

FRESHWATER MUSSEL SHELL THIN-SECTION ANALYSES FOR THE HUDSON RIVER NRDA

HUDSON RIVER NATURAL RESOURCE DAMAGE ASSESSMENT

HUDSON RIVER NATURAL RESOURCE TRUSTEES

STATE OF NEW YORK

U.S. DEPARTMENT OF COMMERCE

U.S. DEPARTMENT OF THE INTERIOR

JULY 2020

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TRUSTEES' EXECUTIVE SUMMARY

Past and continuing discharges of polychlorinated biphenyls (PCBs) from the Hudson River PCBs Superfund Site have contaminated the natural resources of the Hudson River. The Hudson River Natural Resource Trustees—New York State, the U.S. Department of Commerce, and the U.S. Department of the Interior—are conducting a natural resource damage assessment (NRDA) to assess and restore those natural resources injured by PCBs.

The Hudson River supports a rich array of ecological resources that interact in complex ways, and provides habitat for a wide range of plants and animals. As part of the NRDA, the Trustees are documenting exposure and injury of the natural resources of the Hudson River to PCBs as well as physical impacts to natural resources from the remedial action.

The Hudson River provides habitat to native freshwater pearly mussels (Unionidae) and these mussel beds function as habitat for other species. Physical removal of PCB-contaminated sediments from portions of the river bottom during the remedial dredging operation harmed freshwater mussels living in those sediments. Backfilling and capping operations implemented in the dredged areas smothered mussels that may have escaped the dredges because of the thickness and specifications of material placed. The cap and backfill material can be unsuitable for mussels to recolonize, survive, grow and reproduce in the reconstructed river bottom.

As part of the Hudson River NRDA, the Trustees quantitatively surveyed six pools of the Upper Hudson River in 2013 and 2015 to investigate the effects of the remedy on freshwater mussels. Five pools - Thompson Island, Fort Miller, Northumberland, Stillwater, and, Upper Mechanicville - are within the Site boundaries, and the sixth pool and reference area, Feeder Dam, was upstream of the General Electric (GE) plant sites. The surveys targeted non-remediated, before-remediation and/or after-remediation areas within the pools.

The current study investigated age structure and growth of the native Eastern Elliptio (*Elliptio complanata*) collected from non-remediated and before-remediation areas of the first four pools (Thompson Island, Fort Miller, Northumberland, Stillwater) downstream of the GE plant sites to inform the injury quantification, damage determination, and restoration phases of the Hudson River NRDA. Age structure provides information on the number and proportion of native mussels collected in each age class, the amount of recruitment (based on individual age ≤ 3 years), and maximum age (minimum estimate of life span) in the Upper Hudson. Potential factors influencing growth of mussels at local sites in the river include habitat quality, food resources, slight but measurable temperature differences and other unknown factors within each pool.

Mussels can be aged by counting external or internal rings (annuli). These growth rings can be counted as external rings on the outside surface of mussel shells, similar to counting tree rings, and as internal rings using cross-sectional layers of deposited shell material. As mussels age, the external rings grow closer together and can be more difficult to count. Thus, the number of external growth rings may underestimate the age of mussels and overestimate their growth rates. To reduce the uncertainty in the age of Hudson River mussels, a subset of shells ($n=600$) collected in 2013 and 2015 by Mayer *et al.* (2020), as reported in HRNRT (2020), were selected for this study. A total of 589 shells were thin-sectioned (shells thinly cut using a low-speed saw, mounted, viewed with a dissecting microscope, and growth rings counted). Randomly selected shells ($n=529$) were used in the age length histograms developed for each pool while the random and

non-random¹ samples (n=589) were used together to develop an age-length von Bertalanffy growth curve² for each pool and strata. Because a goal of 100 shells per strata per pool was set for thin-sectioning, the after-remediation shells from the Thompson Island and Northumberland Pools were not thin-sectioned as part of this study.

Shell length ranged from a minimum of 16.0 mm to a maximum of 106.5 mm for randomly selected shells and a minimum of 16.0 mm and a maximum of 114.0 mm for randomly and non-randomly selected shells. Mussels aged 3 years old (randomly selected) averaged 44.9 mm in length overall (ranging from 38.0-56.6 mm across pools and strata).

Age class structure of mussels was also determined for each pool. Randomly selected mussels varied in age from 1 to 35 years old with the mean and maximum mussel age ranging from 11.1-18.4 and 25-35, respectively, across pools and strata (before-remediation and non-remediation). In comparison, ages ranged from 1-39 years old for randomly and non-randomly selected shells. Ages are presented by 5- and 10-mm length groups and as frequency distributions. Age frequency distributions of the non-remediated and before-remediation areas of the Fort Miller Pool and the Stillwater Pool were not significantly different from each other allowing for the merging of these distributions by pool.

A total of 10.6%³ of all randomly selected mussels were ≤ 3 years of age indicating the level of recruitment within the past three years. Recent recruitment was observed in all four pools but was higher in the before-remediation areas of Fort Miller and Stillwater Pools than in the non-remediation areas of those pools. The highest recruitment was observed for the before-remediation areas of the Stillwater Pool (23.5%). Densities of young *Elliptio* ranged from 1.76 mussels \leq age-3/m² at the Fort Miller Pool (non-remediated) to 6.45 mussels \leq age-3/m² in the Northumberland Pool (non-remediated).

Von Bertalanffy growth curves (shell length vs. age) showed a typically steeper increase in growth at an earlier age and then a slower or plateauing of growth with age. Growth of mussels (slope) ranged from a low of 1.515 mm/year (non-remediated areas Fort Miller Pool) to a high of 2.605 mm/year (non-remediated areas Stillwater Pool).

¹ Shells non-randomly selected from total *Elliptio complanata* collected to ensure representation of mussels in 5 mm bins not populated in the random selection process.

² The von Bertalanffy growth curve is derived from a regression model and can be used to predict mussel age based on length. The model also predicts the rate at which the growth of a given mussel species reaches an asymptote, i.e., growth slows with increased age.

³ Age 1, 2 and 3 year old mussels comprised 5.7%, 1.9% and 3.0%, respectively of the 529 thin-sectioned mussels from the four river pools.

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**PREPARED FOR THE
HUDSON RIVER NATURAL RESOURCE TRUSTEES**

JULY 2020

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EXECUTIVE SUMMARY

The 40-mile stretch of the Upper Hudson River, which extends from Fort Edward to Troy, NY, consists of eight pools (or reaches) separated by a series of locks and dams. Between 2009 and 2015, over 2.7 million cubic yards of PCB (polychlorinated biphenyl) contaminated sediment—along with the associated mussel communities—were dredged, impacting varying acreages in each pool. Remedial dredging followed by backfill and/or capping altered the habitat and consequently injured native mussel assemblages in the river. Shells for thin section analysis were collected in the 2013 and 2015 quantitative quadrat surveys (HRNRT 2020). At the time of those surveys, there were three different remediation strata in the river, including sections dredged for sediment removal (after-remediation strata⁴), sections where dredging was planned but had not occurred (before-remediation strata⁵), and sections where dredging was not planned (non-remediated strata⁶).

The purpose of the current study was to investigate differences in growth and age structure of local mussel populations in the before-remediation and non-remediated strata in mussels collected from four river pools: the Thompson Island, Fort Miller, Northumberland, and Stillwater Pools. The Fort Miller and Stillwater Pools contained paired before-remediation and non-remediated strata, while the Thompson Island and Northumberland Pools contained after-remediation and non-remediated strata. Thus, all four pools contained non-remediated strata. This report presents results of thin-sectioning of shells from the before-remediation and non-remediated strata.

This study's results will inform mussel injury quantification, damage determination, and restoration work to be performed as part of the Hudson River natural resource damage assessment (Table ES-1). In particular, mussel age structure provides information on the number and proportion of native mussels collected in each age class, on the amount of recruitment (based on ages ≤ 3 years), and on the maximum age (i.e., it provides a minimum estimate of life span) in the Upper Hudson. In addition, mussel growth is an indicator of habitat quality, food resource availability and other unknown factors within each pool.

⁴ "After-remediation strata" is equivalent to the "remediated" areas described in the Study Plan and Amendments.

⁵ "Before-remediation strata" is equivalent to "to be remediated" areas described in the Study Plan and Amendments.

⁶ "Non-remediated strata" is equivalent to the "unremediated" areas described in the Study Plan and Amendments.

Table ES-1 Study location for mussels aged in the current study. Shells collected during previous surveys (HRNRT 2020) (*). BR = before-remediation, and NR = non-remediated.

| River Pool | River Section | River Reach | Mussel Survey* (year) | Strata Sampled and Aged | |
|-----------------------|---------------|-------------|-----------------------|---------------------------------|-----------------------------|
| | | | | Before-Remediation ⁷ | Non-Remediated ⁸ |
| Thompson Island (TIP) | 1 | 8 | 2015 | | X |
| Fort Miller (FMP) | 2 | 7 | 2013 | X | X |
| Northumberland (NUP) | 2 | 6 | 2015 | | X |
| Stillwater (SWP) | 3 | 5 | 2013 | X | X |

The oldest mussel recorded by thin-sectioning shells had lived almost four decades, at 39 years of age⁹. Results from comparisons of the before-remediation and non-remediated strata within the Fort Miller and Stillwater Pools indicated that mussel recruitment, mean age, and growth were comparatively lower in the Fort Miller Pool non-remediated stratum relative to the other remediation stratum in the Fort Miller Pool (i.e., before-remediation) and also relative to the two Stillwater Pool strata (before-remediation and non-remediated). Comparisons of the non-remediated strata among the four pools showed comparatively lower mussel recruitment in the Fort Miller and Thompson Island Pools, as indicated by comparatively lower percentages of mussels of age ≤ 3 and higher mean mussel ages in the pools, relative to the Northumberland and Stillwater Pools. In the Stillwater Pool, the lowest mean mussel ages (11.1 years in the before-remediation stratum and 11.8 years in the non-remediated stratum), highest percentage of total mussels ≤ 3 years of age [evidence of recent recruitment; 23.5% (before-remediation)], and the highest mussel growth rates [2.04 mm/year (before-remediation) and 2.07 mm/year (non-remediated)] were observed, indicating that environmental conditions in the Stillwater Pool were more conducive to mussel recruitment and growth compared to the other sampled pools.

During the 2013 and 2015 quantitative quadrat surveys (HRNRT 2020), mussels from these and other Hudson River pools were collected and archived. This collection included shells of Eastern *Elliptio* (*Elliptio complanata*). During the present study, subsets of the total number of collected *E. complanata* shells at the above pools and strata were randomly¹⁰ and non-randomly¹¹ selected for thin-sectioning and microscopic (internal) aging. The results were used to determine differences in mussel age (years) and length (mm). Characteristics of interest included maximum age, percentages of total mussels within age classes, population age structures, and physical growth between the before-remediation and non-remediated strata in the Fort Miller and Stillwater Pools and among the non-remediated strata at all four of the study pools (Thompson Island, Fort Miller, Northumberland, Stillwater).

Mean (\pm standard deviation (SD)) lengths and ages were determined from randomly selected mussels from the two remediation strata (before-remediation, non-remediated) within pools (Table ES-1). Mean mussel lengths of all mussels ($n = 529$) ranged from 58.3 mm (± 18.3) in the Stillwater Pool (before-remediation) to 74.7 mm (± 15.6) in the Thompson Island Pool (non-remediated). Minimum and maximum observed lengths were 16.0 mm (Thompson Island Pool - non-remediated) and 106.5 mm (Fort Miller Pool - non-remediated), respectively (Table ES-2). The mean (\pm SD) thin-section ages of mussels ($n = 529$) ranged from 11.1 years (± 7.5) in the Stillwater Pool (before-remediation) to 18.4 years (± 7.1) in the Thompson Island Pool (non-remediated) (Table ES-2). Multiple comparisons showed that mean ages did not differ among the before-remediation (11.1 years) and non-remediated (11.8 years) strata within the Stillwater

⁷ Mussel survey conducted prior to remedial dredging.

⁸ This section of the river pool was not remediated per the 2002 Record of Decision. After-remediation strata surveyed in TIP and NUP but not thin-sectioned as part of this study.

⁹ This is based on thin-sectioning of 589 randomly and non-randomly selected shells.

¹⁰ Shells randomly selected from total *Elliptio complanata* collected per pool and strata by HRNRT 2020.

¹¹ Shells non-randomly selected from total *Elliptio complanata* collected by HRNRT 2020 to ensure representation of mussels in 5 mm bins not populated in the random selection process.

Pool ($p > 0.05$). However, mean mussel ages from the non-remediated stratum (16.2 years) were significantly greater than the before-remediation (13.1 years) stratum in the Fort Miller Pool ($p < 0.05$).

Multiple comparisons also revealed that the mean age of mussels from non-remediated strata significantly varied by pool. The mean mussel age from Thompson Island Pool (18.4 years) was significantly greater than the mean ages from the Northumberland (14.1 years) and Stillwater Pools, and the mean age from the Fort Miller Pool (16.2 years) was significantly greater than the mean age from Stillwater Pool (11.8 years) ($p < 0.05$).

Table ES-2 Mean (\pm standard deviation, SD) length (mm;) and age (years) of *Elliptio complanata* shells randomly selected from total shells collected by HRNRT 2020 in 2013 and 2015 from Hudson River pools before-remediation (BR) and non-remediated (NR). Pools include the Thompson Island Pool (River Section 1, Reach 8; TIP), Fort Miller Pool (River Section 2, Reach 7; FMP), Northumberland Pool (River Section 2, Reach 6; NUP), and Stillwater Pool (River Section 3, Reach 5; SWP). n = number of shells microscopically evaluated for age. Age (years) represents rounded mean of internal annuli ages from two evaluators. Where $n < 90$, shells were too thick to accurately count growth annuli or no growth annuli were visible (>0 - <1 years of age).

| Pool | Strata | n | Length (mm) | | | | Internal Annuli Age (years) | | | | |
|------|--------|-----|-------------|------|------|-------|-----------------------------|-----|-----|-----|-----|
| | | | Mean | SD | Min | Max | Mean | SE | SD | Min | Max |
| All | All | 529 | 67.3 | 16.3 | 16.0 | 106.5 | 14.1 | 0.3 | 7.6 | 1 | 35 |
| FMP | BR | 90 | 67.9 | 16.3 | 20.0 | 100.5 | 13.1 | 0.8 | 7.2 | 1 | 31 |
| | NR | 90 | 71.8 | 13.3 | 31.0 | 106.5 | 16.2 | 0.8 | 7.6 | 1 | 33 |
| SWP | BR | 85 | 58.3 | 18.3 | 18.5 | 95.5 | 11.1 | 0.8 | 7.5 | 1 | 33 |
| | NR | 87 | 66.1 | 14.7 | 21.7 | 93.5 | 11.8 | 0.6 | 5.6 | 1 | 25 |
| NUP | NR | 90 | 65.0 | 14.8 | 25.0 | 95.0 | 14.1 | 0.8 | 7.7 | 1 | 31 |
| TIP | NR | 87 | 74.7 | 15.6 | 16.0 | 96.0 | 18.4 | 0.8 | 7.1 | 1 | 35 |

Maximum thin-sectioned ages of randomly selected mussels ranged from 25 years (Stillwater Pool – non-remediated) to 35 years (Thompson Island Pool – non-remediated) (Table ES-2). Maximum ages of the combined randomly and non-randomly selected mussels ranged from 31 years (Fort Miller Pool – before-remediation and Northumberland Pool - non-remediated) to 39 years (Thompson Island Pool - non-remediated). The mean (\pm SD) age of all randomly selected mussels was 14.1 (\pm 7.6) years and the mean (\pm SD) of the combined randomly and non-randomly selected mussels was 14.5 (\pm 8.0) years.

Age class structures of mussels were determined for all remediation strata within the pools. Of interest, 10.6% (56 mussels) of all randomly selected mussels were of ages ≤ 3 years. The percentages (numbers observed) of mussels with ages ≤ 3 from the strata were 12.2% (11 mussels) at the Fort Miller Pool (before-remediation), 4.4% (4 mussels) at Fort Miller Pool (non-remediated), 23.5% (20 mussels) at Stillwater Pool (before-remediation), 8.1% (7 mussels) at Stillwater Pool (non-remediated), 10.0% (9 mussels) at Northumberland Pool (non-remediated), and 5.8% (5 mussels) at Thompson Island Pool (non-remediated) (Table ES-3). The number of mussels ≤ 3 years old is indicative of recent recruitment within the past 3 years within the pools.

Table ES-3

Numbers and percentages of *Elliptio complanata* of age ≤ 3 years selected randomly from total shells collected by HRNRT 2020 in 2013 and 2015 from Hudson River pools in strata including before-remediation (BR) and non-remediated (NR). Pools include Thompson Island Pool (River Section 1, Reach 8; TIP, non-remediated), Fort Miller Pool (River Section 2, Reach 7; FMP, before-remediation and non-remediated), Northumberland Pool (River Section 2, Reach 6; NUP, non-remediated), and Stillwater Pool (River Section 3, Reach 5; SWP, before-remediation and non-remediated). Age represents rounded mean ages from two evaluators reading thin-sectioned shells.

| Pool | Strata | Total Mussels Selected | | | |
|------|--------|------------------------|------|-------|-------|
| | | Age ≤ 3 | | Total | |
| | | n | % | N | % |
| All | All | 56 | 10.6 | 529 | 100.0 |
| FMP | BR | 11 | 12.2 | 90 | 100.0 |
| | NR | 4 | 4.4 | 90 | 100.0 |
| SWP | BR | 20 | 23.5 | 85 | 100.0 |
| | NR | 7 | 8.1 | 87 | 100.0 |
| NUP | NR | 9 | 10.0 | 90 | 100.0 |
| TIP | NR | 5 | 5.8 | 87 | 100.0 |

Von Bertalanffy (1938) mussel growth curves, as well as von Bertalanffy parameters, were generated using length (mm) and age (years) data from the combined randomly and non-randomly selected mussels from the total of *E. complanata* collected by HRNRT 2020. Data from non-randomly selected mussels were included to ensure adequate representation of mussels in all 5 mm bin size classes in the dataset (Table ES-4). Estimates of the theoretical average maximum (asymptotic) length (L_{∞} in mm) of mussels ranged from 88.4 mm (Northumberland Pool - non-remediated) to 107.8 mm (Thompson Island Pool - non-remediated). Estimates of the growth coefficient (k) ranged from 0.051 (Fort Miller Pool - non-remediated) to 0.096 (Fort Miller Pool – before-remediation). Estimates of the age in years when length would theoretically be equal to zero (t_0) ranged from -8.183 years (Fort Miller Pool - non-remediated) to -3.992 years at (Fort Miller Pool – before-remediation). The parameter t_0 is often less than zero, therefore it sometimes is of no biological significance; however, this parameter is necessary in growth curve production by providing y-axes intercepts for the curves.

