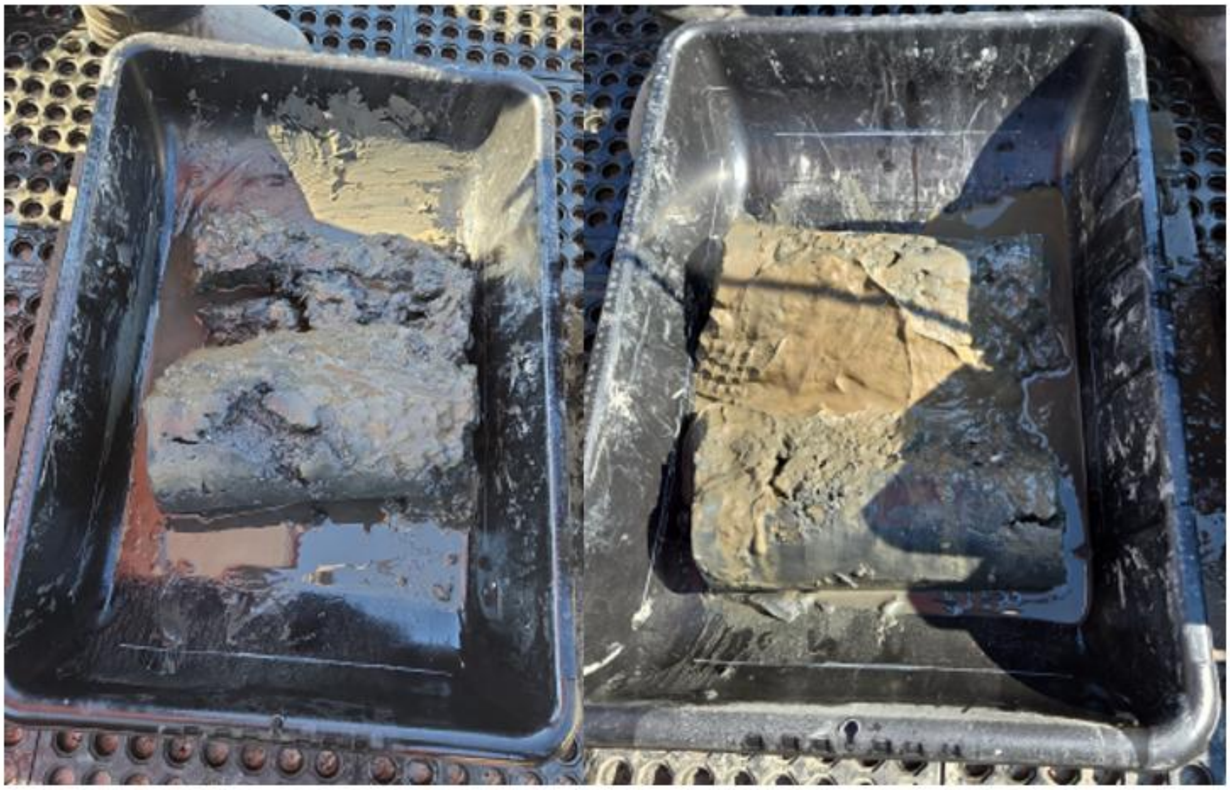

Figure 3. Field Photos of Collected Samples

Table 3. NYSDEC Benthic Mapping Project Categories

Sediment Category	Dominant Particle Size	Modifier Particle Size	Modifier Volume Percent
Mud	<0.05 mm	NA	NA
Sandy mud	<0.05 mm	>0.05 to 2 mm	≥ 15% but < 35% sand
Gravely mud	<0.05 mm	2 to 76 mm	≥ 15% but < 35% gravel
Muddy sand	>0.05 to 2 mm	<0.05 mm	≥ 15% but < 35% mud
Sand	>0.05 to 2 mm	NA	NA
Gravely sand	>0.05 to 2 mm	2 to 76 mm	≥ 15% but < 35% gravel
Muddy gravel	2 to 76 mm	<0.05 mm	≥ 15% but < 35% mud
Sandy gravel	2 to 76 mm	>0.05 to 2 mm	≥ 15% but < 35% sand
Gravel	2 to 76 mm	NA	NA

Two samples per transect were QC reviewed to confirm the sediment had been characterized correctly and consistently. After characterizing the sediment and recording the sediment type on the data form, the entire sample was then sieved through a 2 mm mesh sieve to retain gravel and a 0.05 mm mesh sieve to retain sand. All sediment sieved through the smallest sieve was classified as mud (Figure 4). The approximate volume in each sieve was visually estimated by the field scientist to determine the dominant sediment type and modifier, if applicable.

Figure 4. Field Photo of Sediment Characterization QC Check

Sediment samples were sieved through a 0.187-inch (4.75 mm) sieve to isolate the collected oysters (Figure 5). Any live or dead oysters collected were counted. An oyster was determined to be alive if it had two closed valves, or valves that closed if tapped. A dead oyster was one that had two attached valves and an intact body but would not close if tapped. All oysters were measured for shell length and shell height (from umbo to furthest growth edge) to the nearest millimeter using digital calipers (Figure 6). After each sample was processed, all sediment, oysters and other organisms were immediately returned to the Hudson River at the same location from which they were collected.

Figure 5. Field Photos Rinsing and Isolating Oysters with 0.187-inch (4.75 mm) Sieve

Figure 6. Field Photo Measuring an Oyster with Digital Calipers

Water temperature, salinity, and DO concentration were measured approximately one foot above the river bottom at each sample location using a calibrated multiparameter water quality meter, YSI ProDSS, as described in 3.2. Location data was collected via GNSS connected to an ArcGIS online field map.

3.2 Instrument/Equipment Testing, Inspection, and Maintenance

Prior to field data collection, all equipment planned for field use was inspected for operational readiness, calibrated as necessary and fully charged. The multiparameter water quality meter was calibrated according to requirements detailed in Table 4. All calibrations, calibration checks, and QC readings were recorded.

Table 4. Water Quality Calibration Requirements

Water Quality Parameter	Calibration Schedule	Acceptance Criteria	Expected Level of Accuracy
Dissolved Oxygen	Daily (when in use)	0% standard calibration check (0.0-0.3 mg/L);	±2% of the reading or ±0.2 mg/L, whichever is greater
Temperature	Annually	The meter-specific correction factor must be considered while reading temperature.	± 0.3ºC
Specific Conductance/ Salinity	Weekly (when in use), daily accuracy check with secondary standard	Minimum of one-point calibration near measured value; secondary standard calibration check (± 1.0% at 25ºC)	± 1.0% of the reading or 0.1 ppt, whichever is greater

A field duplicate was collected each field day. Duplicates are a measure of water quality reading precision. If a duplicate result fell outside QC limits, the original sample and the duplicate sample data were deemed unreliable. If the acceptance criteria are met, the original data were deemed valid. The acceptance criteria for each parameter shown in Table 5 was documented on project datasheets.

Table 5. QA / QC Objectives for Analysis of Physical and Chemical Parameters

Parameter	Duplicate Acceptance Criteria
Conductivity	± 20% relative percent difference
DO	± 0.15 mg/L
Temperature	± 1°C

3.3 Data Review, Verification, and Validation

After each field day, field data was reviewed by the QA Manager for completeness, accuracy and to ensure that pertinent observations have been recorded. Any changes to the data by the QA Manager was confirmed with the person(s) who collected the data, and a QC note was recorded in a comments field to retain the original data.

After collecting all field data, data validation occurred and involved a review of the data collected relative to the accuracy of each instrument and an evaluation of the data against overall data quality objectives. Acceptability of the data collected was determined by the Project Manager in consultation with the QA Manager and project partners and was based on the accuracy, applicability and usefulness of the data relative to its intended final use.

3.4 Data Management/Reporting

After completing the field sampling, the final validated data was submitted to NEIWPCC and NYSDEC and used to develop this report.

4. Quality Assurance Tasks Completed

Prior to field data collection, all equipment planned for field use was inspected for operational readiness, calibrated as necessary. The multiparameter water quality meter was calibrated daily according to the procedures defined in the QAPP. As a measure of precision, duplicate water quality readings were collected daily. All calibration and duplicate recordings were reviewed and found to be within the given acceptance criteria, indicating that all water quality measurements collected were reliable.

A QC check was performed twice daily on the sediment characterizations made in the field. All duplicate readings were the same as the assigned primary sediment characterizations. Thus, the sediment characterizations made for this study are deemed reliable.

After each field day, all collected data was reviewed for completeness and accuracy. Any changes to the data were confirmed with the person(s) who collected the data, and a QC note was recorded in a comments field to retain the original data. After completing data collection at all locations, final data validation was completed involving a review of the data collected relative to the accuracy of each instrument and an evaluation of the data against overall data quality objectives. Any potentially erroneous data was removed from the data set and any further analysis. During the study period, one independent field audit was conducted by the NYSDEC Hudson River Estuary Program Project Manager. The audit found field data were collected per the approved QAPP.

5. Results

Per the approved QAPP, data collected from samples with less than 75 percent recovery were used to calculate oyster density but not used to characterize sediment. At stations with less than 75 percent recovery, the sample with the highest recovery percentage was processed. At 80 stations sample recovery was less than 75 percent after making three grab attempts. In these circumstances, gravel or oyster shells often prevented the jaws of the dredge from closing, causing some sample loss and the recovery percentage to be below 75 percent. This was particularly true in deeper water where finer material would wash out of the dredge as it was raised through the water column. The data for these samples were retained and are included in Appendix A.

Oysters were found at 39 of the 200 stations (19.5 %). All oyster data collected, regardless of the percentage of sample that was recovered, have been retained, as oyster presence and counts provide valuable information. Counts of oysters at each location have been expressed as density (number of oysters per ft^2) as the dredge is equal to 1 ft^2.

5.1 Water Quality

This tidal reach of the Hudson River is semi-diurnal, with two highs and two lows within a 25-hour period. Water quality in the study area was within typical ranges for this tidal location of the River but fluctuated based on when the readings were taken in the tidal cycle. Water depth in the study area ranged from approximately 0.5 meters (1.5 feet), at location E-1, to 18 meters (59 feet) at location B-5, and the average water depth in the study area was 9.1 meters (30 feet) (Figure 7). Water depth was greatest on the eastern side of the transects, reflective of the river channel. Water temperature ranged from 18.1 to 26.5°C and averaged 22°C. The water temperature increased over the sampling period, which is likely due to the timing of the study from early to mid-summer. Salinity exhibited wide variability as expected for this tidal location, ranging from 2 parts-per-thousand (ppt) to 16.3 ppt, with an average of 8.4 ppt. DO ranged from 5.0 milligrams-per-liter (mg/L) to 8.1 mg/L. Appendix C presents the water quality measurements collected at each station.