Table ES-4 Estimated parameters generated during development of von Bertalanffy (1938) growth curves of predicted mean lengths-at-ages for *Elliptio complanata* (total n = 589) collected randomly and non-randomly from pools in the Hudson River before-remediation (BR) and non-remediated (NR). Pools include the Thompson Island Pool (River Section 1, Reach 8; TIP; NR), Fort Miller Pool (River Section 2, Reach 7; FMP; BR and NR), Northumberland Pool (River Section 2, Reach 6; NUP; NR), and Stillwater Pool (River Section 3, Reach 5; SWP; BR and NR). Negative values of t_0 are biologically meaningless, since mussel length at age-0 cannot be negative; however, values of t_0 are required for generation of the curves by providing y-axis intercepts. n=number of shells, L_∞ is length at k , k =growth coefficient, and t_0 =theoretical time when length=0 mm. Where n < 100, shells were too thick to accurately count growth annuli or no growth annuli were visible (>0 - <1 years of age).

| Pool | Strata | n | L_∞ | k | t_0 |
|------|--------|-----|------------|-------|--------|
| FMP | BR | 100 | 90.69 | 0.096 | -3.992 |
| | NR | 100 | 104.95 | 0.051 | -8.183 |
| SWP | BR | 95 | 92.66 | 0.071 | -4.837 |
| | NR | 97 | 102.43 | 0.066 | -4.995 |
| NUP | NR | 100 | 88.42 | 0.082 | -4.823 |
| TIP | NR | 97 | 107.84 | 0.053 | -5.497 |

Mussel growths (regression growth slopes, mm/year) were statistically analyzed for differences among the before-remediation and non-remediated strata in the Fort Miller and Stillwater Pools and among the non-remediated strata in the four pools (Table ES-5). Growth of mussels was significantly greater in the before-remediation stratum (1.918 mm/year) than in the non-remediated stratum (1.515 mm/year) in the Fort Miller Pool ($p < 0.05$); whereas, growths among the strata within the Stillwater Pool did not significantly differ (before-remediation and non-remediated slopes were 2.037 and 2.065 mm/year, respectively). Growth of mussels from non-remediated stratum in the Stillwater Pool (slope = 2.065 mm/year) was significantly greater than mussel growths in the non-remediated strata at Fort Miller Pool (slope = 1.515 mm/year) and Northumberland Pool (slope = 1.601 mm/year ($p < 0.05$)). There were no significant differences for all other paired comparisons among mussel growth across the non-remediated strata.

Table ES-5 Slopes (mm growth/year) from lengths (mm)-on-ages (years) regression general linear models of *Elliptio complanata* randomly selected from total shells collected by HRNRT 2020 in 2013 and 2015 from selected Hudson River pools. Comparisons included growth of mussels between before-remediation (BR) and non-remediated (NR) strata within the Fort Miller Pool (River Section 2, Reach 7; FMP) and Stillwater Pool (River Section 3, Reach 5; SWP) among pools FMP, SWP, Northumberland Pool (River Section 2, Reach 6; NUP), and Thompson Island Pool (River Section 1, Reach 8; TIP) within the NR strata. Where n < 90, shells were too thick to accurately count growth annuli or no growth annuli were visible (>0 - <1 years of age).

| Multiple Comparisons | | | | | | | | | |
|-----------------------------------|--------|----|-----------------|----------------------|------------------------------|--------|-----|-----------------|----------------------|
| BR v. NR Within FMP and SWP Pools | | | | | Among NR Strata Within Pools | | | | |
| Pool | Strata | N | Slope (mm/year) | Statistical Grouping | Pool | Strata | n | Slope (mm/year) | Statistical Grouping |
| FMP | BR | 90 | 1.918 | a | All | NR | 354 | - | - |
| | NR | 90 | 1.515 | b | SWP | NR | 87 | 2.065 | a |
| | | | | | TIP | NR | 87 | 1.769 | a b |
| SWP | BR | 87 | 2.037 | a | NUP | NR | 90 | 1.601 | b |
| | NR | 85 | 2.065 | a | FMP | NR | 90 | 1.515 | b |

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ACRONYMS AND ABBREVIATIONS

| | |
|----------------|--|
| BR | before remediation |
| CRAN | Comprehensive R Archive Network |
| CI | confidence interval |
| FSA | fisheries stock assessment |
| FMP | Fort Miller Pool |
| FMCC | Freshwater Mollusk Conservation Center |
| GLM | general linear models |
| HRNRT | Hudson River Natural Resource Trustees |
| m ² | meters square |
| mm | millimeters |
| NRDA | natural resource damage assessment |
| NUP | Northumberland Pool |
| NYSM | New York State Museum |
| NR | non-remediated |
| PCB | polychlorinated biphenyl |
| SD | standard deviation |
| SE | standard error |
| SWP | Stillwater Pool |
| TIP | Thompson Island Pool |
| X ² | Chi-Squared |

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1.0 INTRODUCTION

The U.S. Department of the Interior, the U.S. Department of Commerce, and New York State are engaged collectively as the Hudson River Natural Resource Trustees (Trustees) in a natural resource damage assessment (NRDA) for the Hudson River PCBs Superfund Site, which extends almost 200 miles between Hudson Falls and the Battery in New York City (USEPA 2002). The Trustees issued an Assessment Plan describing their proposed approach to pathway determination, injury determination and quantification, and damage determination and restoration (HRTC 2002). The Trustees are in the process of implementing the Assessment Plan. As part of the NRDA, the Trustees are conducting a study that involves measuring the loss of freshwater mussels in the Hudson River as a consequence of remedy implementation.

A 40-mile stretch of the freshwater non-tidal Upper Hudson River, from Fort Edward to Troy, NY, was the site of an extensive polychlorinated biphenyls (PCBs) Federal Superfund remediation project (dredging followed by capping or backfill and habitat reconstruction¹²) conducted from 2009 to 2016 by General Electric Company pursuant to the Record of Decision issued by EPA in 2002 (USEPA 2017a,b). Over 2.7 million cubic yards of PCB-contaminated sediment (USEPA 2017a) removed from 8 river pools during remediation, directly harmed the associated mussel community and altered the habitat of the native mussel in the river (HRNRT 2019b).

On behalf of the Trustees, thin-section analyses of freshwater mussel shell samples were conducted pursuant to the Hudson River NRDA and Hudson River Trustee Study Plan (HRNRT 2014a, 2014b, 2015, 2019a). Our analyses focused on a subset of freshwater mussel shells collected during the 2013 and 2015 surveys (HRNRT 2020).

2.0 STATEMENT OF OBJECTIVES

The objectives of this study are described below:

- 1) provide site-specific mussel age-class information to support the Hudson River NRDA;
- 2) thin-section 600 shells of *Elliptio complanata* collected from four pools downstream of the GE plant sites in the Upper Hudson River stratified by remediation history: before remediation and no remediation planned (non-remediation)¹³ from the suite of mussels surveyed in 2013 and 2015 for determinations of internal ages;
- 3) microscopically determine age of Upper Hudson River thin-sectioned shells and validate ages by two evaluators;
- 4) create von Bertalanffy (1938) mussel growth curves for the Upper Hudson River using length-age data from each pool and statistically compare growth of mussels from each pool;
- 5) generate histograms for mussel length and age data from each pool and statistically compare population age structures across pools and strata; and
- 6) create electronic databases containing the data.

¹² Habitat reconstruction work continued after 2016.

¹³ Shells from some pools or strata were not targeted for thin-sectioned as part of this study, e.g., limited number of mussels collected in a given pool or strata, shell length was too short to internally age (<11 mm). The results of thin-sectioned reference shells will be reported in a separate report when those analyses become available.

3.0 MATERIALS AND METHODS

Freshwater mussel surveys were conducted in six pools of the Hudson River between 2013 and 2015 (HRNRT 2020). Strata surveyed included before-remediation, after-remediation, and non-remediated. During the surveys mussel tissues and shells were retained. Voucher shells from these surveys were labelled with unique identification information. A subset of those mussel shells, randomly and non-randomly selected (uses explained subsequently under separate methods description headings), were used in the present thin-sectioning study (HRNRT 2019a).

Initially, shells were selected randomly. These randomly selected shells were then examined for representativeness relative to the size class distribution in a given strata and pool. The non-random selection process was then implemented to increase the number of shells in a given 5 mm bin size class that was under-represented or lacked any representation. Shells within those data-gap size classes were then randomly selected (HRNRT 2019a) and are identified in this report as “non-randomly” selected.

This subset of *E. complanata* shells from the New York State Museum (NYSM) were shipped, received and vouch-safe stored at the Virginia Tech Freshwater Mollusk Conservation Center (FMCC), Blacksburg, VA. During shipping and receiving, chain-of-custody procedures were observed. The mussel shells and their shipping boxes were labelled by collection quadrat, pool, and remediation strata [before-remediation (BR) and non-remediated (NR)]. The BR strata were those that were targeted for remedial dredging but not yet been dredged, and the NR strata were those that were not targeted for dredging.

Mussel shells from four of the eight Upper Hudson River pools downstream of the General Electric Company’s two plant sites were provided for thin-sectioning. Traveling from upstream to downstream, the pools ($n = 4$) and strata ($n = 2$) included the Thompson Island Pool (River Section 1, Reach 8; TIP; NR), Fort Miller Pool (River Section 2, Reach 7; FMP; BR and NR), Northumberland Pool (River Section 2, Reach 6; NUP; NR), and the Stillwater Pool (River Section 3, Reach 5; SWP; BR and NR) (see Fig. 1 for map). Thus, for the purposes of this study, the FMP and SWP contained paired strata (BR and NR), and NUP and TIP contained only NR strata. The other surveyed strata for NUP and TIP was “after-remediation”, and those shells were not aged¹⁴. Similarly, mussel shells from the Feeder Dam Pool (reference) and from the Upper Mechanicville Pool¹⁵ were not thin-sectioned.

3.1 Shell Thin Sectioning and Aging

A total of 600 *E. complanata* shells, selected from the full complement of mussels collected in 2013 and 2015 (HRNRT 2020) were thin-sectioned from each of four pools, including 540 randomly selected and 60 non-randomly selected shells.

Of the 600 shells, 100 shells were selected for thin-sectioning from each of the strata (BR and NR) within the pools, including FMP (BR), FMP (NR), SWP (BR), SWP (NR), NUP (NR), and TIP (NR). Of these 100 total shells, 90 mussel shells were randomly selected from each of these two strata within the four pools (no BR in two pools). Ten additional mussels were selected non-randomly from these same two strata within four pools to ensure inclusion of mussels across each of the 5 mm bin size classes in each of the stratified pool datasets.

The dataset used to create the von Bertalanffy (1938) growth curves and parameters contained mussel shells that were randomly and non-randomly ($n = 100$ shells per remediation strata) selected from the total shells collected by HRNRT 2020. The non-random samples were used in the von Bertalanffy growth curve to provide length-at-age estimates for under-represented length classes. The dataset used to conduct the mussel age structure analyses only contained shells collected randomly from the total shells collected by HRNRT 2020. Inference concerning mussel age structures within

¹⁴ *ibid.*

¹⁵ The NR strata in the Upper Mechanicville Pool was surveyed but the AR strata was not surveyed (HRNRT 2019a).

strata and pool required random selection of quadrat positions during quantitative mussel surveys within strata and random selection of the shell subset used for thin sectioning from the total shells collected by HRNRT 2020.

Calipers were used to measure length (mm) and height (mm) of all shells (HRNRT 2019a). Shell length was defined as the projected straight-line distance from the anterior most point of the mussel shell to the most posterior point, and length was measured with the shell sample held on its edge. Shell height was defined as the maximum projected straight-line distance between the dorsal and ventral edges on a valve (one half of a complete shell). Height included the projection of the beak, the dorsal protuberance on the shell, and also included the umbo if it is raised above the shell. Shell length and height were recorded for each uniquely numbered shell by pool and strata on a Mussel Aging Data Sheet.

Thin-sections of shells were prepared following procedures described by Clark (1980) and Neves and Moyer (1988), using a Buehler Isomet low-speed saw unit with a diamond-impregnated blade (Buehler, Evanston, IL) (HRNRT 2019a). One shell valve from each mussel was cut from the center of the umbo to the ventral margin. Cut valves then were glued (Gorilla Epoxy, The Gorilla Glue Company, Sharonville, OH) to petrographic glass slides (27 × 46 mm), vacuum-sealed into a petrographic chuck, attached to the cutting arm of the saw, and thin sectioned at a thickness of 280 μm (Neves and Moyer 1988). Prior to gluing, the cut shell edges were sanded with 320 and then 1000 grit waterproof sandpaper (Norton/Saint-Gobain Abrasives, Worchester, MA) on a glass plate.

Shell thin-sections were aged using a dissecting microscope at 40X magnification. Internal growth lines were considered true annuli if they were continuous from the umbonal region to the outer surface of the shell. It was assumed, based on previous shell-aging of mussels, that one annulus was formed each year, and the first external annulus was considered the age-zero annulus. The assumption of annual shell ring deposition in freshwater mussels has been validated in more than a dozen species in North America (Veinott and Cornett 1996, Haag and Commens-Carson 2008). All shell sections were microscopically aged by counting growth annuli by two evaluators. Age estimations from the two evaluators were recorded on a Mussel Aging Data Sheet. Mean ages from the two evaluators did not significantly differ ($p = 0.183$, median ages from evaluator 1 and 2 were 14 and 15 years, respectively) using the two-sample t -test in Minitab (Minitab Inc, State College, Pennsylvania). Age data for the individual mussels used in subsequent analyses were the rounded means of estimated ages from the evaluators for each mussel (Appendix A1). The length and age data were verified and loaded into Excel data worksheets by mussel collection quadrats and strata within each pool for subsequent descriptive, graphical, and statistical analyses.

Of the 600 thin-sectioned shells, 589 were microscopically aged. Ages were not determined from shells of 11 mussels. Thin-sections of three of these mussels, all from TIP (NR), were too thick to accurately count the growth annuli with a similar degree of certainty as the other aged shells¹⁶. The ages of the other eight mussels, all from pool SWP (five from strata BR and three for strata NR) were estimated to be between zero and one year, i.e., no growth annuli visible during microscopic inspections. Given the total starting sample size of 100 mussel shells per pool per strata, the inability to age 3 to 5 mussels out of 100 per strata in two pools was considered inconsequential to subsequent data analyses.

All shells, shell-thin sections, and data sheets were stored in a secured office at Virginia Tech's Freshwater Mollusk Conservation Center, Blacksburg, VA. All of the thin-sectioned slides and associated shells have been returned to and are stored in the Malacology Collection at the New York State Museum.

3.2 Mussel Age Structure Analyses

Only lengths (mm) and thin-section ages (years) of mussels that were randomly selected were used during the mussel thin-section age summaries and evaluations, described later in this section. Sample sizes (n = number of thin-sectioned shells) per strata per pool were as follows: FMP (BR) ($n = 90$), FMP (NR) ($n = 90$), SWP (BR) ($n = 85$), SWP (NR) ($n =$

¹⁶ Reading of these shells would have led to an underestimation of age, because the thin-sections were not transparent enough to count all of the growth annuli.

87), NUP (NR) (n = 90), and TIP (NR) (n = 87) (data from randomly selected mussels is in Appendix A1). Mussel length and age summary statistics (e.g., minimum, maximum, mean, median, mode, skewness), length-age histograms, determinations of maximum ages, numbers, percentages, and densities (mussels/m²) of mussels whose ages were ≤ 3 years, and statistical analyses of age structures by pools and strata within pools were calculated using Minitab 18 statistical software (Minitab, Inc., College Station, PA). Densities (mussels/m²) of mussels ≤ 3 years of age were calculated by multiplying the strata/pool total densities (*E. complanata*/m²) as determined by HRNRT 2020 by fractions of total thin-sectioned mussels with ages ≤ 3 years from strata within the pools.

Statistical analyses of strata per pool mussel age structures were conducted using general linear models (GLM) using Minitab. The paired strata analyses of mussel ages (BR versus NR strata) within the FMP and SWP pools were accomplished with designations of strata nested within pools as statistical factors. Subsequent Bonferroni-corrected multiple comparisons were conducted using Minitab to determine strata differences within pools. During the analyses of mussel ages from the NR strata among FMP, SWP, NUP, and TIP, pool was designated as a factor during GLM analyses in Minitab, and Bonferroni-corrected multiple comparisons also were subsequently conducted.

To determine whether the ages from randomly selected mussels from the BR and NR strata within the separate FMP and SWP pools could be pooled, Chi-Squared (X²) analyses were conducted using Minitab. Age bins were created to ensure that there were at least 5 mussels per bin. In the analyses, age bins were selected as rows in the contingency table, stratum (BR and NR) was selected as columns, and mussel counts within age bins were selected as frequency data.

3.3 Mussel von Bertalanffy Growth Curves and Parameters

Lengths (mm) and internal ages (years) of mussels that were randomly and non-randomly selected were used to develop the von Bertalanffy (1938) mussel growth curves and estimate the associated growth curve parameters. The non-random samples were used in the von Bertalanffy growth curve to provide length-at-age estimates for under-represented length classes. Sample sizes (n = number of thin-sectioned shells) per strata per pool were FMP (BR) (n = 100), FMP (NR) (n = 100), SWP (BR) (n = 95), SWP (NR) (n = 97), NUP (NR) (n = 100), and TIP (NR) (n = 97). Data from randomly and non-randomly selected mussels is in Appendix A1.

Using the mussel length (mm) and internal age (average years as derived from companion values from the two age evaluators) data, von Bertalanffy (1938) growth curves were developed for the pools and strata within pools using the Fisheries Stock Assessment program (FSA-package) developed by Dr. Derek Ogle at Northland College, Wisconsin and methods described by Ogle (2016). The FSA-package was implemented in the program R (R Development Core Team 2018). The growth curves were generated for each stratum within pools using the formula:

$$L_t = L_{\infty} (1 - e^{-k(t-t_0)})$$

where, L_t is mussel length (mm) at time t (age), L_{∞} (L_{infinity}) is not the maximum observed mussel age but is a theoretical average maximum (asymptotic) length. The coefficient k is not a growth rate (mm/year) but is a growth coefficient that changes with each yearly increase in mussel age that indicates how quickly L_{∞} is approached. Thus, k is an exponential rate of change in mussel length that varies with each annual increase in mussel age. The coefficient t is time or age in years, t_0 is not the minimum age observed age, but is the age in years when length would theoretically be equal to zero, and e is the natural log exponent necessary to the creation of the growth curves and parameters (von Bertalanffy 1938). Parameter values of t_0 are sometimes negative and are therefore sometimes of no biological significance; however, these parameters are necessary in growth curve production by providing y-axes intercepts for the curves. Von Bertalanffy growth curve parameters (L_{∞} , k , and t_0) were generated using the “typical” von Bertalanffy function in FSA for each of the growth curves, and the values of these parameters varied with each pool’s strata. The pools’ strata-specific von Bertalanffy equations and parameters are presented in a table and von Bertalanffy curves as figures in this report.

3.4 Mussel Growth (mm/year)

Growth rates (mm/year) were developed for the randomly selected mussels. Statistical analyses were conducted to assess differences in mussel growth among the BR and NR remediation strata within the FMP and SWP pools and among pools within the NR strata using length (mm)-on-age (years) regression slopes (mm/year) generated in general linear models (GLM) in Minitab. Sample sizes (n = number of thin-sectioned shells) per strata per pool were FMP (BR) (n = 90), FMP (NR) (n = 90), SWP (BR) (n = 85), SWP (NR) (n = 87), NUP (NR) (n = 90), and TIP (NR) (n = 87) (data from randomly selected mussels is in Appendix A1). Within the two GLM models that compared regression slopes (mm/year) among the BR and NR strata within the FMP and SWP pools, strata were declared as statistical factors. Within the model that compared slopes (mm/year) among pools within the NR strata, pool was declared as the factor. In the three models, mussel length (mm) was set as the dependent variables, and mussel age (years) was used as covariates. Significant interactions ($p < 0.05$) among age and strata or pool (age*FMP BR versus age*FMP NR, age*SWP BR versus age*SWP NR, and age*TIP NR vs age*FMP NR vs age*NUP NR vs age* SWP NR comparisons) were examined to determine significant differences among regression slopes (mm/year). The slope can be interpreted as the average yearly increase in mussel lengths of all examined mussels aged from one year to the next. Because the thin-sectioned shells were randomly selected, the regression slopes represent the average increases in mussel lengths (mm/year) that occurred at the separate strata and pools.

Mean lengths (mm) and ages (years) for the randomly selected mussels were calculated by determining the mean length for each mussel age (one-year increments) observed in each pool's strata. The 95% confidence interval (CI) of the mean length for each age class was calculated using the formula:

$$CI = \bar{X} \pm Z_{\alpha/2} * \frac{SD}{\sqrt{N}}$$

where, \bar{X} = the mean length (mm) of mussels in each age class, $Z_{\alpha/2} = 1.96$ [z score at the selected significance level ($\alpha = 0.05$) / 2], SD = standard deviation of mussel lengths in age class, and N = number of mussels in age class.

4.0 RESULTS

4.1 Mussel Lengths and Heights

4.1.1 Lengths

Mean (\pm standard deviation, SD) mussel lengths (mm) of randomly selected individuals (n = 529) ranged from 58.3 mm (± 18.3) at pool SWP (BR) to 74.7 mm (± 15.6) at TIP (NR). Minimum and maximum observed lengths were 16.0 mm at TIP (NR) and 106.5 mm at FMP (NR), respectively (Table 1, Figs. A2.1 to A2.9 in Appendix A2).

The means (\pm SD) mussel lengths of the combined mussels selected randomly and non-randomly (n = 589) from the total mussels collected by HRNRT 2020 ranged from 60.5 mm (± 19.0) at SWP (BR) to 75.0 mm (± 17.1) at TIP (NR), and minimum and maximum observed lengths were 16.0 mm and 114.0 mm at TIP (NR), respectively (Table 2).

4.1.2 Heights

Mean (\pm SD) mussel heights (mm) of randomly selected mussels (n = 529) ranged from 33.2 mm (± 10.4) at pool SWP (BR) to 40.9 mm (± 8.4) at TIP (NR). Minimum and maximum observed lengths were 8.0 mm at TIP (NR) and 57.0 mm at FMP (NR), respectively (Table 1).

Mean (\pm SD) mussel heights (mm) of the combined randomly and non-randomly selected mussels ($n = 589$) ranged from 34.3 mm (± 10.6) at pool SWP (BR) to 40.9 mm (± 9.3) at TIP (NR). Minimum and maximum observed lengths were 8.0 mm and 60.5 mm at TIP (NR), respectively (Table 2).

4.2 Mussel Thin-Section Ages

4.2.1 Mean Ages

The means (\pm SD) of mussel ages of randomly selected shells ($n = 529$) ranged from 11.1 years (± 7.5) at SWP (BR) to 18.4 years (± 7.1) at TIP (NR) (Table 1, Figs. 2 and 3, Figs. A2.1 to A2.9 in Appendix A2). There were close alignments among the means and median ages from all of the remediation strata (Table 1). The means (\pm SD) of mussel ages of randomly and non-randomly selected thin-sectioned mussels ($n = 589$) were similar to the results for the randomly selected mussels, ranging from 12.2 years (± 8.1) at SWP (BR) to 18.6 years (± 8.3) at TIP (NR) (Table 2).

4.2.2 Minimum Ages

The minimum age of mussels in each pool and strata was one year old (Tables 1 and 2) (randomly selected or randomly and non-randomly selected combined). Three shells lacking growth annuli could not be aged by thin-sectioning were >0 and <1 year old.

4.2.3 Maximum Ages

Maximum ages of mussels randomly selected ranged from 25 to 35 years compared to 31 to 39 years for mussels randomly and non-randomly selected. Maximum ages of the randomly selected shells were 31 years at FMP (BR), 33 years at FMP (NR), 33 years at SWP (BR), 25 years at SWP (NR), 31 years at NUP (NR), and 35 years at TIP (NR) (Table 1). Maximum ages of the combined randomly and non-randomly selected mussels were 31 years at FMP (BR), 33 years at FMP (NR), 33 years at SWP (BR), 34 years at SWP (NR), 31 years at NUP (NR), and 39 years at TIP (NR) (Table 2).

4.3 Mussel Age Structure Evaluation

4.3.1 Age Frequency Distribution of Randomly Selected Shells

Mode and skewness assessed how similar or different the distributions of age were in each pool by strata. The mode, or age that was detected most often, ranged from 1 to 24 years across all strata and pools. With a mode = 1, the most frequent age class collected from SWP (BR) was one year of age, indicating a higher level of recent recruitment of mussels relative to the NR strata (mode=13 years old) within the same pool and to other pools (mode ranged from 18 – 24 years old) (Table 1). Values of histogram skewness for all pool strata were close to zero, indicating relative symmetry of age distributions, except at two pools (Table 1). The age-frequency distribution at pool SWP (BR) was right-skewed (skewness = 0.42), indicating higher relative frequencies of younger mussels. At SWP (BR), as discussed above, 1-year-old mussels were more prevalent than any other age class. In contrast, the age-frequency distribution at TIP (NR) was left-skewed (skewness = -0.42) indicative of a higher percentage of older mussels in the sample (Table 1, Fig. A2.9 in Appendix A2). The mode for TIP (NR) was 24 years of age.

4.3.2 Statistical Analyses of Mussel Age and Age Class Structure of Randomly Selected Shells

Mean Age. Mean ages significantly differed among the FMP and SWP ($df = 1$, $F = 18.45$, $p < 0.001$) and strata (BR versus NR) within these pools ($p = 0.012$) (Table 3). Multiple comparisons of pools showed that the overall mean age of

mussels from FMP (14.6 years) was significantly greater than the mean age from SWP (11.4 years) ($p < 0.05$) (Tables 1 and 3). Although mussel mean ages did not significantly differ among the BR (11.1 years) and NR (11.8 years) strata within the SWP ($p > 0.05$), FMP mean mussel ages from the NR stratum (16.2 years) were significantly greater than the BR mean mussel ages (13.1 years) ($p < 0.05$) (Tables 1 and 3).

Mean ages of mussels from within the NR strata in the four pools also significantly differed ($n = 354$, $df = 3$, $F = 14.15$, $p < 0.001$) (Table 3), based on Bonferroni-corrected multiple comparisons. Mean age of mussels from TIP (18.4 years) was significantly greater than from NUP (14.1 years) ($p < 0.05$); mean age from FMP (16.2 years) was significantly greater than the mean age from SWP (11.8 years) ($p < 0.05$); and the mean age from TIP was significantly greater than the mean age from SWP ($p < 0.05$) (Tables 1 and 3). Other paired comparisons of mussel ages from the NR strata did not show significant differences ($p > 0.05$) (Tables 1 and 3).

Age Class Structure. The results of the X^2 analyses showed that the counts of the BR and NR mussels within age bins from the FMP and SWP did not significantly differ (FMP, BR versus NR: $n = 180$, $df = 10$, $X^2 = 14.3$, $p = 0.16$; SWP, BR versus NR: $n = 172$, $df = 8$, $X^2 = 13.8$, $p = 0.09$). Because of the lack of statistical differences, the age class structure data from the BR and NR strata were combined by pool for FMP (Fig. A2.2 and Table A3.2) and SWP (Fig. A2.5 and Table A3.5).

4.3.3 Percentages of Mussels in All Age Classes of Randomly Selected Shells

The percentages of mussels observed in each age classes (age class = a single year) are presented in Tables A3.1 through A3.9 in Appendix A3 where age classes ranged from one year to the maximum ages of 25 to 35 years depending on strata and pool.

4.3.4 Percentages and Densities of Mussels \leq Age-Three of Randomly Selected Shells

Of the 529 thin-sectioned mussel shells, 10.6% (56 mussels) were of ages ≤ 3 years. The percentages (numbers observed) of mussels with ages ≤ 3 from the strata were 12.2% (11 mussels) at FMP (BR), 4.4% (4 mussels) at FMP (NR), 23.5% (20 mussels) at SWP (BR), 8.1% (7 mussels) at SWP (NR), 10.0% (9 mussels) at NUP (NR), and 5.8% (5 mussels) at TIP (NR) (Table 4). The occurrences of mussels whose ages were ≤ 3 years indicate recent mussel recruitment that occurred within the 3 years prior to mussel collection during surveys of HRNRT 2020. The grand mean length (mm) (\pm SD) of age-3 mussels was 44.9 mm (± 7.3), and the mean lengths of age-3 mussels from the separate strata ranged from 38.0 mm to 56.6 mm (Table 4). The densities of young *E. complanata* at the pools by strata were estimated as 4.30 mussels \leq age-3/ m^2 at FMP (BR), 1.76 mussels \leq age-3/ m^2 at FMP (NR), 4.39 mussels \leq age-3/ m^2 at SWP (BR), 2.33 mussels \leq age-3/ m^2 at SWP (NR), 6.45 mussels \leq age-3/ m^2 at NUP (NR), and 2.92 mussels \leq age-3/ m^2 at TIP (NR) (Table 5).

4.4 Mussel von Bertalanffy Growth Curves

The dataset used to create the von Bertalanffy (1938) growth curves and evaluate von Bertalanffy parameters by pool and strata included mussels that were randomly and non-randomly selected from total *E. complanata* collected by HRNRT 2020 (see Appendix A1). Appendix A1 contains identification numbers, pool sources, lengths (mm), and internal annuli ages of all shells randomly and non-randomly selected thin-sectioned during this study from remediation strata [before remediation (BR) and non-remediated (NR)] within the Hudson River pools.

Using the lengths (mm) and ages (years) of mussels selected randomly and non-randomly, the pool and strata-specific von Bertalanffy (1938) growth curves and parameters (L_∞ , k , and t_0) were created (Table 6 and Figs. 4 through 10). Note that Fig. 4 contains the von Bertalanffy growth curve that was generated using combined length-age data using mussels from all four pools and strata; this curve is presented for reference only, since only comparisons among strata were conducted. Figs. 5 through 10 are the curves using data from the segregated pools and strata.

Estimates of L_{∞} ranged from 88.42 mm at NUP (NR) to 107.84 mm at TIP (NR) (Table 6, Figs. 9 and 10). Estimates of k ranged from 0.051 at FMP (NR) to 0.096 at FMP (BR) (Table 6, Figs. 5 and 6); and estimates of t_0 ranged from -8.183 years at FMP (NR) to -3.992 years at FMP (BR) (Table 6, Figs. 5 and 6).

4.5 Mussel Growth Rate Evaluations

It should be remembered that the von Bertalanffy growth parameter k is not a growth rate (mm increase in length/year) but is an exponential rate of change in mussel length that varies with each annual increase in mussel age. In this results section, results of actual mussel growth rates (mm/year) are presented.

Using GLM, the age data from randomly selected mussels were used to determine statistical differences in mussel length (mm)-on-age (years) regression slopes (mm/year, growth rate, average mm increase in length/year) among the BR and NR strata within the FMP and SWP pools and among the NR strata in the FMP, SWP, NUP, and TIP pools.

Growth of mussels in the BR strata was significantly greater than growth in NR at the FMP Pool (BR and NR slopes were 1.918 and 1.515 mm/year, respectively; $n=180$, $df=1$, $F=6.39$, $p=0.012$) (Table 7 and Fig. A4.1 in Appendix A4). However, growths among the BR and NR mussels from the SWP did not significantly differ (BR and NR slopes were 2.037 and 2.065 mm/year, respectively; $n=172$, $df=1$, $F=0.01$, $p=0.906$) (Table 7 and Fig. A4.2 in Appendix A4).

Mussel growths among the FMP, SWP, NUP, and TIP in the NR strata was significantly different ($n=354$, $df=3$, $F=2.86$, $p=0.037$; Table 7 and Fig. A4.3 in Appendix A4). Only two of the paired comparisons among the NR strata showed significantly different mussel growths. Growth of mussels from SWP (NR, slope = 2.065 mm/year) was significantly greater than mussel growths at FMP (NR; slope = 1.515 mm/year) and NUP (NR, slope = 1.601 mm/year) (SWP versus FMP, $n=177$, $df=1$, $F=8.38$, $p=0.004$; SWP versus NUP, $n=177$, $df=1$, $F=4.97$, $p=0.027$) (Table 7 and Figs. A4.4 and A4.7 in Appendix A4). All other paired comparisons among mussel growths at the NR strata did not show significant differences ($df=1$, $F<2.4$, $p>0.05$) (Table 7 and Figs. A4.5, A4.6, A4.8, and A4.9 in Appendix A4).

4.6 Mean Mussel Lengths-at-Ages

Mean (\pm 95% confidence intervals) lengths (mm)-at-ages (years) for randomly selected mussels are presented in Appendix A5. Overall, for all pools and strata combined for randomly selected mussels ($n=529$), mean length generally increased with internal age, but most age classes (internal) cannot be individually distinguished solely by mean length (\pm SD) due to overlapping 95% confidence intervals (Table A5.1 of Appendix A5).

4.7 Mean and Median Internal Age by Size Class

As an alternative to length-at-age, mussels from all pools and strata selected randomly and non-randomly ($n=589$) (Tables 8 and 9) were combined and divided into either 10 mm (Table 8) or 5 mm (Table 9) size classes where mean and median age were reported for each size class bin. Age generally increases with increasing size class except for the smallest size classes. Mussels < 30 mm in length have a mean and median age of 1 year. Mussels less than 40 mm have a mean and median age of between 1 and 2 years old with a maximum age of 3. Mussels 40 mm in length and longer consist of a wider span of ages with a corresponding increase in mean and median age with each incremental increase in size class up to 110 to < 120 mm (Table 8).

5.0. DISCUSSION

Reports of maximum lengths, ages, and rates of growth of *E. complanata* vary widely by aquatic systems, based on water quality, trophic status, and latitude (Strayer *et al.* 1981, Paterson 1985, Balfour and Smock 1995, Kesler and Downing 1997, Anthony *et al.* 2001, Kesler 2007, Haag and Rypel 2011, Strayer and Malcom 2012). Strayer *et al.* (1981) and Paterson (1985) recorded maximum lengths for *E. complanata* from an oligotrophic lake and reservoir in New Hampshire and New Brunswick of 71 and 82 mm, respectively. Riveredge Environmental, Inc. (2017) reports maximum lengths of *E. complanata* from the lower Grasse River, Massena, New York, another large river system impacted by PCB contamination and remediation, as 112.4 mm with a mean of 73.4 mm (pre-remediation). During our study of Upper Hudson River thin-sectioned shells randomly and non-randomly selected, we observed maximum lengths of 100.5 to 114 mm and mean lengths of 69.3 to 75.0 mm for the two strata (before-remediation and non-remediated, respectively) within the four pools, while the maximum lengths for all shells collected during the 2013 and 2015 surveys ranged from 96.3 to 114.8 mm for the same four pools (HRNRT 2020).

Estimates of the von Bertalanffy average theoretical hypothetical maximum length (L_{∞}) varied widely in the literature from 62.5 mm at a eutrophic lake to 83.6 mm at silted substrate in an oligotrophic lake in Rhode Island (Kesler and Downing 1997, Anthony *et al.* 2001). Balfour and Smock (1995) estimated L_{∞} of 121.5 mm for *E. complanata* from a slow-moving headwater stream in southeastern Virginia. We calculated estimates of L_{∞} that ranged from 88.4 to 107.8 mm depending on pool and strata.

Although there is a dearth of literature that report results of internally aged *E. complanata*, maximum internal ages appear to vary among mussel source waters. Maximum reported internal ages at wadeable streams in southeastern New York ranged from > 20 to 95 years (Schneider and Strayer 2006, Strayer and Malcom 2012). In the Grasse River, in upstate NY on the U.S.-Canadian border, a maximum age of 20.5 years was reported for 20 thin-sectioned mussels (Riveredge Environmental, Inc. 2017). The maximum internal ages observed in the current Upper Hudson River study ranged from 25 to 39 years depending on pool and strata. Mean internal age averaged over the four Hudson pools was 14.1 - 14.5 years¹⁷ compared to 12.6 years in the Grasse River *Elliptio*.

Growth rates of *E. complanata* have also been reported to differ among source waters. Kesler and Downing (1997) and Anthony *et al.* (2001) reported estimates of k (von Bertalanffy growth coefficient) that ranged from 0.027 to 0.176 for *E. complanata* living in lakes in Rhode Island. Balfour and Smock (1995) observed a k estimate of 0.024 in the slow-moving headwater stream in Virginia. We observed higher k estimates ranging from 0.051 to 0.096 in the four Upper Hudson River pools. For reference, the criterion of $k < 0.05$ would classify mussels as exhibiting extremely slow growth (Haag and Rypel 2011). Kesler (2007) observed growth rates in *E. complanata* from Rhode Island lakes that ranged from 0.29 mm/year to 2.33 mm/year, whereas our observed range of growth rates (regression slopes) was from 1.52 mm/year to 2.07 mm/year. It is difficult to draw comparative conclusions concerning growth rates measured in dissimilar systems such as lakes in Rhode Island and the four Hudson River pools that are the focus of this report.

The variation of mussel length, age, and growth among aquatic systems due to abiotic variables demonstrates that comparison of these population demographics should not occur across geographically distinct water bodies. However, comparisons of within-system mussel population characteristics are valid (Strayer and Malcom 2012).