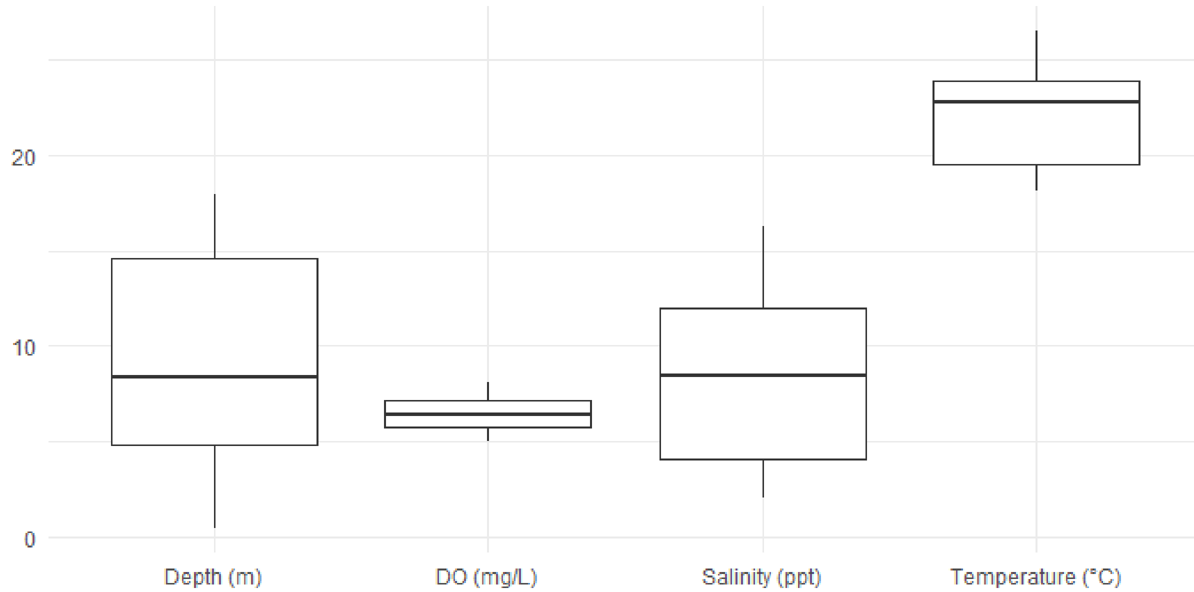

Figure 7. Summary of Water Quality Data Collected During Oyster Sampling

5.2 Sediment Characterization

The dominant sediment type found throughout the study area was mud (Figure 8). Figure 9 shows the sediment types characterized in this study with greater than 75 percent recovery along with the NYSDEC Benthic Mapping Project sediment types. The sediment closer to the eastern and western banks were uniformly characterized as mud. Based on NYSDEC Benthic Mapping Project shown as the polygons throughout the study area in Figure 9, sand and gravel were present in the study area but were generally constrained to the deeper areas within the channel. Data collected for this study classified several stations as mud where previous mapping efforts classified them with the same dominant sediment type (mud), but with a sandy modifier. As sample recovery was low in areas with higher sediment heterogeneity according to NYSDEC Benthic Mapping Project data and in deeper areas of the river, comparison of oyster density among sediment types later in this report uses NYSDEC's Benthic Mapping Project sediment classification for the entire study area. Appendix A presents the sediment classification data per station in addition to, latitude and longitude, the number of oysters collected and percent dredge recovery.

	Station																								
Transect	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
A	0	0	0	0	17	4	5	0	0	4	0	0	0	0	0	0	2	6	3	0	0	0	0	0	6
B	0	0	0	0	0	0	0	0	0	0	14	2	0	3	9	0	0	0	0	4	0	3	0	9	0
C	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	14	0
D	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
E	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	4	5	0
F	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	1	0	0	0	0	0	0	0	0	0
G	0	0	28	0	2	7	12	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H	0	0	1	0	1	7	0	0	0	0	0	0	0	0	0	0	1	1	20	0	9	6	0	0	0

Mud	Sandy mud	Gravelly mud	Sample with <75% recovery

Figure 8. Summary of Sediment Type Assessed During this Study and Oyster Density (number per ft²) at Each Station Along all Eight Transects

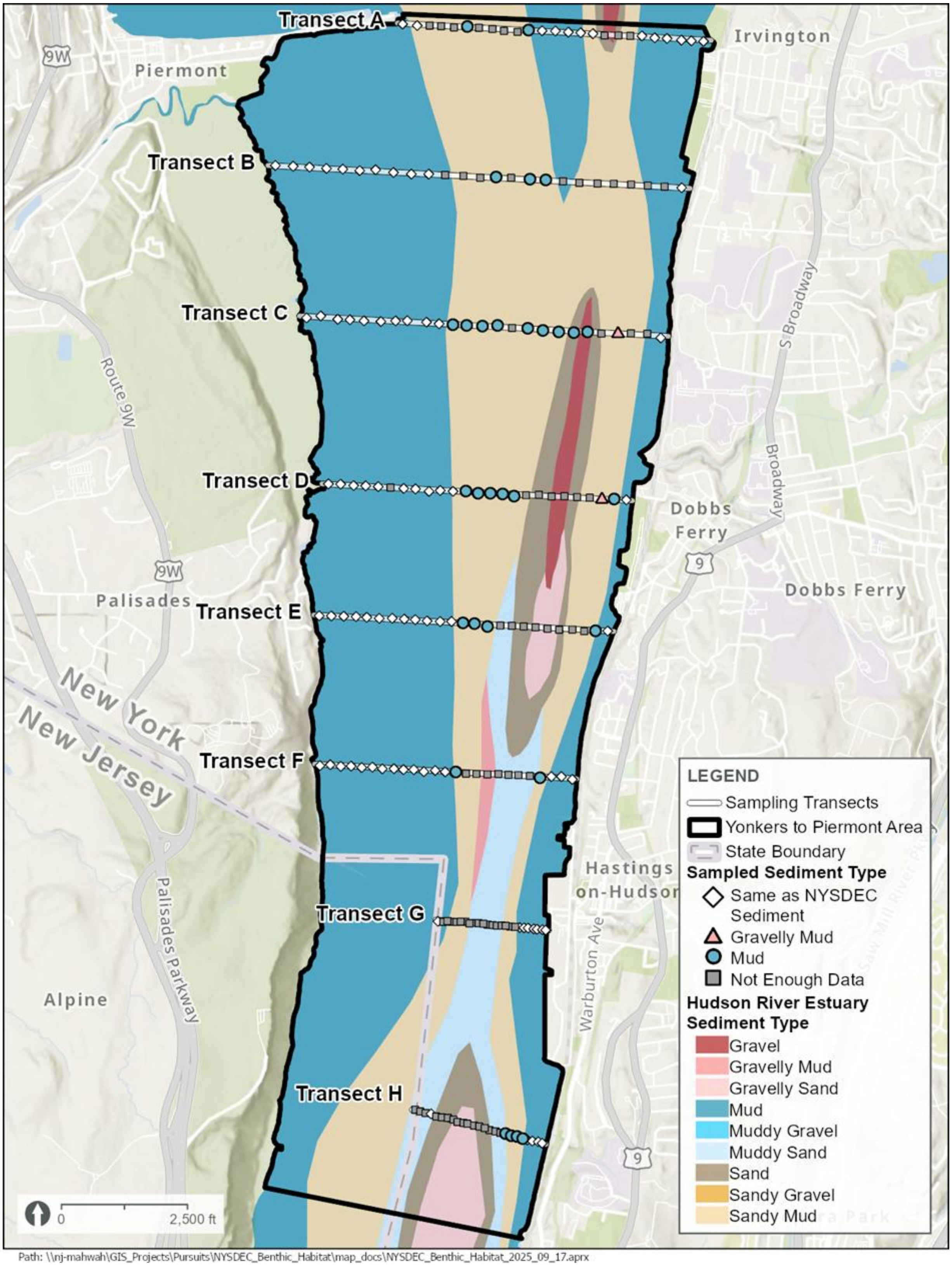

Figure 9. Summary of Sediment Types Characterized in this Study and NYSDEC Benthic Mapping Project Sediment Types

5.3 Oyster Density

Oyster (live and dead) density varied across sampling stations and ranged from zero to 28 oysters per square-foot (ft^2) (Figure 8 and Table 6). Higher densities occurred primarily in the northern and southern portion of the study area (Transects A, B, C, G and H) and on the east side or west sides of the transects (Figure 9). Transects G and H spanned only eastern section of the river to constrain data collection to the waters in New York State, therefore higher numbered stations along these transects did not approach the western bank of the river, unlike the other transects. Oyster densities in these transects, particularly in Transect G, were higher in the center of the channel as compared to the other transects. According to sediment types characterized by NYSDEC Benthic Mapping Project, oysters in the Hudson River were most commonly found and tended to occur in the highest density in muddy sediment (Figure 10). Higher oyster density in muddy sediments may be influenced by better sample recovery. Oyster density was higher in shallower depths (around 6 meters) and deeper water (15 meters and greater) as shown in the scatterplot in Figure 11.

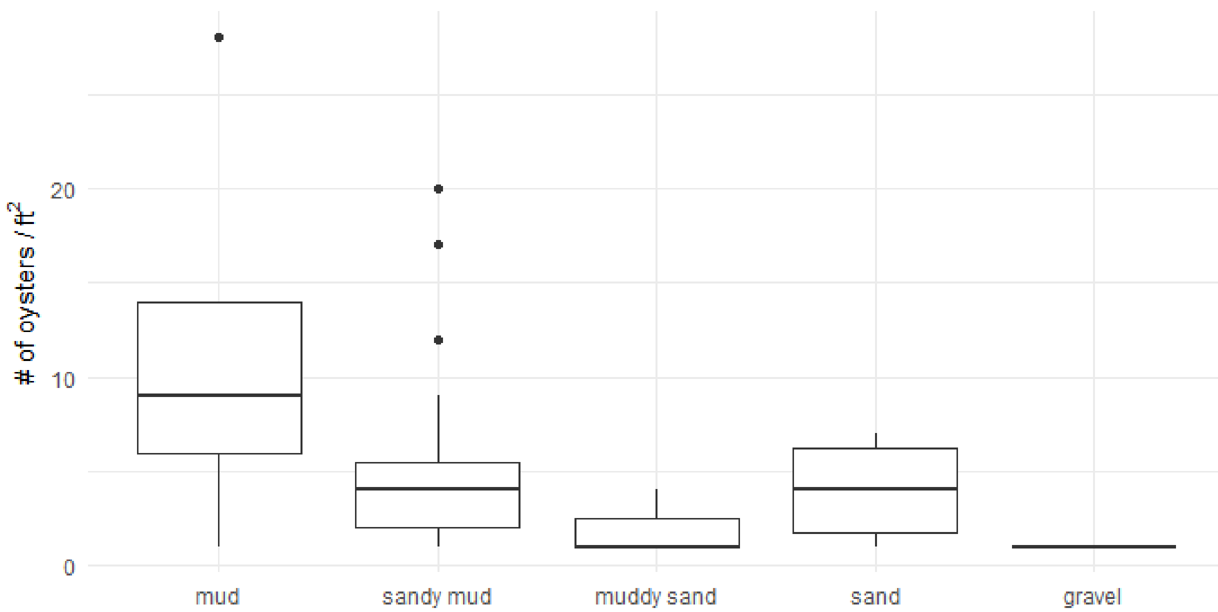

Figure 10. Oyster Density (number per ft^2) by NYSDEC Characterized Sediment Type