5.1 Comparisons of Before-remediation and Non-remediated Strata

Comparisons of length, age, and growth between the BR and NR strata at the FMP and SWP pools showed varied mussel responses by strata. While the percentages of mussels of age ≤ 3 years old showed that recent mussel recruitment occurred in both strata at the FMP and SWP Pools, the highest percentages of age ≤ 3 year old mussels were observed in the BR strata, with percentages of 12.2% and 23.5% at FMP and SWP, respectively. In contrast, percentages from FMP and SWP in the NR strata were lower at 4.4% and 8.1%, respectively. Recent mussel recruitment at SWP (BR)

¹⁷ Range represents random vs random + non-random shells, respectively. See Tables 1 and 2.

appeared to be especially strong, since this pool showed the lowest mean age (11.1 years) and a statistical mode-of-ages of one year. Conversely, mussels from the NR strata within the FMP pool exhibited the highest mode-of-age (24 years) and mean age (16.2 years) and the lowest percentage of mussels of age ≤ 3 years old (4.4 %) compared to SWP (BR), SWP (NR), and FMP (BR). Mean mussel age of 18.4 years for the TIP (BR) was the highest for all pools with the second lowest rate of recent mussel recruitment (5.8% with age ≤ 3 years old).

Comparisons of mussel growth variables between strata by pool also revealed mixed results. The von Bertalanffy growth estimate (k) was apparently higher at FMP (BR, 0.096) than the relatively consistent estimates from mussels selected from FMP (NR), SWP (BR), and SWP (NR) (0.051, 0.071, and 0.066, respectively). However, comparisons of regression growth slopes revealed a different pattern. The slopes from FMP (BR), SWP (BR), and SWP (NR) (1.918, 2.037, and 2.065 mm growth/year, respectively) were relatively consistent and significantly higher than the slope observed from the FMP (NR) mussels (1.515 mm/year).

Our conclusions concerning differences between the BR and NR strata within pools must be limited, since only two pools not yet remediated were surveyed and thin-sectioned. Based on the above discussion synthesis, it is difficult to conclude that observed differences in the various recruitment, age, and growth variables of this study were solely due to the effects of the BR and NR strata. However, it is clear that mussel recruitment, mean age, and growth were lower at FMP (NR) compared to the other strata within pools. It is apparent that other unknown variables besides strata classification likely contributed to effects on mussels at the FMP (NR) pool.

5.2 Comparisons of Pools within Non-remediated Stratum

Differences in mussel recruitment, age, and growth were observed among the pools within the NR strata. Although recent mussel recruitment occurred in all four pools for the NR strata, the percentage of mussels of age ≤ 3 years old observed at FMP (NR, 4.4%) was the lowest percentage observed at the NR pools. The mean of mussel ages from TIP (NR, 18.4 years) was significantly higher than mean ages observed at NUP (NR, 14.1 years) and SWP (NR, 11.8 years). The estimates of the von Bertalanffy growth parameter k were relatively consistent among the NR pools (range from 0.051 to 0.082). However, comparisons of the regression growth slopes revealed significant differences among the NR pools, with SWP (NR, 2.065 mm increase/year) significantly greater than the other NR pools (range from 1.515 to 1.769 mm/year). The results of this study do not reveal a clear pattern of mussel responses among the NR strata across pools. However, comparatively lower mussel recruitment occurred at the FMP (NR) and TIP (NR) pools, as indicated by comparatively lower percentages of mussels of age ≤ 3 years old and higher mean mussel ages at the pools. Mussel growth at SWP (NR) was higher than at the other NR pools, indicating that conditions at that pool were more favorable to support mussel growth.

At the Stillwater Pool, the lowest mean mussel ages (11.1 years in the before-remediation strata and 11.8 years in the non-remediated strata), highest percentage of total mussels ≤ 3 years of age [evidence of recent recruitment; 23.5% (before-remediation)], and the highest mussel growth rates [2.037 mm/year (before-remediation) and 2.065 mm/year (non-remediated)] were observed, indicating that environmental conditions in the Stillwater Pool were more conducive to mussel recruitment and growth compared to the other sampled pools.

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TABLES

Table 1 Mean length (mm), height (mm), and age (years) of randomly selected *Elliptio complanata* shells for thin-sectioning. Shells were randomly selected from total shells collected by HRNRT 2020 in 2013 and 2015 from Hudson River pools before-remediation (BR) and non-remediated (NR). Pools include the Thompson Island Pool (River Section 1, Reach 8; TIP; NR), Fort Miller Pool (River Section 2, Reach 7; FMP; BR and NR), Northumberland Pool (River Section 2, Reach 6; NUP; NR) and Stillwater Pool (River Section 3, Reach 5; SWP; BR and NR). SE = standard error; SD = standard deviation; min = minimum lengths and ages observed; max = maximum lengths and ages observed; *n* = number of shells microscopically evaluated for age; and * = bimodal. Age represents rounded mean ages from two evaluators reading thin-sectioned shells. Mode: most frequent age observed. Skewness: higher positive value indicates a right-skewed histogram, with a higher relative abundance of younger mussels (e.g., pool SWP (BR), Fig. 2), and lower negative value indicates a left-skewed histogram, with a higher relative abundance of older mussels (e.g., pool TIP (NR), Fig.3).

| Pool | Remediation Strata | n | Shell Length and Height (mm) | | | | | | Internal Annuli Age (years) | | | | | | | |
|------|--------------------|-----|------------------------------|------|-----|------|------|-------|-----------------------------|-----|-----|--------|---------|-----|-----|----------|
| | | | Length/Height | Mean | SE | SD | Min | Max | Mean | SE | SD | Median | Mode | Min | Max | Skewness |
| All | All | 529 | Length | 67.3 | 0.7 | 16.3 | 16.0 | 106.5 | 14.1 | 0.3 | 7.6 | 14.0 | 16 | 1 | 35 | 0.11 |
| | | | Height | 36.7 | 0.4 | 9.0 | 8.0 | 57.0 | | | | | | | | |
| FMP | BR + NR | 180 | Length | 69.8 | 1.1 | 15.0 | 20 | 106.5 | 14.6 | 0.6 | 7.5 | 15.0 | *16, 18 | 1 | 33 | -0.49 |
| | | | Height | 38.0 | 0.6 | 8.0 | 11.0 | 57.0 | | | | | | | | |
| | BR | 90 | Length | 67.9 | 1.7 | 16.3 | 20.0 | 100.5 | 13.1 | 0.8 | 7.2 | 13.5 | 18 | 1 | 31 | 0.03 |
| | | | Height | 37.0 | 1.0 | 9.1 | 11.0 | 53.5 | | | | | | | | |
| | NR | 90 | Length | 71.8 | 1.4 | 13.3 | 31.0 | 106.5 | 16.2 | 0.8 | 7.6 | 16.0 | 24 | 1 | 33 | 0.11 |
| | | | Height | 38.9 | 0.7 | 6.8 | 16.0 | 57.0 | | | | | | | | |
| SWP | BR + NR | 172 | Length | 66.2 | 1.3 | 17.0 | 18.5 | 95.5 | 11.4 | 0.5 | 6.6 | 11.0 | 1 | 1 | 33 | 0.28 |
| | | | Height | 33.8 | 0.7 | 9.7 | 10.0 | 52.5 | | | | | | | | |
| | BR | 85 | Length | 58.3 | 2.0 | 18.3 | 18.5 | 95.5 | 11.1 | 0.8 | 7.5 | 11.0 | 1 | 1 | 33 | 0.42 |
| | | | Height | 33.2 | 1.1 | 10.4 | 10.5 | 51.5 | | | | | | | | |
| | NR | 87 | Length | 66.1 | 1.6 | 14.7 | 21.7 | 93.5 | 11.8 | 0.6 | 5.6 | 12.0 | 13 | 1 | 25 | 0.09 |
| | | | Height | 34.5 | 1.0 | 8.9 | 10.0 | 52.5 | | | | | | | | |
| NUP | NR | 90 | Length | 65.0 | 1.6 | 14.8 | 25.0 | 95.0 | 14.1 | 0.8 | 7.7 | 15.0 | 20 | 1 | 31 | 0.02 |
| | | | Height | 35.3 | 0.9 | 8.1 | 13.5 | 49.5 | | | | | | | | |
| TIP | NR | 87 | Length | 74.7 | 1.7 | 15.6 | 16.0 | 96.0 | 18.4 | 0.8 | 7.1 | 19.0 | 19 | 1 | 35 | -0.42 |
| | | | Height | 40.9 | 0.9 | 8.4 | 8.0 | 53.5 | | | | | | | | |

Table 2

Mean length (mm) and age (years) of randomly and non-randomly selected *Elliptio complanata* shells for thin-sectioning and use in von Bertalanffy growth curve creation. Shells were selected from total shells collected by HRNRT 2020 in 2013 and 2015 from Hudson River pools before-remediation (BR) and non-remediated (NR). Pools include the Thompson Island Pool (River Section 1, Reach 8; TIP; NR), Fort Miller Pool (River Section 2, Reach 7; BR and NR); FMP, Northumberland Pool (River Section 2, Reach 6; NUP; NR), and Stillwater Pool (River Section 3, Reach 5; SWP; BR and NR). SE = standard error; SD = standard deviation; and *n* = number of shells microscopically evaluated for age. Age (years) represents rounded mean of internal annuli ages from two evaluators.

| Pool | Remediation Strata | n | Shell Length and Height (mm) | | | | | | Internal Annuli Age (years) | | | | |
|------|--------------------|-----|------------------------------|------|-----|------|------|-------|-----------------------------|-----|-----|-----|-----|
| | | | Length/Height | Mean | SE | SD | Min | Max | Mean | SE | SD | Min | Max |
| All | All | 589 | Length | 69.2 | 0.7 | 17.6 | 16.0 | 114.0 | 14.5 | 0.3 | 8.0 | 1 | 39 |
| | | | Height | 37.1 | 0.4 | 9.6 | 8.0 | 60.5 | | | | | |
| FMP | BR | 100 | Length | 69.3 | 1.7 | 16.9 | 20.0 | 100.5 | 13.6 | 0.7 | 7.4 | 1 | 31 |
| | | | Height | 37.7 | 0.9 | 9.2 | 11.0 | 53.5 | | | | | |
| | NR | 100 | Length | 71.4 | 1.5 | 15.3 | 27.5 | 109.5 | 16.0 | 0.8 | 8.2 | 1 | 33 |
| | | | Height | 38.6 | 0.8 | 7.9 | 14.0 | 57.0 | | | | | |
| SWP | BR | 95 | Length | 60.5 | 2.0 | 19.0 | 18.5 | 97.5 | 12.2 | 0.8 | 8.1 | 1 | 33 |
| | | | Height | 34.3 | 1.1 | 10.6 | 10.5 | 55.0 | | | | | |
| | NR | 97 | Length | 66.9 | 1.7 | 17.1 | 21.7 | 108.0 | 12.3 | 0.7 | 6.7 | 1 | 34 |
| | | | Height | 34.9 | 1.0 | 9.9 | 10.0 | 55.0 | | | | | |
| NUP | NR | 100 | Length | 66.1 | 1.7 | 16.6 | 23.0 | 102.0 | 14.4 | 0.8 | 7.8 | 1 | 31 |
| | | | Height | 35.9 | 0.9 | 9.1 | 12.5 | 54.5 | | | | | |
| TIP | NR | 97 | Length | 75.0 | 1.8 | 17.1 | 16.0 | 114.0 | 18.6 | 0.8 | 8.3 | 1 | 39 |
| | | | Height | 40.9 | 0.9 | 9.3 | 8.0 | 60.5 | | | | | |

Table 3

Results from multiple comparisons (Bonferroni) from general linear models (GLM in Minitab) of mean ages (years) of *Elliptio complanata* randomly and non-randomly selected from total shells collected by HRNRT 2020 in 2013 and 2015 from Hudson River. The first table includes comparisons of means from strata [before-remediation (BR) and non-remediated (NR)] nested within pools including the Fort Miller Pool (River Section 2, Reach 7; FMP) and Stillwater Pool (River Section 3, Reach 5; SWP). The second table includes comparisons of means from pools (FMP, SWP, Thompson Island Pool (River Section 1, Reach 8; TIP) and Northumberland Pool (River Section 2, Reach 6; NUP). In statistical grouping, strata with the same letters are not significantly different. Bonferroni multiple comparisons – mean mussel ages (years) among pools and strata within pools.

| Pool | Remediation Strata | n | Mean Age | Statistical Grouping | P-value |
|------|--------------------|----|----------|----------------------|--------------------------|
| FMP | NR | 90 | 16.18 | a | FMP, NR > BR, $p < 0.05$ |
| | BR | 90 | 13.11 | b | |
| SWP | NR | 87 | 11.78 | b | SWP, BR v NR, $p > 0.05$ |
| | BR | 85 | 11.07 | b | |

Bonferroni multiple comparisons – mean mussel ages (years) among pools in NR strata.

| Pool | Remediation Strata | n | Mean Age | Statistical Grouping | P-value |
|------|--------------------|----|----------|----------------------|--|
| TIP | NR | 90 | 18.44 | a | TIP>NUP and SWP, FMP>SWP, $p < 0.05$; all other comparisons not significantly different, $p > 0.05$ |
| FMP | NR | 87 | 16.18 | a b | |
| NUP | NR | 90 | 14.12 | b c | |
| SWP | NR | 87 | 11.78 | c | |

Table 4 Numbers and percentages of *Elliptio complanata* of ages ≤ 3 years and mean lengths (mm) and standard deviations (SD) of age-3 mussels selected randomly from total shells collected by HRNRT 2020 in 2013 and 2015 from Hudson River pools in strata including before-remediation (BR) and non-remediated (NR). Pools include Thompson Island Pool (River Section 1, Reach 8; TIP, NR), Fort Miller Pool (River Section 2, Reach 7; FMP, BR and NR), Northumberland Pool (River Section 2, Reach 6; NUP, non-remediated), and Stillwater Pool (River Section 3, Reach 5; SWP, BR and NR). Age represents rounded mean ages from two evaluators reading thin-sectioned shells.

| Pool | Strata | Total Mussels Selected | | | | Length at Age-3 | | | Maximum Age |
|------|--------|------------------------|------|-------|-------|-----------------|----|-----|-------------|
| | | Age ≤ 3 | | Total | | Mean Length | n | SD | |
| | | N | % | n | % | | | | |
| All | All | 56 | 10.6 | 529 | 100.0 | 44.9 | 16 | 7.3 | 35 |
| FMP | BR | 11 | 12.2 | 90 | 100.0 | 44.0 | 1 | - | 31 |
| | NR | 4 | 4.4 | 90 | 100.0 | 38.5 | 1 | - | 33 |
| SWP | BR | 20 | 23.5 | 85 | 100.0 | 45.8 | 5 | 7.6 | 33 |
| | NR | 7 | 8.1 | 87 | 100.0 | 56.6 | 2 | 0.9 | 25 |
| NUP | NR | 9 | 10.0 | 90 | 100.0 | 46.9 | 4 | 8.3 | 31 |
| TIP | NR | 5 | 5.8 | 87 | 100.0 | 38.0 | 3 | 6.5 | 35 |

Table 5 Estimated densities (mussels/m²) of randomly selected *Elliptio complanata* of ages ≤ 3 at Hudson River strata within pools (n = 6) in strata including before-remediation (BR) and non-remediated (NR). Estimated densities are percentages of mussels of age ≤ 3 years (Table 3) multiplied by estimated pool mussel densities (mussels/m²) from surveys conducted in 2013 and 2015 (HRNRT 2020). Pools include the Thompson Island Pool (River Section 1, Reach 8; TIP, NR), Fort Miller Pool (River Section 2, Reach 7; FMP, BR and NR), Northumberland Pool (River Section 2, Reach 6; NUP, NR), and Stillwater Pool (River Section 3, Reach 5; SWP, BR and NR).

| Pool | Strata | Total Density* (mussels/m ²) | Mussels \leq Age-3 | |
|------|--------|---|----------------------------|--|
| | | | % of Thin-sectioned Shells | Estimated Site Density (mussels/m ²) |
| FMP | BR | 35.27 | 12.2 | 4.30 |
| | NR | 40.09 | 4.4 | 1.76 |
| SWP | BR | 18.67 | 23.5 | 4.39 |
| | NR | 28.82 | 8.1 | 2.33 |
| NUP | NR | 64.52 | 10.0 | 6.45 |
| TIP | NR | 50.37 | 5.8 | 2.92 |

* Indicates total mussel densities of *Elliptio complanata* observed by HRNRT 2020 during quantitative quadrat surveys conducted at the pools in 2013 and 2015.

Table 6

Estimated parameters generated during development of von Bertalanffy (1938) growth curves of predicted mean lengths-at-ages for *Elliptio complanata* (total n = 589) collected from pools in the Hudson River before-remediation (BR) and non-remediated (NR). Data included lengths (mm) and ages (years) from mussels selected randomly and non-randomly from total shells collected by HRNRT 2020 in 2013 and 2015 from Hudson River pools. Equation used to generate the curves was: $L_t =$

$$L_t = L_{\infty}(1 - e^{-K(t - t_0)}).$$

L_t is the mean length (mm) at age t , L_{∞} (L-infinity, mm) is a theoretical maximum (asymptotic) mean length, K is a growth coefficient indicating how quickly L_{∞} is approached, t is age (years), t_0 is the age (years) when length would theoretically be equal to zero, and e is the natural log exponent. Pools include the Thompson Island Pool (River Section 1, Reach 8; TIP; NR), Fort Miller Pool (River Section 2, Reach 7; FMP; BR and NR), Northumberland Pool (River Section 2, Reach 6; NUP; NR), and Stillwater Pool (River Section 3, Reach 5; SWP; BR and NR). Negative values of t_0 are biologically meaningless, since mussel length at age-0 cannot be negative; however, values of t_0 are required for generation of the curves by providing y-axes intercepts.

| Pool | Strata | n | L_{∞} | K | t_0 |
|------|--------|-----|--------------|-------|--------|
| FMP | BR | 100 | 90.69 | 0.096 | -3.992 |
| | NR | 100 | 104.95 | 0.051 | -8.183 |
| SWP | BR | 95 | 92.66 | 0.071 | -4.837 |
| | NR | 97 | 102.43 | 0.066 | -4.995 |
| NUP | NR | 100 | 88.42 | 0.082 | -4.823 |
| TIP | NR | 97 | 107.84 | 0.053 | -5.497 |

Table 7

Paired-pool comparisons of regression slopes (mm growth/year) from lengths (mm)-on-ages (years) regression general linear models (GLM in Minitab) of *Elliptio complanata* randomly selected from total shells collected by HRNRT 2020 in 2013 and 2015 from Hudson River. Comparisons included growth of mussels between before-remediation (BR) and non-remediated (NR) strata within the Fort Miller Pool (River Section 2, Reach 7; FMP) and Stillwater Pool (River Section 3, Reach 5; SWP) and among pools FMP, SWP, Northumberland Pool (River Section 2, Reach 6; NUP), and Thompson Island Pool (River Section 1, Reach 8; TIP) within the NR strata. Individual paired comparisons of slopes were conducted and actual p-values are provided. In statistical grouping, strata with the same letters are not significantly different. Bonferroni multiple comparisons – mussel growth (mm/year) among strata within pools.

| Pool | Remediation Strata | n | Slope (mm/year) | Statistical Grouping | P-value |
|------|--------------------|----|-----------------|----------------------|-----------------------------|
| FMP | BR | 90 | 1.918 | a | df = 1, F = 6.39, p = 0.012 |
| | NR | 90 | 1.515 | b | |
| SWP | BR | 87 | 2.037 | a | df = 1, F = 0.01, p = 0.906 |
| | NR | 85 | 2.065 | a | |

Paired comparisons – mussel growth (mm/year) among pools within NR strata.

| Pool | n | Slope (mm/year) | Statistical Grouping | P-value |
|------|-----|-----------------|----------------------|---|
| All | 354 | All | - | Some pools different; df = 3, F = 2.86, p = 0.037 |
| SWP | 87 | 2.065 | a | SWP>NUP; df = 1, F = 4.97, p = 0.027 |
| TIP | 87 | 1.769 | a b | SWP>FMP; df = 1, F = 8.38, p = 0.004 |
| NUP | 90 | 1.601 | b | All other paired comparisons not significantly different; df = 1, F < 2.4, p > 0.12 |
| FMP | 90 | 1.515 | b | |

Table 8 Internal ages of *Elliptio complanata* ($n = 589$) collected by HRNRT (2020) from 4 Hudson river pools (Thompson Island, Fort Miller, Northumberland, Stillwater) in before-remediation and non-remediated strata (BR and NR, respectively) by 10 mm size classes. NA = not applicable; SD = standard deviation.

| Size Class* | | Internal Growth Annuli | | | |
|--------------------|----------|---------------------------------------|--------|------|-----|
| Mussel Length (mm) | <i>n</i> | Minimum - Maximum Annuli Ages (years) | Median | Mean | SD |
| 0-<10 | 0 | NA | NA | NA | NA |
| 10-<20 | 2 | 1 | 1 | 1 | 0 |
| 20-<30 | 24 | 1-2 | 1 | 1.2 | 0.4 |
| 30-<40 | 23 | 1-3 | 2 | 1.7 | 0.8 |
| 40-<50 | 33 | 2-17 | 5 | 5.6 | 3.4 |
| 50-<60 | 73 | 3-22 | 7 | 8.0 | 4.2 |
| 60-<70 | 136 | 4-26 | 12 | 12.6 | 4.3 |
| 70-<80 | 143 | 6-33 | 17 | 17.4 | 4.5 |
| 80-<90 | 104 | 9-35 | 20 | 21.3 | 5.2 |
| 90-<100 | 39 | 16-32 | 24 | 24.2 | 4.1 |
| 100-<110 | 10 | 20-37 | 29 | 28.8 | 5.6 |
| 110-<120 | 2 | 20-39 | 37.5 | 37.5 | 2.1 |

* As reported in Appendix A1, excluding 3 shells from Thompson Island that were too thick to accurately count the growth annuli and 8 shells from Stillwater Pool with no growth annuli.

Table 9 Internal ages of *Elliptio complanata* (n = 589) collected by HRNRT (2020) from 4 Hudson river pools (Thompson Island, Fort Miller, Northumberland, Stillwater) in before-remediation and non-remediated strata (BR and NR, respectively) by 5 mm size classes. NA = not applicable; SD = standard deviation.

| Size Class* | | Internal Growth Annuli | | | |
|-----------------------|----|---|--------|----------|-----|
| Mussel Length (mm) | n | Minimum - Maximum Annuli Ages (years) | Median | Mean Age | SD |
| 0-<10 | 0 | NA | NA | NA | NA |
| 10-<15 | 0 | NA | NA | NA | NA |
| 15-<20 | 2 | 1 | 1 | 1 | 0 |
| 20-<25 | 8 | 1 | 1 | 1 | 0 |
| 25-<30 | 16 | 1-2 | 1 | 1.3 | 0.4 |
| 30-<35 | 8 | 1-3 | 1.5 | 1.8 | 0.9 |
| 35-<40 | 15 | 1-3 | 2 | 1.7 | 0.8 |
| 40-<45 | 15 | 2-11 | 5 | 5.3 | 2.8 |
| 45-<50 | 18 | 2-17 | 5 | 5.9 | 3.9 |
| 50-<55 | 33 | 3-22 | 6 | 6.5 | 3.9 |
| 55-<60 | 40 | 4-19 | 8 | 9.3 | 4.1 |
| 60-<65 | 59 | 5-22 | 11 | 10.9 | 3.8 |
| 65-<70 | 77 | 4-26 | 13 | 13.9 | 4.3 |
| 70-<75 | 70 | 6-33 | 16 | 16.2 | 4.5 |
| 75-<80 | 73 | 6-29 | 18 | 18.5 | 4.3 |
| 80-<85 | 65 | 9-30 | 20 | 20.5 | 4.7 |
| 85-<90 | 39 | 13-35 | 20 | 22.6 | 5.7 |
| 90-<95 | 23 | 16-31 | 23 | 23.8 | 4.1 |
| 95-<100 | 16 | 16-32 | 25 | 24.6 | 4.2 |
| 100-<105 | 6 | 20-37 | 25 | 26.3 | 6.0 |
| 105-<110 | 4 | 30-34 | 33 | 32.5 | 1.7 |
| 110-<115 | 2 | 36-39 | 37.5 | 37.5 | 2.1 |

* As reported in Appendix A1, excluding 3 shells from Thompson Island that were too thick to accurately count the growth annuli and 8 shells from Stillwater Pool with no growth annuli.

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FIGURES

Figure 1

Map of Hudson River pools ($n=6$) where thin-sectioned shells of *Elliptio complanata* were selected for this study including strata before-remediation (BR) and non-remediated (NR). Pools include the Fort Miller Pool (River Section 2, Reach 7; FMP; BR and NR), Stillwater Pool (River Section 3, Reach 5; SWP; BR and NR), Northumberland Pool (River Section 2, Reach 6; NUP; NR), and Thompson Island Pool (River Section 1, Reach 8; TIP; NR). Map copied from HRNRT (2014b). Shells used in this study were selected randomly and non-randomly from total shells collected by HRNRT 2020 in 2013 and 2015 from Hudson River pools.

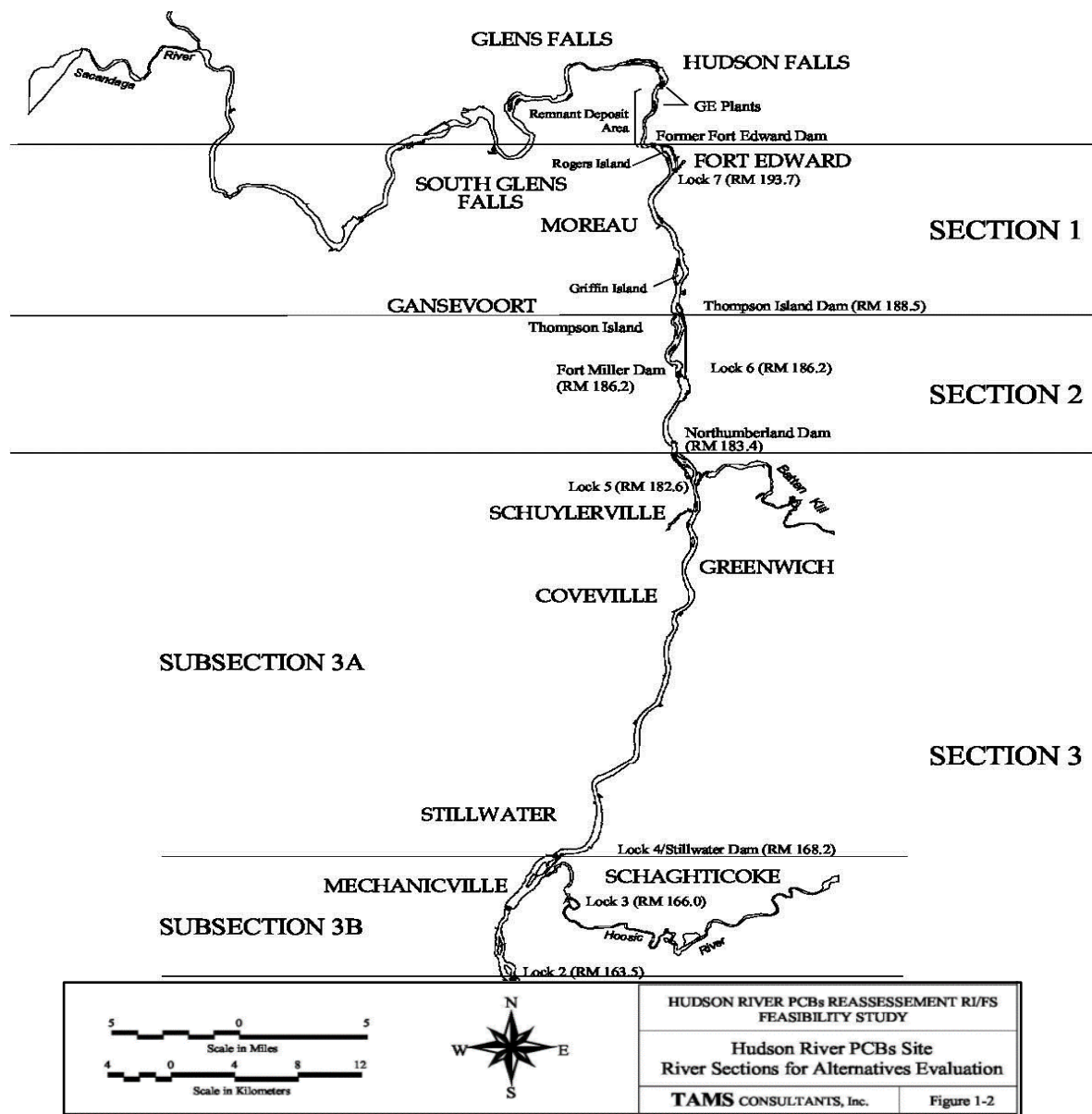


Figure 2

Age frequency histograms of randomly selected *Elliptio complanata* from total shells collected by HRNRT 2020 in 2013 and 2015 at 2 Hudson River pools (sites) in before-remediation and non-remediated strata. Pools included Fort Miller Pool (River Section 2, Reach 7; FMP) and Stillwater Pool (River Section 3, Reach 5; SWP).

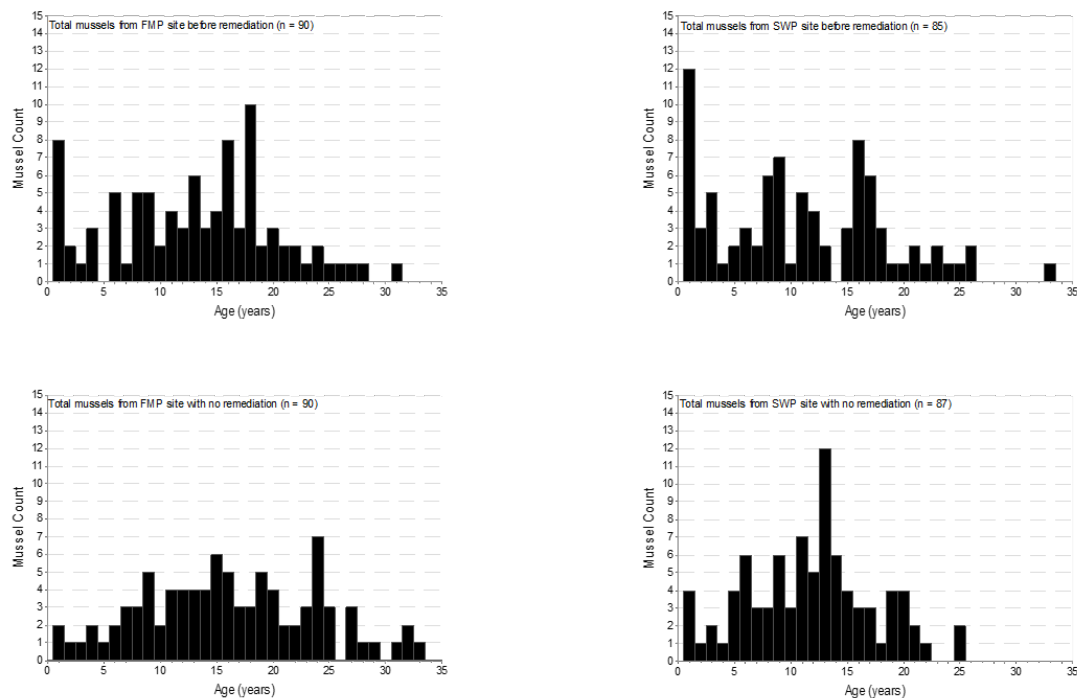


Figure 3

Age frequency histograms of randomly selected *Elliptio complanata* from total shells collected by HRNRT 2020 in 2013 and 2015 at 4 Hudson River pools in non-remediated strata. Pools included Thompson Island Pool (River Section 1, Reach 8; TIP), Fort Miller Pool (River Section 2, Reach 7; FMP), Northumberland Pool (River Section 2, Reach 6; NUP), and Stillwater Pool (River Section 3, Reach 5; SWP).

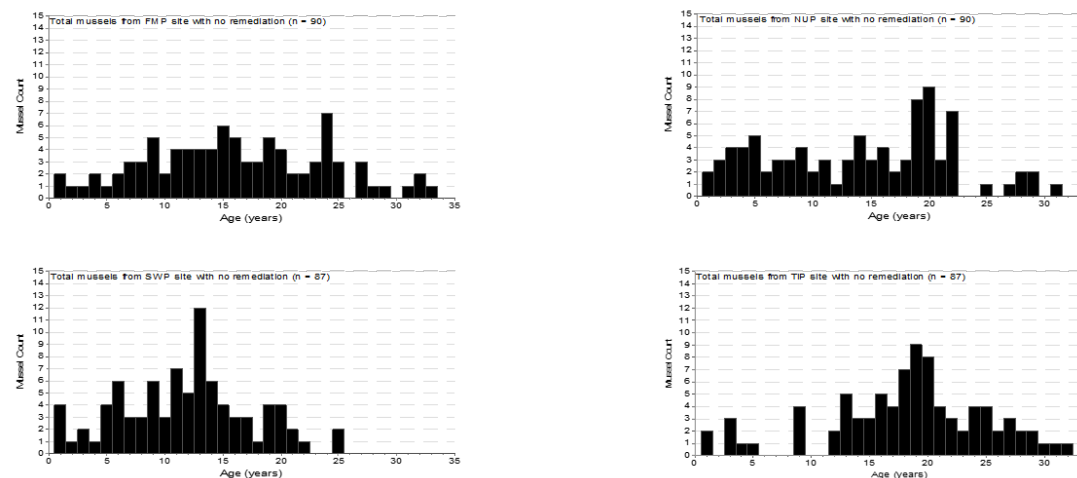


Figure 4

Estimated von Bertalanffy growth curve of predicted mean length-at-age (solid line) with 95% confidence intervals (dashed lines) for *Elliptio complanata* ($n = 589$) thin-sectioned from all four pools in the Hudson River before-remediation (BR) and non-remediated (NR). Data included lengths (mm) and ages (years) from mussels selected randomly and non-randomly from total shells collected by HRNRT 2020 in 2013 and 2015. Observed length-at-age is shown by dots. L_t is the mean length (mm) at age t , L_∞ (L-infinity, mm) is a theoretical maximum (asymptotic) mean length, K is a growth coefficient indicating how quickly L_∞ is approached, t is age (years), t_0 is the age (years) when length would theoretically be equal to zero, and e is the natural log exponent. Pools include the Fort Miller Pool (River Section 2, Reach 7; FMP; BR and NR), Stillwater Pool (River Section 3, Reach 5; SWP; BR and NR), Northumberland Pool (River Section 2, Reach 6; NUP; NR), and Thompson Island Pool (River Section 1, Reach 8; TIP; NR).

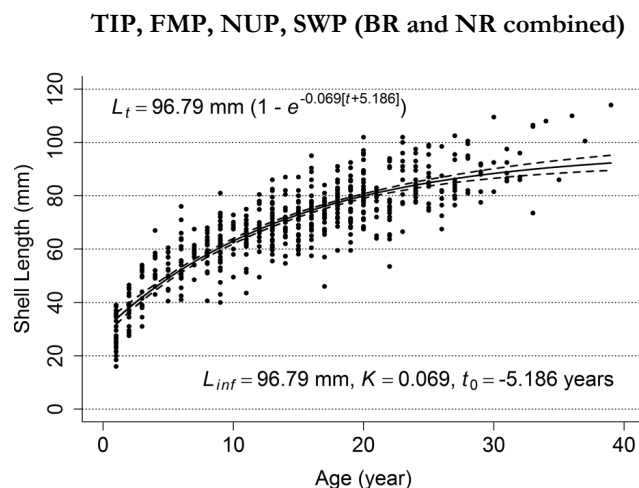


Figure 5

Estimated von Bertalanffy growth curve of predicted mean length-at-age (line) with 95% confidence intervals (dashed lines) for *Elliptio complanata* (n = 100) in the Hudson River from the Fort Miller Pool (FMP; River Section 2, Reach 7) before-remediation (BR). Data included lengths (mm) and ages (years) from mussels selected randomly and non-randomly from total shells collected by HRNRT 2020 in 2013 and 2015. Observed length-at-age is shown by dots. L_t is the mean length (mm) at age t , L_∞ (L-infinity, mm) is a theoretical maximum (asymptotic) mean length, K is a growth coefficient indicating how quickly L_∞ is approached, t is age (years), t_0 is the age (years) when length would theoretically be equal to zero, and e is the natural log exponent.