Table 6. Sample Density of Oysters (# / ft²)

Location	Density of Oysters in Sample (# / ft2)	75 % Dredge Volume Criteria Met
A-1	6	Y
A-7	3	N
A-8	6	N
A-9	2	N
A-16	4	N
A-19	5	N
A-20	4	Y
A-21	17	N
B-2	9	N
B-4	3	N
B-6	4	N
B-11	9	N
B-12	3	Y
B-14	2	N
B-15	14	N
C-2	14	N
C-5	2	N
C-14	2	Y
D-7	1	N
D-9	1	N
E-2	5	Y
E-3	4	N
E-12	2	Y
E-18	1	Y
F-10	1	N
F-12	4	Y
G-17	4	N
G-19	12	N
G-20	7	N
G-21	2	N
G-23	28	N
H-4	6	Y
H-5	9	Y
H-7	20	Y
H-8	1	Y
H-9	1	N
H-20	7	N
H-21	1	N
H-23	1	N

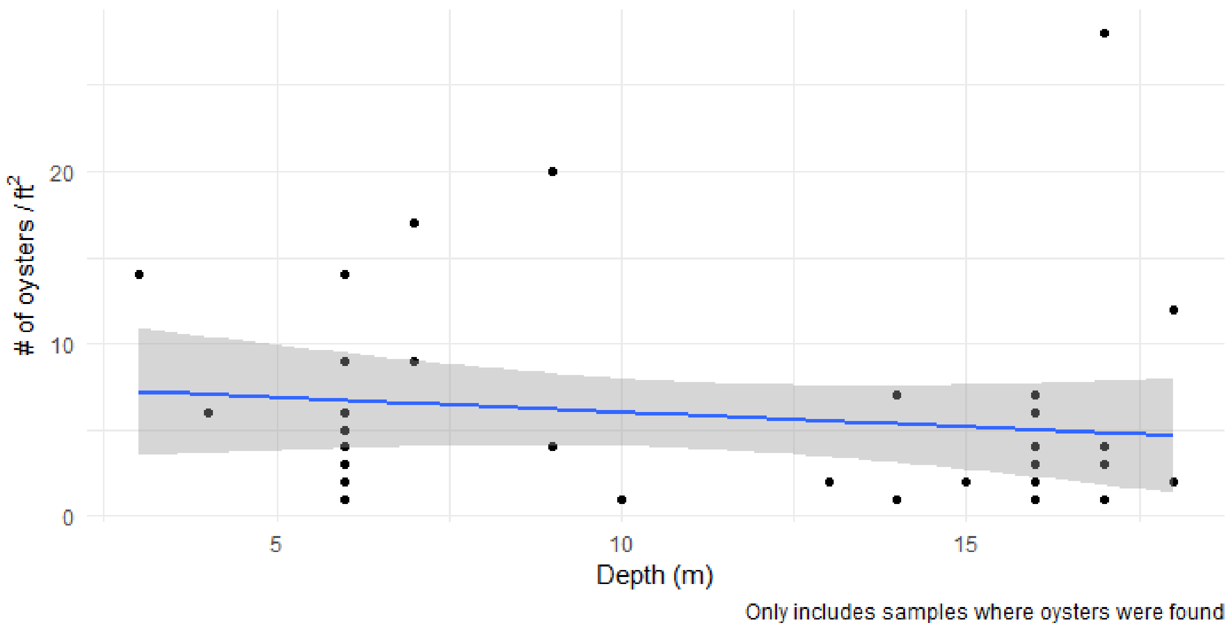

Figure 11. Oyster Density (number per ft2) by Depth (NOAA Bathymetric DEM)

5.4 Oyster Morphometrics

Oyster morphometrics ranged from 5 to 65 mm in length and from 5 to 145 mm in height; however, most individuals were between 15 and 45 mm in length and between 15 and 65 mm in height (Figure 12). While most oysters collected were alive, morphometrics were similar between the live and dead oysters. As such, calculations and data summaries presented in this report include densities and morphometrics for both live and dead oysters combined. Appendix B presents the morphometrics for each oyster collected.

Oyster height was generally higher in finer substrates than courser substrates, with height decreasing as substrates coarsened (Figure 13).

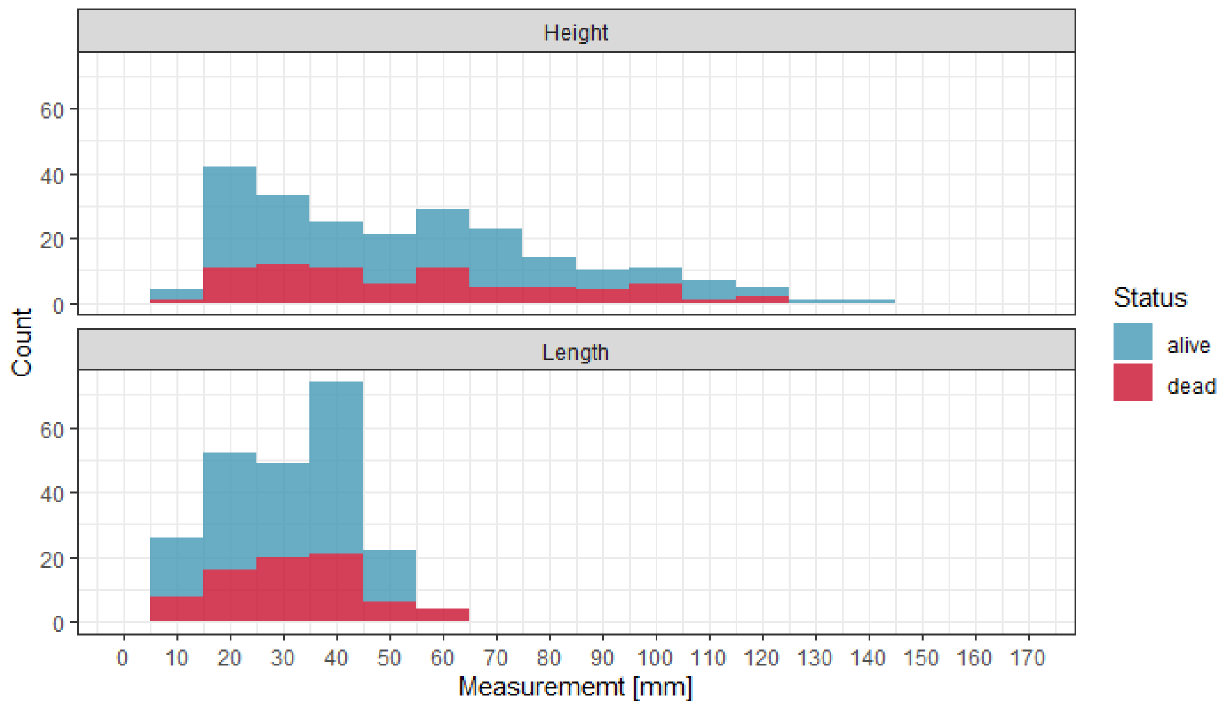

Figure 12. Oyster Length and Shell Height Frequency for Live and Dead Oysters

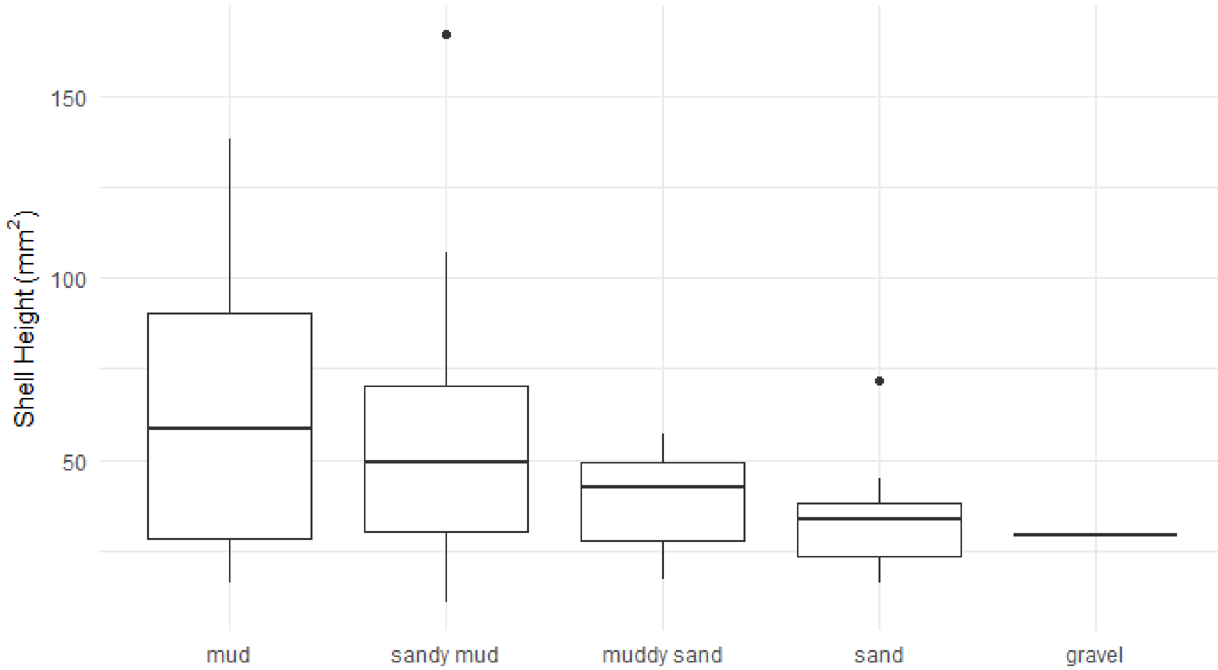

Figure 13. Oyster Height by NYSDEC Characterized Sediment Type

5.5 Sonar Data

Maps of raw sonar data collected along with oyster density are presented in Figure 15 and Figure 16. Brighter areas indicate areas of higher return or higher backscatter which are typically caused by harder or rougher substrates or steeper slopes (Buscombe et al. 2015; Buscombe 2017). Darker areas are places where less sound energy was reflected and are usually associated with softer/smoother substrates that absorb more of the incident sound energy. Figure 17 presents the side-scan sonar reflectivity versus oyster density and shows a positive trend between sonar reflectivity and oyster density in the locations where oysters were collected. The side-scan sonar data did not reveal any high backscatter or acoustic signatures indicative of extensive oyster reefs or formations. This observation aligns with the dredge sampling results, which identified only sparse distributions and isolated pockets of oysters within the study area.