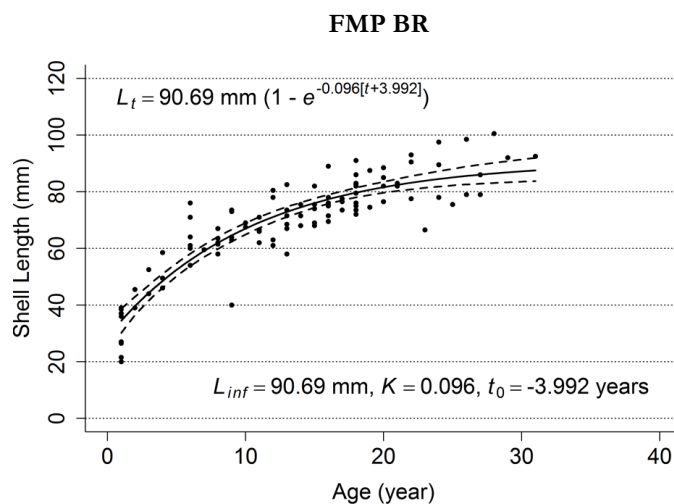


Figure 6

Estimated von Bertalanffy growth curve of predicted mean length-at-age (line) with 95% confidence intervals (dashed lines) for *Elliptio complanata* (n = 100) in the Hudson River selected from the Fort Miller Pool (FMP; River Section 2, Reach 7) non-remediated (NR). Data included lengths (mm) and ages (years) from mussels selected randomly and non-randomly from total shells collected by HRNRT 2020 in 2013 and 2015. Observed length-at-age is shown by dots. L_t is the mean length (mm) at age t , L_∞ (L-infinity, mm) is a theoretical maximum (asymptotic) mean length, K is a growth coefficient indicating how quickly L_∞ is approached, t is age (years), t_0 is the age (years) when length would theoretically be equal to zero, and e is the natural log exponent.

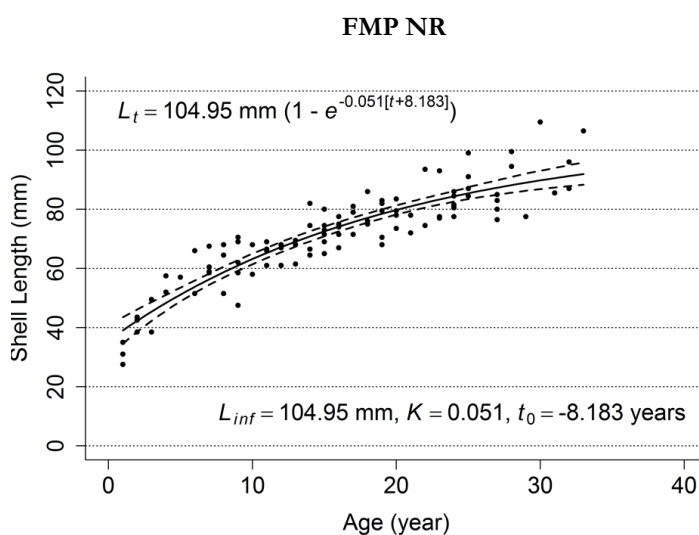


Figure 7

Estimated von Bertalanffy growth curve of predicted mean length-at-age (line) with 95% confidence intervals (dashed lines) for *Elliptio complanata* (n = 95) in the Hudson River selected from the Stillwater Pool (SWP; River Section 3, Reach 5) before-remediation (BR). Data included lengths (mm) and ages (years) from mussels selected randomly and non-randomly from total shells collected by HRNRT 2020 in 2013 and 2015. Observed length-at-age is shown by dots. L_t is the mean length (mm) at age t , L_∞ (L-infinity, mm) is a theoretical maximum (asymptotic) mean length, K is a growth coefficient indicating how quickly L_∞ is approached, t is age (years), t_0 is the age (years) when length would theoretically be equal to zero, and e is the natural log exponent.

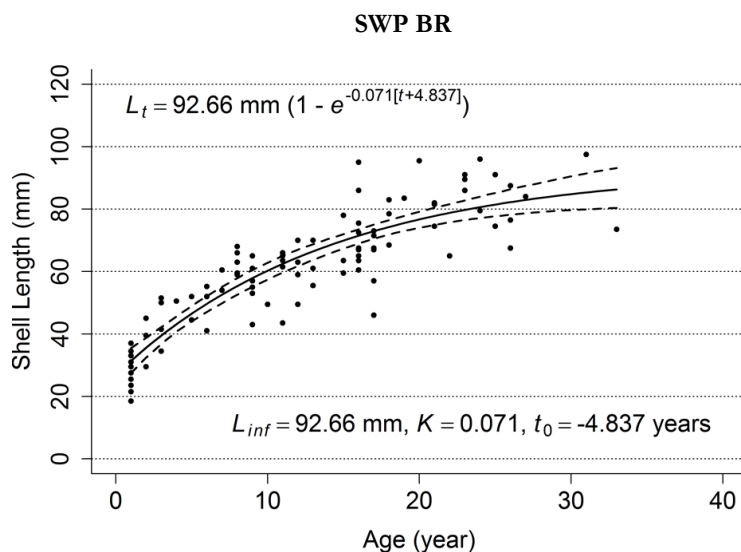


Figure 8

Estimated von Bertalanffy growth curve of predicted mean length-at-age (line) with 95% confidence intervals (dashed lines) for *Elliptio complanata* (n = 97) in the Hudson River selected from the Stillwater Pool (SWP; River Section 3, Reach 5) non-remediated (NR). Data included lengths (mm) and ages (years) from mussels selected randomly and non-randomly from total shells collected by HRNRT 2020 in 2013 and 2015. Observed length-at-age is shown by dots. L_t is the mean length (mm) at age t , L_∞ (L-infinity, mm) is a theoretical maximum (asymptotic) mean length, K is a growth coefficient indicating how quickly L_∞ is approached, t is age (years), t_0 is the age (years) when length would theoretically be equal to zero, and e is the natural log exponent.

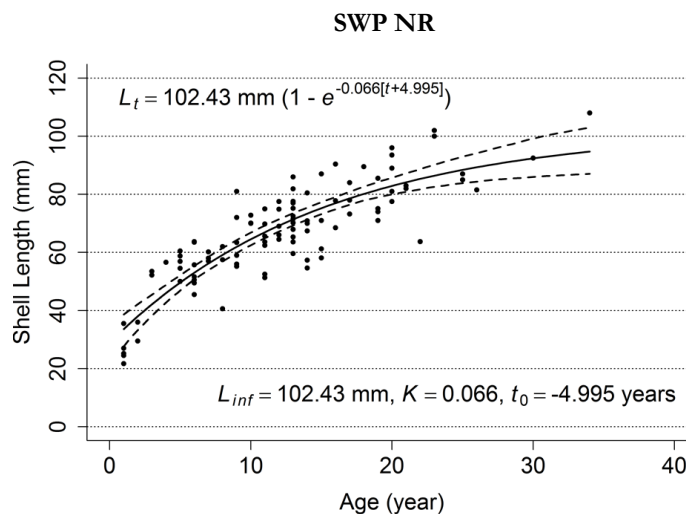


Figure 9

Estimated von Bertalanffy growth curve of predicted mean length-at-age (line) with 95% confidence intervals (dashed lines) for *Elliptio complanata* (n = 97) in the Hudson River selected from the Thompson Island Pool (TIP; River Section 1, Reach 8) non-remediated (NR). Data included lengths (mm) and ages (years) from mussels selected randomly and non-randomly from total shells collected by HRNRT 2020 in 2013 and 2015. Observed length-at-age is shown by dots. L_t is the mean length (mm) at age t , L_∞ (L-infinity, mm) is a theoretical maximum (asymptotic) mean length, K is a growth coefficient indicating how quickly L_∞ is approached, t is age (years), t_0 is the age (years) when length would theoretically be equal to zero, and e is the natural log exponent.

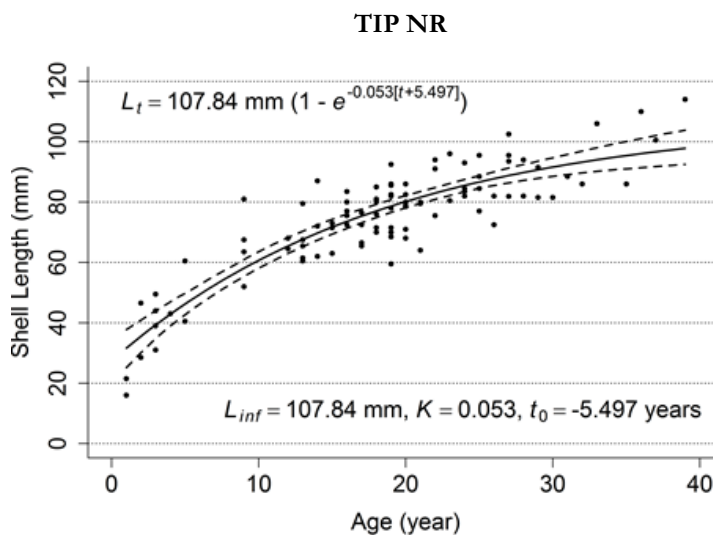
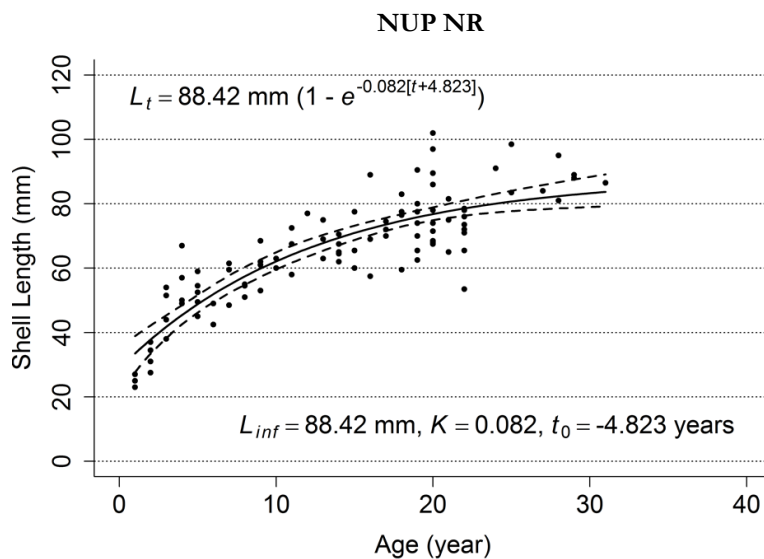


Figure 10

Estimated von Bertalanffy growth curve of predicted mean length-at-age (line) with 95% confidence intervals (dashed lines) for *Elliptio complanata* ($n = 100$) in the Hudson River selected from the Northumberland Pool (NUP; River Section 2, Reach 6) non-remediated (NR). Data included lengths (mm) and ages (years) from mussels selected randomly and non-randomly from total shells collected by HRNRT 2020 in 2013 and 2015. Observed length-at-age is shown by dots. L_t is the mean length (mm) at age t , L_∞ (L-infinity, mm) is a theoretical maximum (asymptotic) mean length, K is a growth coefficient indicating how quickly L_∞ is approached, t is age (years), t_0 is the age (years) when length would theoretically be equal to zero, and e is the natural log exponent.



Appendices

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Appendix A1 Mussel Shell Dimensions and Ages

This appendix contains data from thin-sectioned mussel shells used in this study from Hudson River pools and strata within pools. Shells used in this study were randomly and non-randomly selected from total shells collected from Hudson River pools by HRNRT 2020 in 2013 and 2015 from remediation strata [before-remediation (BR) and non-remediated (NR)]. Pools include the Fort Miller Pool (River Section 2, Reach 7; FMP; BR and NR), Stillwater Pool (River Section 3, Reach 5; SWP; BR and NR), Northumberland Pool (River Section 2, Reach 6; NUP; NR), and Thompson Island Pool (River Section 1, Reach 8; TIP; NR).

Internal annuli ages were determined by counting shell annuli in thin-sectioned shells using a dissecting microscope. The table indicates which records were used in age structure analyses, including the length-age histograms (Appendix A2) and age class structure information (Appendix A3). The table also indicates which records were used to create the von Bertalanffy length-age growth curves (Appendix A4) and for statistical analyses of von Bertalanffy parameters (Appendix A5). This table is split into two parts to facilitate presentation.

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|--------------------|-------------------|-------------------|----------|------------------|
| 00200 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 19 | Before-Remediation | 66.0 | 37.5 | 10 | 7/25/2018 |
| 00212 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 32 | Before-Remediation | 67.0 | 37.5 | 8 | 7/25/2018 |
| 00215 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 32 | Before-Remediation | 21.5 | 11 | 1 | 7/25/2018 |
| 00229 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 97 | Before-Remediation | 82.0 | 47 | 22 | 7/25/2018 |
| 00234 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 62 | Before-Remediation | 92.5 | 49 | 33 | 7/25/2018 |
| 00247 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 30 | Before-Remediation | 69.5 | 37.5 | 16 | 7/25/2018 |
| 00257 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 65 | Before-Remediation | 64.0 | 35.5 | 11 | 7/25/2018 |
| 00278 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 66 | Before-Remediation | 71.5 | 40 | 14 | 7/25/2018 |
| 00282 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 73 | Before-Remediation | 91.0 | 49.5 | 18 | 7/25/2018 |
| 00311 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 22 | Before-Remediation | 64.0 | 37.5 | 6 | 7/25/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|--------------------|-------------------|-------------------|----------|------------------|
| 00317 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 25 | Before-Remediation | 44.0 | 23 | 2 | 7/25/2018 |
| 00318 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 25 | Before-Remediation | 61.0 | 35 | 6 | 7/25/2018 |
| 00331 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 44 | Before-Remediation | 37.0 | 19 | 1 | 7/25/2018 |
| 00332 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 44 | Before-Remediation | 36.0 | 19 | 1 | 7/25/2018 |
| 00333 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 44 | Before-Remediation | 67.0 | 36 | 14 | 7/25/2018 |
| 00337 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 45 | Before-Remediation | 46.0 | 24.5 | 5 | 7/25/2018 |
| 00339 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 85 | Before-Remediation | 77.5 | 42 | 16 | 7/25/2018 |
| 00343 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 125 | Before-Remediation | 39.0 | 19.5 | 1 | 7/25/2018 |
| 00346 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 127 | Before-Remediation | 67.5 | 37 | 11 | 7/25/2018 |
| 00347 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 127 | Before-Remediation | 73.5 | 39.5 | 9 | 7/25/2018 |
| 00353 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 131 | Before-Remediation | 74.5 | 41 | 19 | 7/25/2018 |
| 00361 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 128 | Before-Remediation | 38.5 | 21 | 1 | 7/25/2018 |
| 00369 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 29 | Before-Remediation | 87.5 | 48 | 19 | 7/25/2018 |
| 00373 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 46 | Before-Remediation | 61.0 | 34 | 12 | 7/25/2018 |
| 00374 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 46 | Before-Remediation | 66.5 | 38 | 25 | 7/25/2018 |
| 00376 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 46 | Before-Remediation | 73.5 | 40.5 | 19 | 7/25/2018 |
| 00377 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 46 | Before-Remediation | 75.5 | 42 | 17 | 7/25/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|--------------------|-------------------|-------------------|----------|------------------|
| 00392 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 138 | Before-Remediation | 39.0 | 20 | 1 | 7/25/2018 |
| 00411 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 141 | Before-Remediation | 59.5 | 33.5 | 7 | 7/25/2018 |
| 00412 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 141 | Before-Remediation | 58.0 | 31 | 13 | 7/25/2018 |
| 00414 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 141 | Before-Remediation | 78.0 | 38 | 17 | 7/25/2018 |
| 00420 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 149 | Before-Remediation | 78.0 | 40.5 | 23 | 7/25/2018 |
| 00421 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 146 | Before-Remediation | 69.0 | 37.5 | 15 | 7/25/2018 |
| 00422 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 146 | Before-Remediation | 60.0 | 30.5 | 5 | 7/25/2018 |
| 00423 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 99 | Before-Remediation | 89.0 | 47.5 | 15 | 7/25/2018 |
| 00424 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 99 | Before-Remediation | 69.0 | 38.5 | 10 | 7/25/2018 |
| 00425 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 99 | Before-Remediation | 27.0 | 14 | 1 | 7/25/2018 |
| 00426 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 99 | Before-Remediation | 49.5 | 21 | 4 | 7/25/2018 |
| 00432 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 101 | Before-Remediation | 77.5 | 43.5 | 22 | 7/25/2018 |
| 00447 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 113 | Before-Remediation | 76.5 | 42 | 18 | 7/25/2018 |
| 00483 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 14 | Before-Remediation | 71.0 | 39.5 | 6 | 7/25/2018 |
| 00484 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 14 | Before-Remediation | 73.0 | 40.5 | 8 | 7/25/2018 |
| 00487 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 14 | Before-Remediation | 82.5 | 46 | 13 | 7/25/2018 |
| 00509 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 25 | Before-Remediation | 58.0 | 31 | 8 | 7/25/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|--------------------|-------------------|-------------------|----------|------------------|
| 00511 | FMP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 25 | Before-Remediation | 62.0 | 33.5 | 8 | 7/25/2018 |
| 00512 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 25 | Before-Remediation | 75.0 | 41.5 | 16 | 7/26/2018 |
| 00513 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 25 | Before-Remediation | 76.0 | 41.5 | 18 | 7/26/2018 |
| 00516 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 25 | Before-Remediation | 66.5 | 36.5 | 13 | 7/26/2018 |
| 00520 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 25 | Before-Remediation | 71.5 | 39 | 13 | 7/26/2018 |
| 00522 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 25 | Before-Remediation | 75.0 | 40.5 | 18 | 7/26/2018 |
| 00524 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 25 | Before-Remediation | 83.0 | 44 | 17 | 7/26/2018 |
| 00525 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 25 | Before-Remediation | 76.0 | 39.5 | 14 | 7/26/2018 |
| 00526 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 25 | Before-Remediation | 74.0 | 41.5 | 15 | 7/26/2018 |
| 00540 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 44 | Before-Remediation | 72.0 | 41 | 18 | 7/26/2018 |
| 00543 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 44 | Before-Remediation | 78.0 | 43 | 12 | 7/26/2018 |
| 00546 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 61.5 | 33.5 | 9 | 7/26/2018 |
| 00550 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 86.0 | 45.5 | 18 | 7/26/2018 |
| 00564 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 82.5 | 46 | 19 | 7/26/2018 |
| 00568 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 83.0 | 44.5 | 23 | 7/26/2018 |
| 00575 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 68.5 | 37 | 15 | 7/26/2018 |
| 00577 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 73.5 | 41.5 | 17 | 7/26/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|--------------------|-------------------|-------------------|----------|------------------|
| 00584 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 85.0 | 46 | 22 | 7/26/2018 |
| 00587 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 90.5 | 47 | 20 | 7/26/2018 |
| 00589 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 100.5 | 53.5 | 25 | 7/26/2018 |
| 00591 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 63.5 | 34 | 10 | 7/26/2018 |
| 00594 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 71.5 | 38.5 | 16 | 7/26/2018 |
| 00597 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 73.5 | 40 | 13 | 7/26/2018 |
| 00599 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 79.0 | 43 | 24 | 7/26/2018 |
| 00601 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 79.0 | 43.5 | 26 | 7/26/2018 |
| 00605 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 58.5 | 32.5 | 4 | 7/26/2018 |
| 00609 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 71.0 | 39.5 | 9 | 7/26/2018 |
| 00613 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 75.5 | 40.5 | 29 | 7/31/2018 |
| 00614 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 75.5 | 41.5 | 12 | 7/26/2018 |
| 00617 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 76.0 | 40.5 | 6 | 7/26/2018 |
| 00620 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 89.5 | 48 | 22 | 7/26/2018 |
| 00621 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 79.5 | 41 | 18 | 7/26/2018 |
| 00622 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 82.0 | 46 | 20 | 7/26/2018 |
| EC101 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 25 | Before-Remediation | 62.0 | 34 | 11 | 7/26/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|--------------------|-------------------|-------------------|----------|------------------|
| EC22 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 89 | Before-Remediation | 63.0 | 37 | 9 | 7/26/2018 |
| EC29 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 78 | Before-Remediation | 68.0 | 37.5 | 15 | 7/26/2018 |
| EC36 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 66 | Before-Remediation | 75.5 | 43 | 15 | 7/26/2018 |
| EC37 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 66 | Before-Remediation | 76.0 | 42.5 | 16 | 7/26/2018 |
| EC38 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 66 | Before-Remediation | 68.0 | 39 | 14 | 7/26/2018 |
| EC54 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 12 | Before-Remediation | 82.0 | 46.5 | 16 | 7/26/2018 |
| EC69 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 36 | Before-Remediation | 76.5 | 43 | 18 | 7/26/2018 |
| EC75 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 40 | Before-Remediation | 63.0 | 35.5 | 10 | 7/26/2018 |
| EC76 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 40 | Before-Remediation | 40.0 | 22.5 | 11 | 7/26/2018 |
| EC87 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 44 | Before-Remediation | 20.0 | 11.5 | 1 | 7/26/2018 |
| EC90 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 45 | Before-Remediation | 45.5 | 25 | 1 | 7/26/2018 |
| EC96 | FMP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 22 | Before-Remediation | 26.5 | 14 | 1 | 7/26/2018 |
| 00206 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 37 | Non-remediated | 80.0 | 44 | 15 | 7/26/2018 |
| 00207 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 42 | Non-remediated | 68.0 | 31.5 | 12 | 7/26/2018 |
| 00209 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 17 | Non-remediated | 58.0 | 32.5 | 10 | 7/26/2018 |
| 00210 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 17 | Non-remediated | 31.0 | 16 | 1 | 7/26/2018 |
| 00218 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 116 | Non-remediated | 75.0 | 41 | 18 | 7/26/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| 00219 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 116 | Non-remediated | 64.5 | 35 | 13 | 7/26/2018 |
| 00222 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 94 | Non-remediated | 67.0 | 36.5 | 15 | 7/26/2018 |
| 00223 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 94 | Non-remediated | 93.0 | 49.5 | 21 | 7/26/2018 |
| 00224 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 94 | Non-remediated | 58.5 | 33.5 | 9 | 7/26/2018 |
| 00227 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 110 | Non-remediated | 70.5 | 39 | 9 | 7/26/2018 |
| 00232 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 104 | Non-remediated | 61.5 | 35 | 12 | 7/26/2018 |
| 00233 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 104 | Non-remediated | 61.0 | 32.5 | 11 | 7/26/2018 |
| 00235 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 57 | Non-remediated | 71.5 | 39.5 | 17 | 7/26/2018 |
| 00237 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 57 | Non-remediated | 35.0 | 18.5 | 1 | 7/26/2018 |
| 00241 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 93 | Non-remediated | 62.0 | 35 | 10 | 7/26/2018 |
| 00243 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 93 | Non-remediated | 57.0 | 31 | 5 | 7/26/2018 |
| 00261 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 56 | Non-remediated | 38.5 | 25 | 2 | 7/26/2018 |
| 00269 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 185 | Non-remediated | 77.5 | 38.5 | 22 | 7/26/2018 |
| 00270 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 185 | Non-remediated | 68.0 | 38 | 18 | 7/26/2018 |
| 00274 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 193 | Non-remediated | 66.5 | 36 | 14 | 7/26/2018 |
| 00276 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 193 | Non-remediated | 83.0 | 42.5 | 28 | 7/26/2018 |
| 00286 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 82 | Non-remediated | 47.5 | 25.5 | 11 | 7/26/2018 |

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Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| 00290 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 84 | Non-remediated | 66.0 | 38 | 12 | 7/26/2018 |
| 00308 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 21 | Non-remediated | 68.0 | 38.5 | 12 | 7/26/2018 |
| 00313 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 23 | Non-remediated | 51.5 | 28.5 | 7 | 7/26/2018 |
| 00380 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 123 | Non-remediated | 83.0 | 42 | 19 | 7/26/2018 |
| 00381 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 121 | Non-remediated | 66.0 | 36.5 | 6 | 7/26/2018 |
| 00383 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 121 | Non-remediated | 75.0 | 39 | 17 | 7/26/2018 |
| 00397 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 96 | Non-remediated | 67.5 | 37 | 7 | 7/26/2018 |
| 00398 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 98 | Non-remediated | 69.0 | 39.5 | 15 | 7/26/2018 |
| 00402 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 98 | Non-remediated | 68.0 | 38.5 | 14 | 7/26/2018 |
| 00403 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 98 | Non-remediated | 71.5 | 40 | 17 | 7/26/2018 |
| 00404 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 147 | Non-remediated | 64.5 | 36 | 7 | 7/26/2018 |
| 00405 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 147 | Non-remediated | 74.5 | 40.5 | 14 | 7/26/2018 |
| 00429 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 102 | Non-remediated | 68.0 | 37 | 8 | 7/26/2018 |
| 00431 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 102 | Non-remediated | 38.5 | 20.5 | 3 | 7/26/2018 |
| 00434 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 105 | Non-remediated | 57.5 | 31 | 4 | 7/26/2018 |
| 00436 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 105 | Non-remediated | 69.0 | 38 | 8 | 7/26/2018 |
| 00442 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 109 | Non-remediated | 67.0 | 39.5 | 12 | 7/26/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| 00444 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 112 | Non-remediated | 106.5 | 57 | 33 | 7/26/2018 |
| 00445 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 112 | Non-remediated | 58.5 | 31.5 | 7 | 7/26/2018 |
| 00450 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 9 | Non-remediated | 65.0 | 36 | 15 | 7/26/2018 |
| 00451 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 9 | Non-remediated | 59.0 | 32.5 | 6 | 7/26/2018 |
| 00453 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 9 | Non-remediated | 69.0 | 38.5 | 11 | 7/26/2018 |
| 00454 | FMP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | FMP | 9 | Non-remediated | 82.0 | 42 | 12 | 7/26/2018 |
| 00455 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 9 | Non-remediated | 80.5 | 42 | 24 | 7/27/2018 |
| 00457 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 9 | Non-remediated | 84.5 | 44.5 | 25 | 7/27/2018 |
| 00461 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 9 | Non-remediated | 91.0 | 42.5 | 27 | 7/27/2018 |
| 00462 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 13 | Non-remediated | 70.5 | 39.5 | 19 | 7/27/2018 |
| 00463 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 13 | Non-remediated | 74.5 | 43 | 22 | 7/27/2018 |
| 00464 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 13 | Non-remediated | 68.0 | 38 | 12 | 7/27/2018 |
| 00465 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 13 | Non-remediated | 76.5 | 41 | 29 | 7/27/2018 |
| 00467 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 13 | Non-remediated | 81.0 | 41 | 18 | 7/27/2018 |
| 00468 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 13 | Non-remediated | 79.0 | 42 | 17 | 7/27/2018 |
| 00469 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 13 | Non-remediated | 77.0 | 42.5 | 27 | 7/27/2018 |
| 00470 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 13 | Non-remediated | 77.5 | 43.5 | 31 | 7/27/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| 00471 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 13 | Non-remediated | 87.0 | 48 | 29 | 7/27/2018 |
| 00474 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 13 | Non-remediated | 85.0 | 46 | 28 | 7/27/2018 |
| 00475 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 13 | Non-remediated | 81.0 | 44.5 | 26 | 7/27/2018 |
| 00493 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 16 | Non-remediated | 73.5 | 38.5 | 23 | 7/27/2018 |
| 00494 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 16 | Non-remediated | 83.5 | 47.5 | 21 | 7/27/2018 |
| 00499 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 23 | Non-remediated | 74.5 | 39.5 | 15 | 7/27/2018 |
| 00500 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 23 | Non-remediated | 78.0 | 44 | 22 | 7/27/2018 |
| 00501 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 23 | Non-remediated | 77.5 | 44 | 27 | 7/27/2018 |
| 00505 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 23 | Non-remediated | 84.5 | 46 | 26 | 7/27/2018 |
| 00535 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 34 | Non-remediated | 79.5 | 43 | 21 | 7/27/2018 |
| 00536 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 34 | Non-remediated | 78.0 | 44 | 21 | 7/27/2018 |
| EC105 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 34 | Non-remediated | 94.5 | 49.5 | 27 | 7/27/2018 |
| EC107 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 34 | Non-remediated | 74.0 | 38 | 17 | 7/27/2018 |
| EC110 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 176 | Non-remediated | 86.0 | 45 | 19 | 7/27/2018 |
| EC112 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 176 | Non-remediated | 51.5 | 28.5 | 8 | 7/27/2018 |
| EC113 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 193 | Non-remediated | 82.0 | 41 | 19 | 7/27/2018 |
| EC116 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 185 | Non-remediated | 96.0 | 51.5 | 33 | 7/27/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| EC117 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 185 | Non-remediated | 72.0 | 40 | 21 | 7/27/2018 |
| EC34 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 87 | Non-remediated | 66.5 | 36 | 10 | 7/27/2018 |
| EC44 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 84 | Non-remediated | 77.5 | 42.5 | 15 | 7/27/2018 |
| EC47 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 9 | Non-remediated | 86.0 | 45 | 25 | 7/27/2018 |
| EC48 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 9 | Non-remediated | 71.5 | 40 | 16 | 7/27/2018 |
| EC50 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 10 | Non-remediated | 85.5 | 41 | 30 | 7/27/2018 |
| EC51 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 10 | Non-remediated | 87.0 | 45 | 36 | 7/27/2018 |
| EC52 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 10 | Non-remediated | 69.5 | 41.5 | 13 | 7/27/2018 |
| EC58 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 13 | Non-remediated | 93.5 | 49.5 | 23 | 7/27/2018 |
| EC59 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 13 | Non-remediated | 73.0 | 41 | 14 | 7/27/2018 |
| EC65 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 21 | Non-remediated | 77.5 | 43 | 27 | 7/27/2018 |
| EC66 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 21 | Non-remediated | 52.0 | 27.5 | 3 | 7/27/2018 |
| EC71 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 39 | Non-remediated | 79.5 | 43.5 | 19 | 7/27/2018 |
| EC77 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 41 | Non-remediated | 68.0 | 38 | 10 | 7/27/2018 |
| EC78 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 41 | Non-remediated | 61.0 | 34 | 14 | 7/27/2018 |
| EC79 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 43 | Non-remediated | 81.5 | 45 | 25 | 7/27/2018 |
| EC80 | FMP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | FMP | 43 | Non-remediated | 76.0 | 41 | 18 | 7/27/2018 |

FRESHWATER MUSSEL SHELL THIN-SECTION ANALYSES FOR THE HUDSON RIVER NRDA

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FRESHWATER MUSSEL SHELL THIN-SECTION ANALYSES FOR THE HUDSON RIVER NRDA