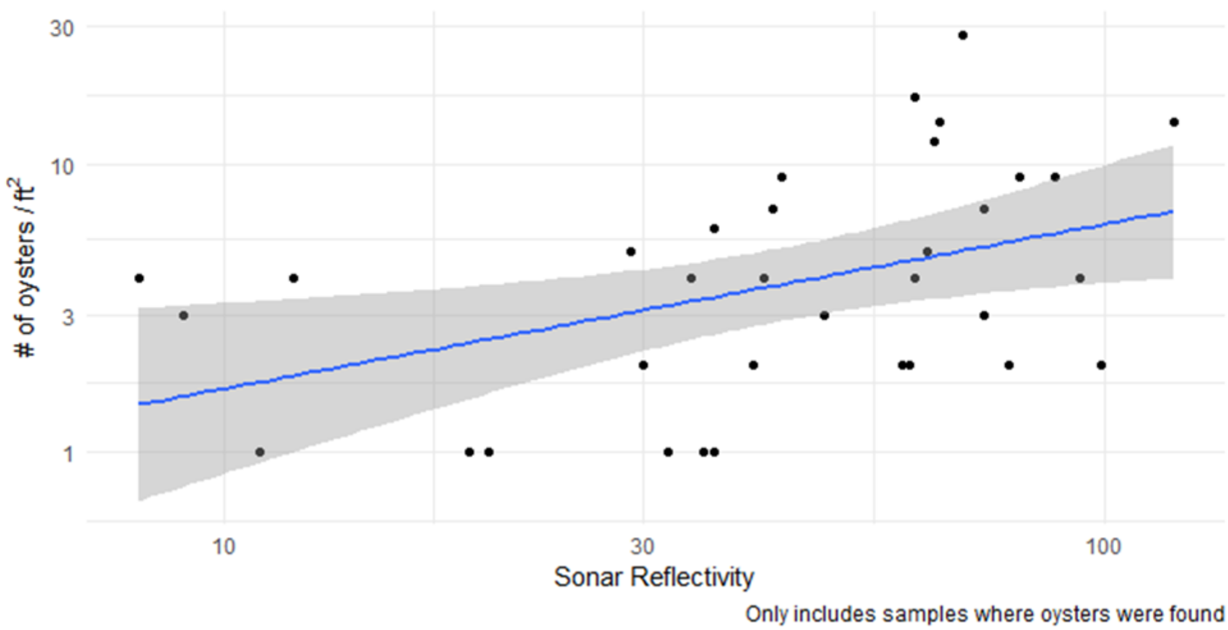

Figure 14. Oyster Density (number per ft²) verses Sonar Reflectivity

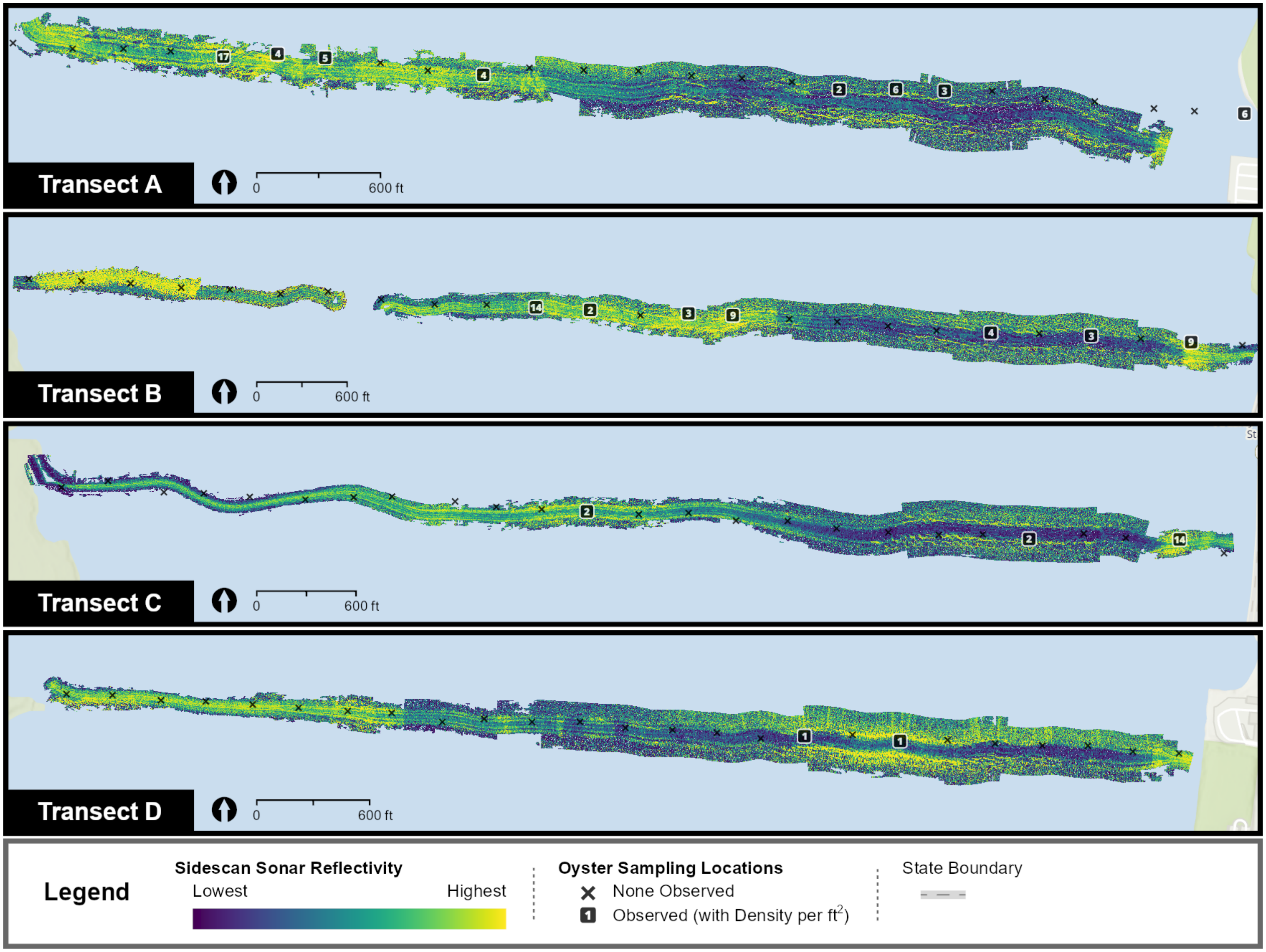

Figure 15. Sonar Data Collected Along Transects A though D, also Showing the Oyster Density (number per ft²) at Each Station

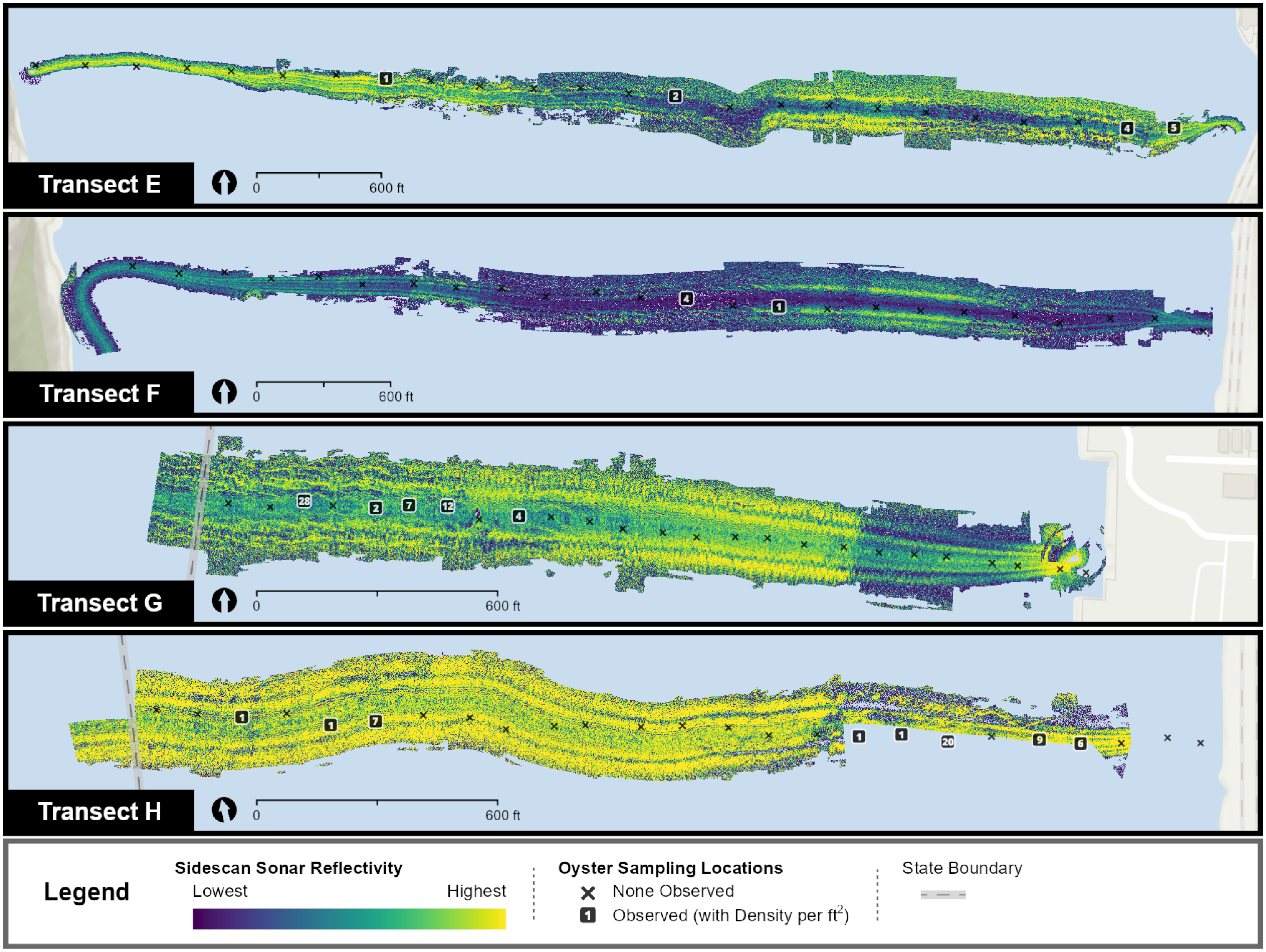

Figure 16. Sonar Data Collected Along Transects E though H, also Showing the Oyster Density (number per ft^2) at Each Station

6. Discussion and Recommendations

Water quality results were in the expected range of this tidal section of the Hudson River. As described in Section 5.3, oyster density was generally higher near the northern and southern portions of the study area (Figure 17). Density also appears to be higher near the edges of the channel or in areas of topographic transition, at approximately 6 and 16 meters. Oysters were found more often and in higher densities in finer sediments (mud and sandy mud). However, finer substrates (mud and sandy mud) make up most of the study area, so oysters may be present in these substrates simply because they are dominant and not necessarily due to a preference by oysters. Additionally, grabs were more successful in areas with finer substrates, so may have more effectively sampled oysters in these locations. Figure 18 is a spatially explicit model of NYSDEC Benthic Mapping Project sediment types and depth (NOAA 2025) to predict spatial correlation of oyster presence using the oyster density data collected for this study. The model indicates that there is some spatial correlation among these inputs, but it is not a strong model fit. As is typical with oyster density distribution, the presence and density of oysters is often very sparse (i.e. most samples contain no oysters with relatively few with some or many oysters) which makes modeling oyster densities more difficult.

If funding allows, additional sampling could be conducted in areas on the channel slope near Piermont and near Yonkers to determine if oyster densities continue to be high in these habitats between transects. In deeper areas, it may be beneficial to use another gear type to assess oyster density. The Petersen dredge used in this study was chosen to match the dredge type used for previous Hudson River oyster sampling efforts to allow for more direct comparisons of the data. However, a spring-loaded dredge such as a Smith McIntrye may allow for more consistent penetration into the sediment at deeper water locations. A scallop dredge that rakes the river bottom as it is pulled behind the boat may also be more effective at collecting oysters, and other epifauna than one that relies on dredge penetration. However, this method may result in more disturbance of existing benthic communities. The sonar data collected could be processed further to provide a better understanding of river bottom hardness, texture and sediment characteristics.

This project contributed to the baseline understanding of oyster presence by identifying areas supporting oysters and documenting the density of oysters in this Hudson River study area. Oyster reefs provide complex habitat for fish, crabs, and other aquatic organisms and support local food webs. Data collected as part of this effort will advance NYSDEC's 2021-2025 Hudson River Estuary Action Agenda's goal of restoring 50 acres of oyster habitat in the Hudson River by 2030. Areas with higher oyster density may be ideal for oyster restoration as existing oysters will serve as a natural broodstock, providing spat to enhance nearby oyster restoration sites. Proximity to these natural sources will promote successful and self-sustaining restoration. In contrast, areas lacking oysters may be less suitable due to limited broodstock and potential unfavorable habitat conditions. The information will be used to guide restoration efforts aimed at improving oyster habitat and support the ecological recovery of the Hudson River estuary.

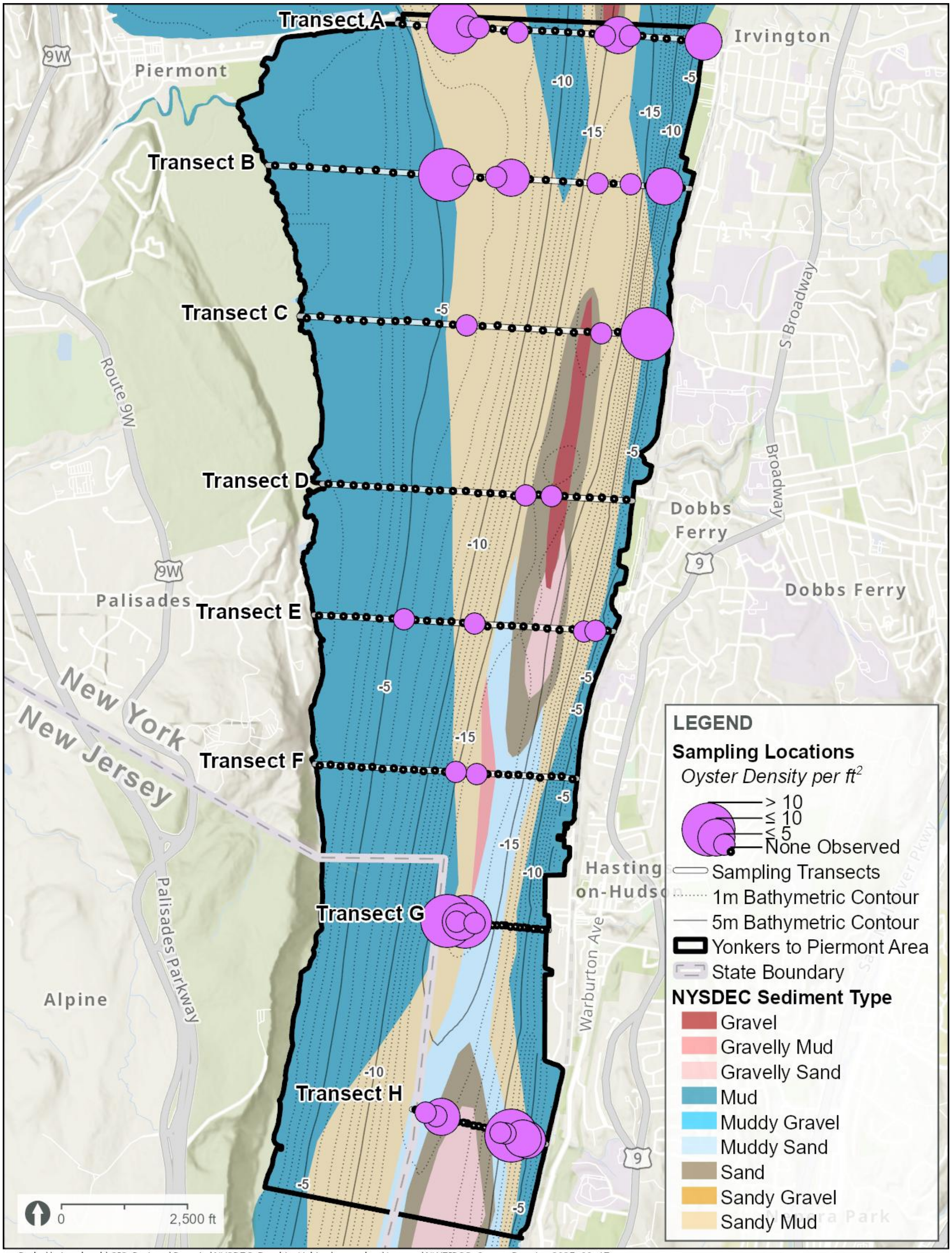

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Figure 17. Oyster Density (number per ft^2) Collected Throughout the NEIWPCC Study Area

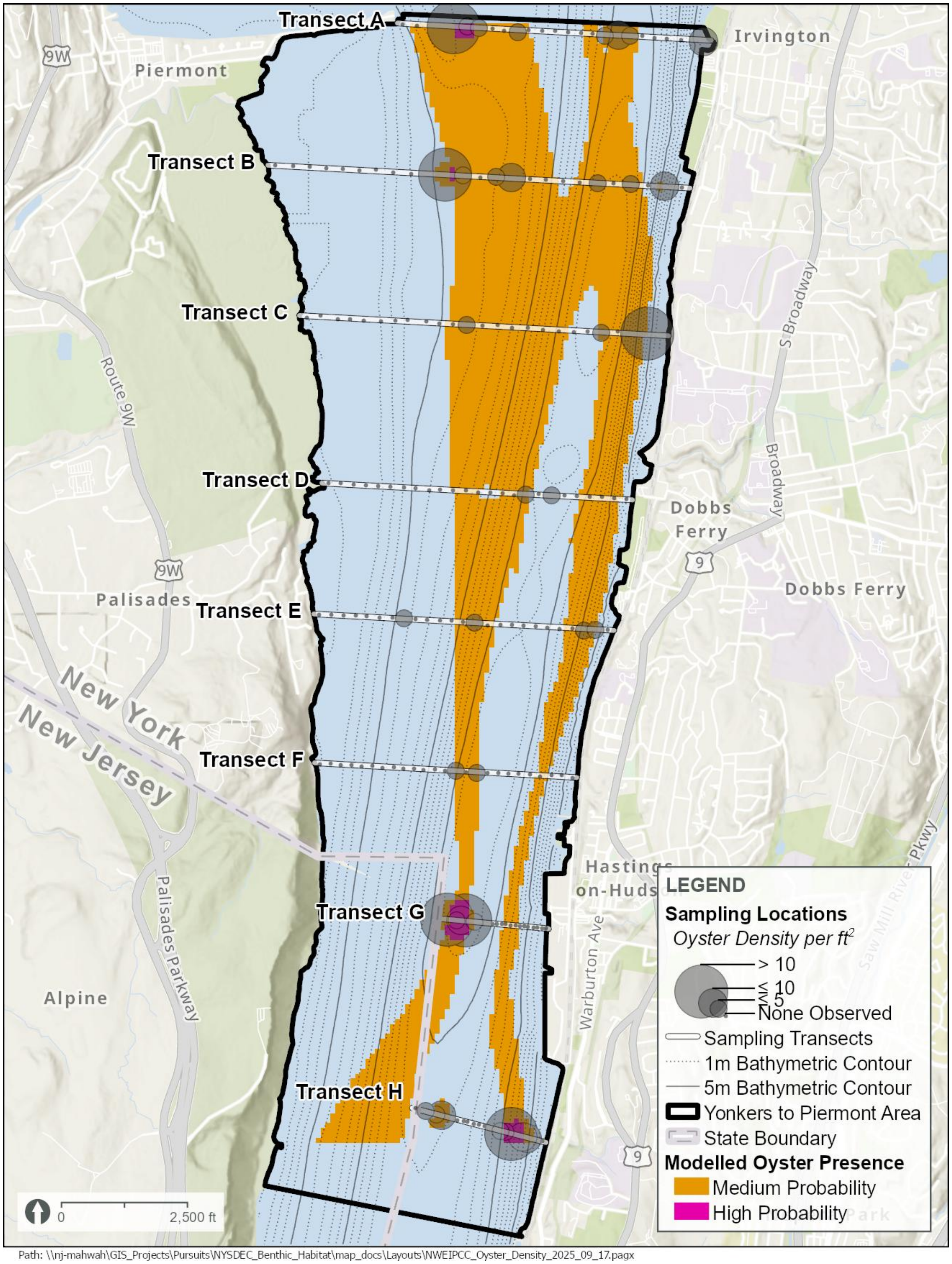

Figure 18. Spatially Explicit Model Prediction based on Sediment Type and Depth

7. References

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Appendix A

Sediment Classification and Oyster Count Data

Location	Date	Latitude	Longitude	Sediment Classification	Number of Paired Oysters	Recovery Percent
A-1	6/13/2025	41.04151	-73.87423	mud	6	100
A-2	6/13/2025	41.04155	-73.87511	mud	0	90
A-3	6/12/2025	41.04159	-73.87582	mud	0	100
A-4	6/12/2025	41.04169	-73.87686	mud	0	85
A-5	7/2/2025	41.04174	-73.87774	mud	0	80
A-6	6/12/2025	41.04185	-73.87866	mud	0	75
A-7	6/12/2025	41.04186	-73.87949	mud	3	10
A-8	6/12/2025	41.04189	-73.88035	mud	6	20
A-9	6/12/2025	41.04190	-73.88135	mud	2	50
A-10	6/12/2025	41.04200	-73.88218	sandy mud	0	75
A-11	6/12/2025	41.04206	-73.88306	mud	0	80
A-12	6/12/2025	41.04210	-73.88394	mud	0	80
A-13	6/12/2025	41.04218	-73.88488	mud	0	100
A-14	6/12/2025	41.04220	-73.88584	mud	0	100
A-15	6/12/2025	41.04224	-73.88679	mud	0	75
A-16	6/12/2025	41.04215	-73.88760	mud	4	35
A-17	6/12/2025	41.04222	-73.88858	mud	0	30
A-18	6/12/2025	41.04233	-73.88941	mud	0	45
A-19	6/12/2025	41.04241	-73.89038	mud	5	30
A-20	6/12/2025	41.04247	-73.89122	mud	4	80
A-21	6/12/2025	41.04244	-73.89217	mud	17	15
A-22	6/12/2025	41.04252	-73.89310	mud	0	10
A-23	6/12/2025	41.04256	-73.89393	mud	0	10
A-24	6/12/2025	41.04257	-73.89482	sandy mud	0	75
A-25	6/12/2025	41.04265	-73.89587	mud	0	100
B-1	6/13/2025	41.03355	-73.87593	mud	0	100
B-2	6/13/2025	41.03362	-73.87717	mud	9	20
B-3	6/13/2025	41.03370	-73.87838	mud	0	3
B-4	6/13/2025	41.03376	-73.87957	mud	3	10
B-5	6/13/2025	41.03382	-73.88082	mud	0	7
B-6	6/13/2025	41.03384	-73.88199	muddy gravel	4	10
B-7	6/13/2025	41.03389	-73.88330	mud	0	10
B-8	6/13/2025	41.03399	-73.88446	mud	0	50
B-9	6/13/2025	41.03414	-73.88684	mud	0	100
B-10	6/13/2025	41.03422	-73.88820	mud	0	75
B-11	6/13/2025	41.03426	-73.88927	mud	9	20
B-12	6/13/2025	41.03424	-73.89042	mud	3	75
B-13	6/13/2025	41.03435	-73.89163	mud	0	25
B-14	6/13/2025	41.03441	-73.89294	mud	2	30
B-16	6/13/2025	41.03449	-73.89538	mud	0	100
B-17	6/13/2025	41.03459	-73.89666	mud	0	75
B-18	6/13/2025	41.03474	-73.89794	mud	0	100

Location	Date	Latitude	Longitude	Sediment Classification	Number of Paired Oysters	Recovery Percent
B-19	6/13/2025	41.03471	-73.89909	mud	0	100
B-20	6/13/2025	41.03480	-73.90030	mud	0	100
B-21	6/13/2025	41.03485	-73.90148	mud	0	100
B-22	6/13/2025	41.03494	-73.90269	mud	0	100
B-23	6/13/2025	41.03500	-73.90387	mud	0	100
B-24	6/13/2025	41.03505	-73.90515	mud	0	100
B-25	6/13/2025	41.03408	-73.88568	mud	0	100
C-1	6/17/2025	41.02539	-73.87758	mud	0	90
B-15	6/13/2025	41.03447	-73.89412	sandy mud	14	40
C-2	6/17/2025	41.02602	-73.88714	mud	14	30
C-3	6/17/2025	41.02604	-73.88827	mud	0	50
C-4	6/17/2025	41.02617	-73.88931	gravelly mud	0	75
C-5	6/17/2025	41.02616	-73.89040	gravelly mud	2	25
C-6	6/17/2025	41.02622	-73.89153	mud	0	100
C-7	6/17/2025	41.02626	-73.89252	mud	0	100
C-8	6/17/2025	41.02631	-73.89351	mud	0	100
C-9	6/17/2025	41.02641	-73.89442	mud	0	100
C-10	6/17/2025	41.02650	-73.89580	mud	0	100
C-11	6/17/2025	41.02650	-73.89664	mud	0	10
C-12	6/17/2025	41.02563	-73.87855	mud	0	100
C-13	6/17/2025	41.02648	-73.89770	mud	0	100
C-14	6/17/2025	41.02653	-73.89892	mud	2	75
C-15	6/17/2025	41.02660	-73.89993	mud	0	75
C-16	6/17/2025	41.02663	-73.90080	mud	0	100
C-17	6/17/2025	41.02683	-73.90202	mud	0	100
C-18	6/17/2025	41.02673	-73.90304	mud	0	100
C-19	6/17/2025	41.02567	-73.87973	mud	0	100
C-20	6/17/2025	41.02575	-73.88065	mud	0	100
C-21	6/17/2025	41.02567	-73.88185	mud	0	85
C-22	6/17/2025	41.02575	-73.88286	mud	0	100
C-23	6/17/2025	41.02576	-73.88383	mud	0	100
C-24	6/17/2025	41.02581	-73.88493	mud	0	100
C-25	6/17/2025	41.02588	-73.88607	mud	0	100
D-1	7/24/2025	41.01660	-73.88021	mud	0	100
D-2	7/24/2025	41.01664	-73.88110	mud	0	85
D-3	7/24/2025	41.01673	-73.88196	gravelly mud	0	85
D-4	7/24/2025	41.01674	-73.88284	gravelly mud	0	20
D-5	7/24/2025	41.01678	-73.88375	muddy gravel	0	5
D-6	7/24/2025	41.01684	-73.88466	mud	0	5
D-7	7/24/2025	41.01684	-73.88558	sandy mud	1	3
D-8	7/24/2025	41.01694	-73.88649	sandy mud	0	25
D-9	7/24/2025	41.01693	-73.88742	sandy mud	1	60

Location	Date	Latitude	Longitude	Sediment Classification	Number of Paired Oysters	Recovery Percent
D-10	7/24/2025	41.01690	-73.88826	mud	0	100
D-11	7/24/2025	41.01699	-73.88910	mud	0	85
D-12	7/24/2025	41.01704	-73.88996	mud	0	100
D-13	7/24/2025	41.01708	-73.89086	mud	0	100
D-14	7/24/2025	41.01718	-73.89174	mud	0	100
D-15	7/24/2025	41.01718	-73.89266	mud	0	100
D-16	7/24/2025	41.01724	-73.89358	mud	0	100
D-17	7/24/2025	41.01720	-73.89439	mud	0	100
D-18	7/24/2025	41.01734	-73.89536	mud	0	100
D-19	7/24/2025	41.01738	-73.89621	mud	0	100
D-20	7/24/2025	41.01743	-73.89716	mud	0	70
D-21	7/24/2025	41.01749	-73.89804	mud	0	100
D-22	7/24/2025	41.01754	-73.89894	mud	0	100
D-23	7/24/2025	41.01757	-73.89981	mud	0	100
D-24	7/24/2025	41.01765	-73.90074	mud	0	100
D-25	7/24/2025	41.01768	-73.90162	mud	0	100
E-1	6/18/2025	41.00947	-73.88167	mud	0	75
E-2	6/18/2025	41.00948	-73.88254	mud	5	75
E-3	6/18/2025	41.00948	-73.88335	gravelly mud	4	40
E-4	6/18/2025	41.00957	-73.88421	mud	0	2
E-5	6/18/2025	41.00957	-73.88516	mud	0	4
E-6	6/18/2025	41.00964	-73.88600	mud	0	7
E-7	6/18/2025	41.00972	-73.88686	mud	0	2
E-8	6/18/2025	41.00978	-73.88771	sand	0	1
E-9	6/18/2025	41.00982	-73.88855	mud	0	2
E-10	6/18/2025	41.00985	-73.88939	sandy mud	0	2
E-11	6/18/2025	41.00982	-73.89029	mud	0	80
E-12	6/18/2025	41.00998	-73.89124	mud	2	85
E-13	6/18/2025	41.01002	-73.89205	mud	0	75
E-14	6/18/2025	41.01010	-73.89289	mud	0	100
E-15	6/18/2025	41.01010	-73.89371	mud	0	80
E-16	6/18/2025	41.01015	-73.89465	mud	0	75
E-17	6/18/2025	41.01022	-73.89550	mud	0	90
E-18	6/18/2025	41.01026	-73.89629	mud	1	100
E-19	6/18/2025	41.01031	-73.89715	mud	0	90
E-20	6/18/2025	41.01032	-73.89808	mud	0	80
E-21	6/18/2025	41.01038	-73.89899	mud	0	75
E-22	6/18/2025	41.01043	-73.89975	mud	0	95
E-23	6/18/2025	41.01046	-73.90064	mud	0	100
E-24	6/18/2025	41.01048	-73.90153	mud	0	100
E-25	6/18/2025	41.01050	-73.90240	mud	0	100
F-1	7/3/2025	41.00141	-73.88435	mud	0	95

Location	Date	Latitude	Longitude	Sediment Classification	Number of Paired Oysters	Recovery Percent
F-2	7/3/2025	41.00158	-73.88513	mud	0	100
F-3	7/3/2025	41.00159	-73.88586	mud	0	100
F-4	7/3/2025	41.00153	-73.88668	mud	0	75
F-5	7/3/2025	41.00164	-73.88740	muddy sand	0	15
F-6	7/3/2025	41.00169	-73.88823	gravelly sand	0	2
F-7	7/3/2025	41.00171	-73.88894	sandy gravel	0	5
F-8	7/3/2025	41.00176	-73.88966	gravel	0	1
F-9	7/3/2025	41.00175	-73.89045	sandy mud	0	2
F-10	7/3/2025	41.00178	-73.89124	sand	1	1
F-11	7/3/2025	41.00180	-73.89199	sandy mud	0	2
F-12	7/3/2025	41.00190	-73.89274	mud	4	75
F-13	7/3/2025	41.00191	-73.89349	mud	0	85
F-14	7/3/2025	41.00200	-73.89420	mud	0	95
F-15	7/3/2025	41.00195	-73.89502	mud	0	100
F-16	7/3/2025	41.00206	-73.89574	mud	0	75
F-17	7/3/2025	41.00207	-73.89648	mud	0	85
F-18	7/3/2025	41.00212	-73.89716	mud	0	95
F-19	7/3/2025	41.00212	-73.89800	mud	0	75
F-20	7/3/2025	41.00222	-73.89871	mud	0	100
F-21	7/3/2025	41.00221	-73.89949	mud	0	85
F-22	7/3/2025	41.00229	-73.90024	mud	0	90
F-23	7/3/2025	41.00229	-73.90098	mud	0	75
F-24	7/3/2025	41.00238	-73.90174	mud	0	100
F-25	7/3/2025	41.00234	-73.90249	mud	0	100
G-1	7/9/2025	40.99323	-73.88641	mud	0	100
G-2	7/9/2025	40.99326	-73.88664	mud	0	100
G-3	7/9/2025	40.99328	-73.88702	mud	0	100
G-4	7/9/2025	40.99330	-73.88725	mud	0	75
G-5	7/9/2025	40.99335	-73.88766	mud	0	90
G-6	7/9/2025	40.99337	-73.88795	mud	0	95
G-7	7/9/2025	40.99339	-73.88827	mud	0	100
G-8	7/9/2025	40.99343	-73.88859	muddy sand	0	15
G-9	7/9/2025	40.99345	-73.88895	sandy gravel	0	15
G-10	7/9/2025	40.99350	-73.88928	gravelly sand	0	20
G-11	7/9/2025	40.99350	-73.88957	sand	0	1
G-12	7/9/2025	40.99351	-73.88992	sandy mud	0	5
G-13	7/9/2025	40.99354	-73.89022	gravel	0	2
G-14	7/9/2025	40.99357	-73.89058	mud	0	1
G-15	7/9/2025	40.99362	-73.89088	sandy gravel	0	2
G-16	7/9/2025	40.99366	-73.89123	sandy gravel	0	1
G-17	7/9/2025	40.99367	-73.89152	muddy sand	4	5
G-18	7/9/2025	40.99365	-73.89188	sandy mud	0	1

Location	Date	Latitude	Longitude	Sediment Classification	Number of Paired Oysters	Recovery Percent
G-19	7/9/2025	40.99374	-73.89216	sand	12	15
G-20	7/9/2025	40.99375	-73.89251	gravelly sand	7	25
G-21	7/9/2025	40.99374	-73.89281	muddy sand	2	15
G-22	7/9/2025	40.99375	-73.89320	sandy mud	0	20
G-23	7/9/2025	40.99379	-73.89345	sandy mud	28	35
G-24	7/9/2025	40.99375	-73.89376	mud	0	10
G-25	7/9/2025	40.99378	-73.89414	mud	0	75
H-1	7/2/2025	40.98163	-73.88686	mud	0	90
H-2	7/2/2025	40.98171	-73.88714	mud	0	95
H-3	7/2/2025	40.98175	-73.88755	mud	0	90
H-4	7/2/2025	40.98182	-73.88791	mud	6	75
H-5	7/2/2025	40.98191	-73.88826	mud	9	80
H-6	7/2/2025	40.98201	-73.88868	mud	0	75
H-7	7/2/2025	40.98204	-73.88907	mud	20	75
H-8	7/2/2025	40.98217	-73.88946	mud	1	75
H-9	7/2/2025	40.98222	-73.88984	mud	1	15
H-10	7/2/2025	40.98231	-73.89020	mud	0	5
H-11	7/2/2025	40.98238	-73.89063	mud	0	15
H-12	7/2/2025	40.98249	-73.89096	mud	0	5
H-13	7/2/2025	40.98258	-73.89136	mud	0	5
H-14	7/2/2025	40.98264	-73.89173	sandy mud	0	30
H-15	7/2/2025	40.98274	-73.89221	sandy mud	0	45
H-16	7/2/2025	40.98279	-73.89249	muddy sand	0	10
H-17	7/2/2025	40.98284	-73.89292	sandy mud	0	10
H-18	7/2/2025	40.98298	-73.89321	sandy mud	0	10
H-19	7/2/2025	40.98307	-73.89361	sandy mud	0	15
H-20	7/2/2025	40.98311	-73.89404	sandy mud	7	5
H-21	7/2/2025	40.98316	-73.89445	sandy mud	1	25
H-22	7/2/2025	40.98331	-73.89481	mud	0	75
H-23	7/2/2025	40.98335	-73.89521	mud	1	30
H-24	7/2/2025	40.98344	-73.89559	mud	0	20
H-25	7/2/2025	40.98354	-73.89594	mud	0	30

Appendix B

Oyster Morphometrics

Location	Status	Shell Height [mm]	Shell Length [mm]
A-1	Dead	58	39
A-1	Dead	120	63
A-1	Alive	79	42
A-1	Alive	59	42
A-1	Alive	59	31
A-1	Dead	36	25
A-7	Alive	79	32
A-7	Alive	67	44
A-7	Alive	54	36
A-8	Alive	38	30
A-8	Alive	37	30
A-8	Alive	33	34
A-8	Dead	39	29
A-8	Alive	72	39
A-8	Dead	37	32
A-9	Alive	34	22
A-9	Alive	21	15
A-16	Dead	85	51
A-16	Dead	77	57
A-16	Dead	101	58
A-16	Dead	60	39
A-19	Alive	60	38
A-19	Alive	62	43
A-19	Alive	74	42
A-19	Alive	75	42
A-19	Alive	76	50
A-20	Dead	39	25
A-20	Dead	92	47
A-20	Alive	63	43
A-20	Alive	82	40
A-21	Alive	82	45
A-21	Alive	86	40
A-21	Alive	53	40
A-21	Alive	70	38
A-21	Alive	28	28
A-21	Alive	49	34
A-21	Alive	75	47
A-21	Alive	38	41
A-21	Alive	79	50
A-21	Alive	107	32
A-21	Alive	87	34
A-21	Dead	56	18
A-21	Dead	80	37

Location	Status	Shell Height [mm]	Shell Length [mm]
A-21	Alive	100	43
A-21	Alive	69	38
A-21	Alive	95	34
A-21	Alive	103	45
B-2	Dead	99	33
B-2	Dead	102	36
B-2	Dead	67	33
B-2	Dead	96	38
B-2	Alive	57	30
B-2	Alive	122	45
B-2	Alive	107	33
B-2	Alive	112	41
B-2	Alive	117	38
B-4	Dead	45	34
B-4	Alive	43	33
B-4	Alive	24	30
B-6	Alive	50	33
B-6	Alive	51	34
B-6	Alive	44	34
B-6	Alive	24	18
B-11	Alive	167	43
B-11	Alive	77	38
B-11	Dead	68	34
B-11	Dead	60	38
B-11	Dead	57	27
B-11	Dead	68	38
B-11	Alive	75	43
B-11	Alive	107	53
B-11	Alive	98	49
B-12	Dead	80	45
B-12	Dead	63	39
B-12	Dead	89	43
B-14	Alive	49	37
B-14	Alive	69	31
B-15	Alive	68	45
B-15	Dead	65	39
B-15	Alive	56	35
B-15	Alive	68	40
B-15	Dead	65	42
B-15	Alive	71	46
B-15	Alive	59	45
B-15	Dead	50	21
B-15	Alive	66	45

Location	Status	Shell Height [mm]	Shell Length [mm]
B-15	Alive	55	37
B-15	Dead	74	38
B-15	Alive	80	40
B-15	Alive	63	31
B-15	Alive	56	45
C-2	Dead	112	51
C-2	Alive	78	55
C-2	Alive	92	43
C-2	Dead	97	42
C-2	Alive	107	51
C-2	Alive	119	50
C-2	Alive	91	49
C-2	Alive	128	43
C-2	Alive	97	40
C-2	Alive	101	43
C-2	Alive	114	41
C-2	Alive	89	49
C-2	Alive	138	55
C-2	Alive	70	46
C-5	Alive	20	18
C-5	Alive	67	50
C-14	Dead	81	58
C-14	Dead	50	36
D-7	Alive	29.2	16.4
D-9	Dead	44.6	25.9
E-2	Dead	101.5	39.7
E-2	Dead	47.2	40.3
E-2	Dead	62.9	31.2
E-2	Alive	59.2	36.5
E-2	Alive	47.5	28.6
E-3	Alive	48.2	35.4
E-3	Dead	93.4	53.2
E-3	Alive	44.9	29.8
E-3	Dead	85.2	46.3
E-12	Alive	62.2	41.2
E-12	Dead	47.3	28.6
E-18	Dead	123.8	43
F-10	Dead	21.2	18.2
F-12	Dead	69.5	53
F-12	Dead	33.8	22
F-12	Dead	30.7	21.5
F-12	Dead	34.5	26.8
G-17	Alive	50	30.1

Location	Status	Shell Height [mm]	Shell Length [mm]
G-17	Alive	46.5	26.6
G-17	Alive	38.2	22.5
G-17	Alive	56.9	36.1
G-19	Dead	50.2	32.8
G-19	Dead	34.2	27.2
G-19	Alive	51.9	40.2
G-19	Dead	33.4	23.7
G-19	Alive	30.7	16.5
G-19	Alive	27.5	19.6
G-19	Dead	22.8	17.9
G-19	Alive	13.6	12.3
G-19	Alive	10.7	7.9
G-19	Dead	18.5	12.9
G-19	Alive	28.6	16.4
G-19	Dead	17.8	9.5
G-20	Dead	20.4	13.9
G-20	Alive	17.4	11.8
G-20	Alive	27	17.3
G-20	Alive	28.4	23.5
G-20	Alive	59.8	35
G-20	Alive	26.6	22.6
G-20	Alive	23.7	16
G-21	Dead	30.8	18
G-21	Dead	37.4	26.3
G-23	Alive	18.2	13.5
G-23	Alive	17.1	9.5
G-23	Dead	29.7	30.7
G-23	Dead	24.6	18.6
G-23	Alive	16.3	15.8
G-23	Alive	43.9	38.5
G-23	Dead	16.4	13.9
G-23	Alive	43.4	36.9
G-23	Alive	60.5	44
G-23	Dead	34.7	15.4
G-23	Dead	24.8	19.1
G-23	Dead	22.1	12.5
G-23	Dead	25.4	21
G-23	Dead	25.4	13.5
G-23	Alive	33.9	21
G-23	Alive	56.1	35.7
G-23	Alive	16.6	15
G-23	Alive	27.6	21.5
G-23	Alive	49.7	32

Location	Status	Shell Height [mm]	Shell Length [mm]
G-23	Alive	25.5	19
G-23	Alive	25.5	13.9
G-23	Alive	24.3	12.2
G-23	Alive	24.7	24.1
G-23	Alive	29.7	22.8
G-23	Alive	24.3	20.5
G-23	Dead	57.2	39.3
G-23	Alive	24.2	21.2
G-23	Alive	16.7	15.3
H-4	Alive	73.5	51.5
H-4	Dead	42.7	37.8
H-4	Alive	25	15
H-4	Alive	26.2	24.8
H-4	Dead	50	37.6
H-4	Alive	47.1	40
H-5	Alive	20.1	13.8
H-5	Alive	22.3	19.1
H-5	Alive	22.6	14.4
H-5	Dead	27.9	23.1
H-5	Alive	12.9	14.4
H-5	Alive	44	31
H-5	Alive	22.6	17.3
H-5	Dead	12.5	8.5
H-5	Alive	35.8	39.3
H-7	Alive	38.9	23.2
H-7	Dead	60.6	25.9
H-7	Alive	53.7	37.7
H-7	Alive	63.5	42.3
H-7	Dead	34.9	25.3
H-7	Alive	31.2	15
H-7	Alive	33.6	17.6
H-7	Alive	21.8	16.2
H-7	Alive	72.8	52.7
H-7	Dead	20.7	22.6
H-7	Alive	41.5	35.7
H-7	Alive	33.7	22
H-7	Alive	29.9	22.3
H-7	Alive	70.2	42
H-7	Alive	60.4	32.6
H-7	Alive	22.2	14.8
H-7	Alive	19.8	15
H-7	Dead	41.8	32.2
H-7	Alive	23	16.2

Location	Status	Shell Height [mm]	Shell Length [mm]
H-7	Alive	21.6	24.2
H-8	Dead	36.7	28.3
H-9	Alive	24.2	15.8
H-20	Alive	45	27.9
H-20	Alive	23.6	22.7
H-20	Dead	45	28.2
H-20	Alive	27.9	18.7
H-20	Alive	23.4	16.6
H-20	Alive	17.8	11.4
H-20	Dead	16.3	12.6
H-21	Alive	23.2	17.5
H-23	Alive	16.9	13.9

Appendix C

Water Quality Data

Location	Depth [ft]	Temperature [°C]	Salinity [ppt]	DO [mg/L]
A-1	4	22.1	2.2	8.07
A-2	12	20.2	3.6	7.66
A-3	17	19.7	3.5	7.69
A-4	43	18.1	8.3	6.8
A-5	51.2	23.1	10.9	5.62
A-6	51	18.1	8.5	6.82
A-7	51	18.1	8.4	6.82
A-8	51	18.2	8.3	6.82
A-9	48	18.2	8.2	6.83
A-10	45	18.3	8.4	6.8
A-11	39	18.2	8.5	6.93
A-12	33	18.1	8.5	6.74
A-13	27	18.3	7.7	6.88
A-14	23	18.4	7.4	7.02
A-15	21	18.9	5.5	7.66
A-16	19	19.5	3.6	7.83
A-17	20	19	5.5	7.59
A-18	20	19.2	4.5	7.69
A-19	20	19.2	3.3	7.67
A-20	17	20.1	2.6	7.85
A-21	20	19.1	4.2	7.47
A-22	25	20	2.6	8.05
A-23	25	19.7	2.8	7.87
A-24	20	20	2.6	7.82
A-25	22	20.6	2.6	7.89
B-1	7	21.1	2.5	7.84
B-2	21	20.1	3.8	7.67
B-3	52	19	6.7	7.08
B-4	57	19	6.8	6.9
B-5	59	18.9	6.9	6.81
B-6	55	18.9	6.9	6.88
B-7	49	18.9	6.9	7.03
B-8	38	18.9	6.8	6.98
B-9	28	19.5	4.5	7.37
B-10	23	20	2.8	7.74
B-11	17	20.2	2.4	7.83
B-12	17	20.4	2.3	7.72
B-13	19	20.2	2.3	7.73
B-14	17	20.1	2.7	7.7
B-15	16	20.5	2	7.66
B-16	15	20.5	2	7.62
B-17	11	20.5	2	7.6
B-18	6	20.5	2.1	7.55

Location	Depth [ft]	Temperature [°C]	Salinity [ppt]	DO [mg/L]
B-19	4.5	21	2.4	7.39
B-20	4.5	21.2	2.5	7.43
B-21	4	21.2	2.6	7.37
B-22	4	21.2	2.6	7.26
B-23	4	21.4	2.7	7.27
B-24	4	21.5	2.8	6.89
B-25	3	22.2	2.9	6.71
C-1	4	19.4	4.2	7.02
C-2	9	19.6	3.7	7.17
C-3	42	19.2	8.3	5.73
C-4	52	19.1	10	6.29
C-5	53	19.1	9.9	6.28
C-6	53	19.1	9.8	6.29
C-7	51	19.1	9.7	6.27
C-8	46	19.1	9.7	6.28
C-9	38	19.2	8.7	6.37
C-10	30	19.3	6.4	6.61
C-11	23	19.5	4.4	6.95
C-12	20	19.5	4.4	7.01
C-13	19	19.5	4	7.04
C-14	18	19.5	4.1	7.05
C-15	17	19.5	4.1	6.99
C-16	17	19.5	4.1	7.05
C-17	15	19.5	4	7.08
C-18	13	19.5	3.7	7.09
C-19	9	19.6	3.2	7.32
C-20	5	19.6	3.4	7.31
C-21	5	19.7	3.2	7.23
C-22	5	19.7	3.3	7.33
C-23	5.5	19.7	3.3	7.28
C-24	5.5	19.7	3.3	7.19
C-25	4.5	19.7	3.3	7.13
D-1	7.2	25.9	8.8	6.72
D-2	34.8	26.3	11.3	5.71
D-3	44.3	26.3	11.6	5.52
D-4	50.5	26.3	12	5.33
D-5	53.1	26.2	12.4	5.34
D-6	54.8	26.1	13.2	5.17
D-7	55.4	26.1	13	5.21
D-8	54.8	26.1	13	5.17
D-9	50.5	26.2	12.9	5.13
D-10	43.4	26.2	12.2	5.53
D-11	37.4	26.2	12	5.56

Location	Depth [ft]	Temperature [°C]	Salinity [ppt]	DO [mg/L]
D-12	29.9	26.3	11.3	5.98
D-13	24.9	26.4	10.5	6.19
D-14	22.3	26.3	11.1	6.03
D-15	20	26.4	10.9	5.84
D-16	19	26.3	11	5.74
D-17	19	26.4	10.7	5.89
D-18	17.7	26.5	10.4	5.91
D-19	15.7	26.1	11.2	6.03
D-20	10.2	26.3	10.4	6.4
D-21	6.9	26.5	10.2	6.42
D-22	5.9	26.4	9.9	6.28
D-23	6.6	26.4	9.6	6.43
D-24	4.9	26	9.6	6.15
D-25	4.6	25.8	9.6	6.17
E-1	1.5	19.7	3.8	7.04
E-2	17	19.7	4.1	6.91
E-3	32	19.3	8.2	6.47
E-4	40	19.2	8.8	6.4
E-5	45	19.1	9.9	6.18
E-6	51	19.1	9.9	6.29
E-7	55	19.1	10.2	6.24
E-8	51	19.1	10.1	6.22
E-9	54	19.1	9.9	6.21
E-10	52	19.1	9.8	6.26
E-11	48	19.1	10.1	6.27
E-12	41	19.1	9.8	6.2
E-13	33	19.3	7.9	6.43
E-14	28	19.4	6.6	6.53
E-15	26	19.4	5.8	6.62
E-16	23	19.4	6.5	6.58
E-17	22	19.6	4.8	7.17
E-18	21	19.7	4.7	6.99
E-19	16	19.9	4.1	7.09
E-20	13	20.2	3.4	7.35
E-21	7	20.7	3.3	7.32
E-22	6	20.7	3.4	7.2
E-23	6	20.7	3.5	7.19
E-24	7	20.6	3.4	7.17
E-25	5	20.7	3.4	7.22
F-1	3	25.1	4.5	7.24
F-2	16.7	26.1	3.9	7.69
F-3	31.8	23.9	8.8	6.04
F-4	40	23.2	11.8	5.71

Location	Depth [ft]	Temperature [°C]	Salinity [ppt]	DO [mg/L]
F-5	46.9	23	12.4	5.59
F-6	51.8	23	12.5	5.49
F-7	53	23	12.6	5.54
F-8	54.1	23	12.7	5.49
F-9	55.1	23	12.7	5.56
F-10	54.8	23	12.7	5.47
F-11	53	23	12.7	5.43
F-12	49.5	23	12.5	5.41
F-13	41.3	23.1	12.7	5.42
F-14	33.5	23.1	12.4	5.32
F-15	28.9	23.2	12.1	5.41
F-16	25.3	23.9	9.2	5.77
F-17	23.3	23.7	9.6	5.74
F-18	21.7	24.1	8.4	5.86
F-19	18.4	24.2	8.3	6.05
F-20	16.4	24.4		6.23
F-21	13.5	24.9	6.2	6.49
F-22	8	25.2	3.9	7.16
F-23	4	25.1	3.8	6.57
F-24	3.5	25.2	4	6.92
F-25	3	25.2	4.1	6.52
G-1	4.3	26.2	5.9	7.15
G-2	9.8	26.3	5.5	7.65
G-3	21.3	26.2	6.3	7.76
G-4	25.3	24.8	11.9	6.69
G-5	31.2	24.1	14.3	6.09
G-6	35.1	24.1	14.3	5.77
G-7	38.7	24	14.7	5.93
G-8	42	23.8	15.3	5.55
G-9	46.3	23.9	15.3	5.79
G-10	47.2	23.9	15.5	5.76
G-11	48.6	23.9	15.3	5.87
G-12	50.2	23.8	15.4	5.86
G-13	51.8	23.8	15.6	5.93
G-14	53.2	23.8	15.7	5.92
G-15	53.8	23.8	15.9	5.88
G-16	55.4	23.7	16.1	5.96
G-17	55.8	23.7	16.1	5.95
G-18	58.1	23.7	16.2	5.61
G-19	55.4	23.7	16.3	5.8
G-20	54.1	23.7	16.3	5.3
G-21	53.1	23.7	16.2	5.79
G-22	54.1	23.7	16.1	5.89

Location	Depth [ft]	Temperature [°C]	Salinity [ppt]	DO [mg/L]
G-23	53.8	23.7	16.1	5.83
G-24	53.1	23.7	16	5.78
G-25	52.5	23.7	16	5.56
H-1	3	24.8	6.3	6.64
H-2	6.6	24.8	6.3	6.76
H-3	13.1	24.8	6.1	7.07
H-4	18.4	24.5	7	6.41
H-5	22	23.5	10.1	5.89
H-6	25.3	23.6	9.4	5.85
H-7	27.6	23.3	10.6	5.84
H-8	30.5	23.2	10.8	5.83
H-9	30.8	22.9	11.6	5.35
H-10	34.4	22.8	12.2	5.31
H-11	36	22.9	11.7	5.53
H-12	38.4	22.9	11.8	5.68
H-13	40	22.9	11.9	5.49
H-14	41.3	22.9	11.9	5.62
H-15	43.3	22.9	12.3	5.49
H-16	44.9	22.9	12.2	5.66
H-17	45.3	22.9	12.1	5.61
H-18	45.6	22.9	12.3	5.48
H-19	46.3	22.9	11.6	5.55
H-20	46.9	22.9	12.4	5.54
H-21	47.5	22.9	12.4	5.47
H-22	47.9	22.9	12.3	5.02
H-23	48.5	22.9	12.4	5.49
H-24	49.5	22.9	12.6	5.52
H-25	49.5	22.8	12.9	5.42

	1.5	18.1	2	5.02
	59	26.5	16.3	8.07
	29.7515	22.024	8.389447236	6.48195