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|------------------|----------------------------|------------|------------|------|-----------------|--------------------|-------------------|-------------------|----------|------------------|
| 03014 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | TIP | 577 | Non-remediated | 28.5 | 14.5 | 1 | 7/30/2018 |
| 03020 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | TIP | 577 | Non-remediated | 46.5 | 23 | 2 | 7/30/2018 |
| 03021 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | TIP | 577 | Non-remediated | 60.5 | 33 | 5 | 7/30/2018 |
| 03126 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | TIP | 672 | Non-remediated | 106.0 | 52 | 32 | 7/30/2018 |
| 03134 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | TIP | 680 | Non-remediated | 100.5 | 51 | 37 | 7/31/2018 |
| 03194 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | TIP | 735 | Non-remediated | 114.0 | 60.5 | 44 | 7/30/2018 |
| 1058 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | SWP | 233 | Non-remediated | 27.0 | 14.5 | 1 | 7/30/2018 |
| 1072 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | SWP | 234 | Before-Remediation | 86.0 | 48 | 22 | 7/30/2018 |
| 1180 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | SWP | 324 | Non-remediated | 81.5 | 45.5 | 32 | 7/30/2018 |
| 1190 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | SWP | 334 | Before-Remediation | 86.0 | 44.5 | 16 | 7/30/2018 |
| 1221 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | SWP | 345 | Non-remediated | 96.0 | 48 | 19 | 7/30/2018 |
| 1281 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | SWP | 346 | Non-remediated | 92.5 | 49 | 27 | 7/30/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|------------------|----------------------------|------------|------------|------|-----------------|--------------------|-------------------|-------------------|----------|------------------|
| 1335 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | SWP | 262 | Before-Remediation | 59.5 | 31 | 15 | 7/30/2018 |
| 1363 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | SWP | 273 | Before-Remediation | 74.5 | 42.5 | 19 | 7/30/2018 |
| 1376 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | SWP | 276 | Before-Remediation | 55.5 | 31 | 13 | 7/30/2018 |
| 1390 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | SWP | 290 | Before-Remediation | 96.0 | 55 | 26 | 7/30/2018 |
| 1391 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | SWP | 290 | Before-Remediation | 97.5 | 54.5 | 23 | 7/30/2018 |
| 1458 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | SWP | 304 | Non-remediated | 29.5 | 15.5 | 2 | 7/30/2018 |
| 771 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | SWP | 73 | Non-remediated | 50.0 | 28 | 5 | 7/30/2018 |
| 807 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | SWP | 83 | Non-remediated | 50.5 | 27 | 7 | 7/30/2018 |
| EC160 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | SWP | 111 | Before-Remediation | 84.0 | 45 | 26 | 7/30/2018 |
| EC196 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | SWP | 155 | Before-Remediation | 81.5 | 44 | 21 | 7/30/2018 |
| EC198 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | SWP | 155 | Before-Remediation | 76.5 | 40.5 | 24 | 7/30/2018 |
| EC217 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | SWP | 318 | Non-remediated | 108.0 | 54 | 32 | 7/30/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|------------------|----------------------------|------------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| EC227 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | SWP | 219 | Non-remediated | 102.0 | 55 | 21 | 7/30/2018 |
| EC228 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | SWP | 219 | Non-remediated | 100.0 | 53.5 | 19 | 7/30/2018 |
| EC289 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | TIP | 705 | Non-remediated | 59.5 | 34.5 | 20 | 7/30/2018 |
| EC293 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | TIP | 588 | Non-remediated | 102.5 | 51.5 | 28 | 7/30/2018 |
| EC314 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | TIP | 772 | Non-remediated | 49.5 | 26 | 2 | 7/30/2018 |
| EC333 | NON-RANDOM BOX 1 | <i>Elliptio complanata</i> | Non-random | 1 | TIP | 654 | Non-remediated | 110.0 | 58.5 | 36 | 7/30/2018 |
| 01826 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | NUP | 247 | Non-remediated | 97.0 | 51.5 | 15 | 7/30/2018 |
| 01858 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | NUP | 248 | Non-remediated | 74.5 | 40.5 | 16 | 7/30/2018 |
| 02161 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | NUP | 330 | Non-remediated | 83.0 | 46 | 16 | 7/30/2018 |
| 02286 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | NUP | 342 | Non-remediated | 23.0 | 12.5 | 1 | 7/30/2018 |
| 02372 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | NUP | 436 | Non-remediated | 91.0 | 51.5 | 20 | 7/30/2018 |
| 02504 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | NUP | 359 | Non-remediated | 73.5 | 41.5 | 20 | 7/30/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|------------------|----------------------------|------------|------------|------|-----------------|--------------------|-------------------|-------------------|----------|------------------|
| 02554 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | NUP | 366 | Non-remediated | 81.5 | 44 | 20 | 7/30/2018 |
| 02582 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | NUP | 372 | Non-remediated | 31.0 | 16.5 | 2 | 7/30/2018 |
| 217 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | FMP | 116 | Non-remediated | 80.0 | 44 | 21 | 7/30/2018 |
| 244 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | FMP | 93 | Non-remediated | 42.5 | 22.5 | 2 | 7/30/2018 |
| 264 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | FMP | 176 | Non-remediated | 49.5 | 26.5 | 2 | 7/30/2018 |
| 267 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | FMP | 185 | Non-remediated | 109.5 | 57 | 28 | 7/30/2018 |
| 287 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | FMP | 82 | Non-remediated | 65.0 | 34 | 14 | 7/30/2018 |
| 315 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | FMP | 23 | Non-remediated | 99.0 | 52.5 | 25 | 7/30/2018 |
| 325 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | FMP | 34 | Non-remediated | 43.5 | 23 | 2 | 7/30/2018 |
| 341 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | FMP | 85 | Before-Remediation | 92.0 | 49.5 | 27 | 7/30/2018 |
| 378 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | FMP | 46 | Before-Remediation | 98.5 | 51 | 25 | 7/30/2018 |
| 395 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | FMP | 138 | Before-Remediation | 97.5 | 50 | 20 | 7/30/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|------------------|----------------------------|------------|------------|------|-----------------|--------------------|-------------------|-------------------|----------|------------------|
| 409 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | FMP | 141 | Before-Remediation | 52.5 | 28 | 3 | 7/30/2018 |
| 417 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | FMP | 149 | Before-Remediation | 54.0 | 30.5 | 6 | 7/30/2018 |
| 486 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | FMP | 14 | Before-Remediation | 80.5 | 44.5 | 12 | 7/30/2018 |
| 488 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | FMP | 14 | Before-Remediation | 82.0 | 46 | 15 | 7/30/2018 |
| 532 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | FMP | 25 | Before-Remediation | 86.0 | 44 | 27 | 7/30/2018 |
| EC100 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | FMP | 25 | Before-Remediation | 93.0 | 48.5 | 22 | 7/30/2018 |
| EC124 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | FMP | 15 | Non-remediated | 27.5 | 14 | 1 | 7/30/2018 |
| EC33 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | FMP | 87 | Non-remediated | 99.5 | 49 | 30 | 7/30/2018 |
| EC342 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | NUP | 247 | Non-remediated | 102.0 | 52 | 16 | 7/30/2018 |
| EC391 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | NUP | 426 | Non-remediated | 98.5 | 54.5 | 24 | 7/30/2018 |
| EC60 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | FMP | 13 | Non-remediated | 60.5 | 34 | 4 | 7/30/2018 |
| EC88 | NON-RANDOM BOX 2 | <i>Elliptio complanata</i> | Non-random | 2 | FMP | 45 | Before-Remediation | 88.5 | 48.5 | 18 | 7/30/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| 01688 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 300 | Non-remediated | 69.0 | 39.5 | 14 | 7/27/2018 |
| 01715 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 326 | Non-remediated | 68.5 | 37.5 | 21 | 7/27/2018 |
| 01757 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 246 | Non-remediated | 75.0 | 41.5 | 21 | 7/27/2018 |
| 01771 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 255 | Non-remediated | 89.0 | 46 | 30 | 7/27/2018 |
| 01779 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 247 | Non-remediated | 50.0 | 25.5 | 4 | 7/27/2018 |
| 01783 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 247 | Non-remediated | 53.5 | 30 | 15 | 7/27/2018 |
| 01787 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 247 | Non-remediated | 57.0 | 24 | 3 | 7/27/2018 |
| 01803 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 247 | Non-remediated | 72.5 | 40.5 | 11 | 7/27/2018 |
| 01811 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 247 | Non-remediated | 77.0 | 43.5 | 12 | 7/27/2018 |
| 01818 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 247 | Non-remediated | 77.5 | 42.5 | 15 | 7/27/2018 |
| 01825 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 247 | Non-remediated | 89.0 | 49 | 16 | 7/27/2018 |
| 01832 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 248 | Non-remediated | 49.0 | 25.5 | 4 | 7/27/2018 |
| 01841 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 248 | Non-remediated | 59.5 | 33.5 | 7 | 7/27/2018 |
| 01867 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 248 | Non-remediated | 70.0 | 36.5 | 18 | 7/27/2018 |
| 01883 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 248 | Non-remediated | 88.0 | 48.5 | 26 | 7/27/2018 |
| 01888 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 403 | Non-remediated | 55.0 | 31.5 | 7 | 7/27/2018 |
| 01889 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 403 | Non-remediated | 61.5 | 33.5 | 6 | 7/27/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| 01901 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 404 | Non-remediated | 67.0 | 37 | 4 | 7/27/2018 |
| 01904 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 404 | Non-remediated | 75.0 | 41.5 | 21 | 7/27/2018 |
| 01948 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 453 | Non-remediated | 44.0 | 23.5 | 3 | 7/26/2018 |
| 01949 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 453 | Non-remediated | 57.5 | 30 | 16 | 7/27/2018 |
| 01976 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 471 | Non-remediated | 74.0 | 43 | 18 | 7/27/2018 |
| 01985 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 477 | Non-remediated | 52.5 | 27.5 | 3 | 7/27/2018 |
| 02022 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 481 | Non-remediated | 25.0 | 14 | 1 | 7/27/2018 |
| 02038 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 390 | Non-remediated | 78.0 | 43 | 21 | 7/27/2018 |
| 02063 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 399 | Non-remediated | 37.0 | 20 | 2 | 7/31/2018 |
| 02065 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 399 | Non-remediated | 45.0 | 24.5 | 5 | 7/27/2018 |
| 02072 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 399 | Non-remediated | 51.0 | 29 | 10 | 7/27/2018 |
| 02085 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 399 | Non-remediated | 67.5 | 31.5 | 12 | 7/27/2018 |
| 02096 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 399 | Non-remediated | 76.0 | 43.5 | 22 | 7/27/2018 |
| 02106 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 310 | Non-remediated | 95.0 | 49.5 | 22 | 7/27/2018 |
| 02110 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 311 | Non-remediated | 65.0 | 36.5 | 22 | 7/27/2018 |
| 02120 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 318 | Non-remediated | 63.0 | 34.5 | 14 | 7/27/2018 |
| 02143 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 329 | Non-remediated | 53.0 | 28.5 | 9 | 7/27/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| 02151 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 329 | Non-remediated | 78.5 | 41.5 | 20 | 7/27/2018 |
| 02157 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 330 | Non-remediated | 68.0 | 37.5 | 21 | 7/27/2018 |
| 02164 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 333 | Non-remediated | 80.0 | 41.5 | 17 | 7/27/2018 |
| 02176 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 333 | Non-remediated | 72.0 | 37.5 | 18 | 7/27/2018 |
| 02182 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 333 | Non-remediated | 89.5 | 48 | 22 | 7/27/2018 |
| 02191 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 339 | Non-remediated | 67.5 | 38 | 15 | 7/27/2018 |
| 02203 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 334 | Non-remediated | 58.0 | 33 | 13 | 7/27/2018 |
| 02207 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 334 | Non-remediated | 60.0 | 34 | 14 | 7/27/2018 |
| 02216 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 334 | Non-remediated | 62.5 | 33.5 | 18 | 7/27/2018 |
| 02221 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 334 | Non-remediated | 64.5 | 35 | 13 | 7/31/2018 |
| 02250 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 338 | Non-remediated | 65.0 | 36 | 14 | 7/27/2018 |
| 02270 | NUP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | NUP | 340 | Non-remediated | 62.0 | 34 | 13 | 7/27/2018 |
| 02275 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 340 | Non-remediated | 70.5 | 39 | 14 | 7/30/2018 |
| 02283 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 341 | Non-remediated | 34.5 | 19 | 1 | 7/30/2018 |
| 02285 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 341 | Non-remediated | 78.0 | 41 | 20 | 7/30/2018 |
| 02288 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 342 | Non-remediated | 65.5 | 34 | 24 | 7/30/2018 |
| 02306 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 343 | Non-remediated | 69.0 | 39 | 13 | 7/30/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| 02307 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 343 | Non-remediated | 69.0 | 37 | 16 | 7/30/2018 |
| 02311 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 346 | Non-remediated | 49.5 | 27.5 | 4 | 7/30/2018 |
| 02344 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 430 | Non-remediated | 84.0 | 44.5 | 27 | 7/30/2018 |
| 02345 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 430 | Non-remediated | 86.5 | 47 | 31 | 7/30/2018 |
| 02360 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 431 | Non-remediated | 68.5 | 36.5 | 22 | 7/30/2018 |
| 02368 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 434 | Non-remediated | 60.0 | 33.5 | 10 | 7/30/2018 |
| 02373 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 437 | Non-remediated | 27.0 | 13.5 | 1 | 7/30/2018 |
| 02374 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 437 | Non-remediated | 27.5 | 14.5 | 2 | 7/30/2018 |
| 02390 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 440 | Non-remediated | 61.0 | 34.5 | 10 | 7/30/2018 |
| 02418 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 444 | Non-remediated | 77.5 | 40.5 | 18 | 7/30/2018 |
| 02423 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 451 | Non-remediated | 74.0 | 39.5 | 18 | 7/30/2018 |
| 02450 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 447 | Non-remediated | 71.5 | 37 | 19 | 7/30/2018 |
| 02452 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 447 | Non-remediated | 76.5 | 41 | 18 | 7/31/2018 |
| 02456 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 447 | Non-remediated | 72.0 | 42 | 21 | 7/30/2018 |
| 02464 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 244 | Non-remediated | 75.0 | 42 | 14 | 7/30/2018 |
| 02467 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 244 | Non-remediated | 81.0 | 42.5 | 24 | 7/30/2018 |
| 02469 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 244 | Non-remediated | 90.5 | 48 | 20 | 7/30/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| 02482 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 261 | Non-remediated | 54.5 | 30 | 7 | 7/30/2018 |
| 02495 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 354 | Non-remediated | 68.5 | 38 | 9 | 7/30/2018 |
| 02521 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 364 | Non-remediated | 59.0 | 31 | 5 | 7/30/2018 |
| 02536 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 366 | Non-remediated | 48.5 | 25.5 | 6 | 7/30/2018 |
| 02541 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 366 | Non-remediated | 62.0 | 32.5 | 9 | 7/30/2018 |
| 02549 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 366 | Non-remediated | 70.0 | 37.5 | 19 | 7/30/2018 |
| 02553 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 366 | Non-remediated | 80.0 | 44 | 19 | 7/30/2018 |
| 02563 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 370 | Non-remediated | 65.5 | 35 | 20 | 7/30/2018 |
| 02568 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 370 | Non-remediated | 77.5 | 42.5 | 20 | 7/30/2018 |
| 02585 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 372 | Non-remediated | 38.0 | 20 | 2 | 7/30/2018 |
| 02606 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 372 | Non-remediated | 59.5 | 34 | 18 | 7/30/2018 |
| 02641 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 372 | Non-remediated | 67.5 | 37 | 19 | 7/30/2018 |
| 02651 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 372 | Non-remediated | 71.0 | 36.5 | 21 | 7/30/2018 |
| 02674 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 372 | Non-remediated | 86.0 | 47 | 21 | 7/30/2018 |
| 02677 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 373 | Non-remediated | 49.0 | 27 | 6 | 7/30/2018 |
| 02706 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 382 | Non-remediated | 54.5 | 29.5 | 6 | 7/30/2018 |
| 02714 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 382 | Non-remediated | 63.0 | 34 | 10 | 7/30/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|--------------------|-------------------|-------------------|----------|------------------|
| 02716 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 382 | Non-remediated | 65.5 | 35 | 16 | 7/30/2018 |
| 02733 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 382 | Non-remediated | 83.5 | 47.5 | 24 | 7/30/2018 |
| EC382 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 331 | Non-remediated | 54.0 | 28 | 2 | 7/30/2018 |
| EC385 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 403 | Non-remediated | 51.5 | 27.5 | 2 | 7/30/2018 |
| EC392 | NUP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | NUP | 431 | Non-remediated | 42.5 | 27.5 | 6 | 7/30/2018 |
| 00737 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 67 | Before-Remediation | 63.5 | 35 | 13 | 7/23/2018 |
| 00860 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 111 | Before-Remediation | 52.0 | 30.5 | 5 | 7/23/2018 |
| 00861 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 111 | Before-Remediation | 54.0 | 32.5 | 6 | 7/23/2018 |
| 00904 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 154 | Before-Remediation | 52.0 | 31.5 | 6 | 7/23/2018 |
| 00906 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 154 | Before-Remediation | 66.0 | 38 | 11 | 7/23/2018 |
| 00908 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 154 | Before-Remediation | 83.0 | 42.5 | 14 | 7/23/2018 |
| 00909 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 155 | Before-Remediation | 53.0 | 31.5 | 8 | 7/23/2018 |
| 00919 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 157 | Before-Remediation | 57.0 | 34.5 | 17 | 7/23/2018 |
| 00921 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 157 | Before-Remediation | 61.0 | 37.5 | 9 | 7/23/2018 |
| 00922 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 157 | Before-Remediation | 63.5 | 38.5 | 15 | 7/23/2018 |
| 00923 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 157 | Before-Remediation | 59.0 | 34.5 | 10 | 7/23/2018 |
| 00935 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 163 | Before-Remediation | 53.0 | 32.5 | 10 | 7/23/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|--------------------|-------------------|-------------------|----------|------------------|
| 00938 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 163 | Before-Remediation | 68.0 | 40 | 6 | 7/23/2018 |
| 00946 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 166 | Before-Remediation | 63.0 | 36.5 | 9 | 7/23/2018 |
| 00961 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 183 | Before-Remediation | 73.0 | 42.5 | 13 | 7/23/2018 |
| 00962 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 183 | Before-Remediation | 63.5 | 37 | 10 | 7/23/2018 |
| 00963 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 183 | Before-Remediation | 65.0 | 39.5 | 17 | 7/23/2018 |
| 00970 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 184 | Before-Remediation | 71.5 | 39.5 | 12 | 7/23/2018 |
| 00986 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 193 | Before-Remediation | 31.0 | 17 | 1 | 7/23/2018 |
| 00988 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 193 | Before-Remediation | 65.0 | 37 | 9 | 7/23/2018 |
| 00990 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 194 | Before-Remediation | 41.0 | 25 | 6 | 7/23/2018 |
| 00997 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 195 | Before-Remediation | 43.0 | 26 | 9 | 7/23/2018 |
| 00998 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 195 | Before-Remediation | 63.0 | 36.5 | 10 | 7/23/2018 |
| 01001 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 195 | Before-Remediation | 67.5 | 40.5 | 15 | 7/23/2018 |
| 01026 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 220 | Before-Remediation | 55.2 | 20.6 | 6 | 7/25/2018 |
| 01027 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 220 | Before-Remediation | 67.0 | 38.5 | 10 | 7/23/2018 |
| 01073 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 234 | Before-Remediation | 89.5 | 49.5 | 15 | 7/23/2018 |
| 01075 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 234 | Before-Remediation | 95.5 | 49.5 | 14 | 7/23/2018 |
| 01124 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 259 | Before-Remediation | 50.5 | 29 | 4 | 7/23/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|--------------------|-------------------|-------------------|----------|------------------|
| 01125 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 259 | Before-Remediation | 70.0 | 40 | 12 | 7/23/2018 |
| 01126 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 259 | Before-Remediation | 67.5 | 40.5 | 23 | 7/26/2018 |
| 01170 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 288 | Before-Remediation | 43.5 | 24.5 | 4 | 7/23/2018 |
| 01173 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 295 | Before-Remediation | 66.0 | 39 | 13 | 7/23/2018 |
| 01174 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 295 | Before-Remediation | 67.0 | 39 | 15 | 7/23/2018 |
| 01176 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 312 | Before-Remediation | 65.0 | 37.5 | 14 | 7/23/2018 |
| 01185 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 332 | Before-Remediation | 60.5 | 37.5 | 13 | 7/23/2018 |
| 01187 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 334 | Before-Remediation | 34.5 | 20 | 2 | 7/23/2018 |
| 01188 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 334 | Before-Remediation | 75.5 | 42.5 | 15 | 7/23/2018 |
| 01222 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 350 | Before-Remediation | 39.5 | 22 | 1 | 7/23/2018 |
| 01228 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 323 | Before-Remediation | 27.5 | 16 | 1 | 7/23/2018 |
| 01229 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 323 | Before-Remediation | 44.5 | 27 | 4 | 7/23/2018 |
| 01233 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 323 | Before-Remediation | 70.0 | 40 | 10 | 7/23/2018 |
| 01235 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 323 | Before-Remediation | 78.0 | 46 | 10 | 7/23/2018 |
| 01260 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 331 | Before-Remediation | 57.0 | 34 | 8 | 7/23/2018 |
| 01261 | SWP-BR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 331 | Before-Remediation | 18.5 | 10.5 | 1 | 7/23/2018 |
| 01336 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 262 | Before-Remediation | 68.5 | 38.5 | 15 | 7/24/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|--------------------|-------------------|-------------------|----------|------------------|
| 01338 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 267 | Before-Remediation | 34.5 | 18 | 1 | 7/24/2018 |
| 01343 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 269 | Before-Remediation | 83.5 | 49 | 14 | 7/24/2018 |
| 01347 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 271 | Before-Remediation | 82.0 | 43 | 15 | 7/24/2018 |
| 01360 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 273 | Before-Remediation | 25.5 | 14 | 1 | 7/24/2018 |
| 01362 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 273 | Before-Remediation | 61.5 | 36.5 | 10 | 7/24/2018 |
| 01364 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 273 | Before-Remediation | 78.5 | 43 | 18 | 7/24/2018 |
| 01377 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 276 | Before-Remediation | 59.5 | 34.5 | 8 | 7/24/2018 |
| 01378 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 276 | Before-Remediation | 67.5 | 38.5 | 14 | 7/24/2018 |
| 01389 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 290 | Before-Remediation | 91.0 | 51.5 | 21 | 7/24/2018 |
| 01393 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 290 | Before-Remediation | 87.5 | 48 | 25 | 7/24/2018 |
| 01394 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 290 | Before-Remediation | 78.0 | 44.5 | 13 | 7/24/2018 |
| 01395 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 290 | Before-Remediation | 73.5 | 42.5 | 25 | 7/24/2018 |
| 01398 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 290 | Before-Remediation | 61.0 | 33.5 | 11 | 7/24/2018 |
| 01400 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 290 | Before-Remediation | 55.0 | 32.5 | 9 | 7/24/2018 |
| 01401 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 290 | Before-Remediation | 51.5 | 28.5 | 2 | 7/24/2018 |
| 01402 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 290 | Before-Remediation | 46.0 | 28 | 17 | 7/24/2018 |
| 01403 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 290 | Before-Remediation | 49.5 | 29.5 | 12 | 7/24/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|--------------------|-------------------|-------------------|----------|------------------|
| 01413 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 296 | Before-Remediation | 59.0 | 34.5 | 7 | 7/24/2018 |
| 01416 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 296 | Before-Remediation | 95.0 | 50.5 | 11 | 7/24/2018 |
| 01457 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 307 | Before-Remediation | 65.0 | 38 | 12 | 7/24/2018 |
| 01495 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 311 | Before-Remediation | 25.5 | 14 | 1 | 7/24/2018 |
| 01499 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 311 | Before-Remediation | 91.0 | 51.5 | 18 | 7/24/2018 |
| 01504 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 315 | Before-Remediation | 72.5 | 42 | 16 | 7/24/2018 |
| EC136 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 29 | Before-Remediation | 60.5 | 34 | 7 | 7/24/2018 |
| EC137 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 29 | Before-Remediation | 49.5 | 28.5 | 10 | 7/24/2018 |
| EC161 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 111 | Before-Remediation | 63.0 | 36.5 | 9 | 7/24/2018 |
| EC162 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 111 | Before-Remediation | 51.5 | 30.5 | 4 | 7/24/2018 |
| EC164 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 116 | Before-Remediation | 45.0 | 23 | 2 | 7/24/2018 |
| EC166 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 116 | Before-Remediation | 29.5 | 15 | 1 | 7/24/2018 |
| EC169 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 95 | Before-Remediation | 29.5 | 16.5 | 1 | 7/24/2018 |
| EC170 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 95 | Before-Remediation | 18.0 | 10 | 1 | 7/24/2018 |
| EC178 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 112 | Before-Remediation | 20.0 | 11.5 | 1 | 7/24/2018 |
| EC179 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 134 | Before-Remediation | 23.5 | 13.5 | 1 | 7/24/2018 |
| EC180 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 134 | Before-Remediation | 18.5 | 9.5 | 1 | 7/24/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|--------------------|-------------------|-------------------|----------|------------------|
| EC181 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 111 | Before-Remediation | 50.0 | 27 | 3 | 7/24/2018 |
| EC191 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 180 | Before-Remediation | 33.0 | 18.5 | 1 | 7/24/2018 |
| EC197 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 155 | Before-Remediation | 79.5 | 44 | 21 | 7/24/2018 |
| EC202 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 152 | Before-Remediation | 37.0 | 19 | 1 | 7/24/2018 |
| EC203 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 152 | Before-Remediation | 19.5 | 11 | 1 | 7/24/2018 |
| EC204 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 152 | Before-Remediation | 11.5 | 7 | 1 | 7/24/2018 |
| EC209 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 153 | Before-Remediation | 74.5 | 42 | 20 | 7/24/2018 |
| EC211 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 157 | Before-Remediation | 41.5 | 23 | 3 | 7/24/2018 |
| EC232 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 184 | Before-Remediation | 29.5 | 16.5 | 1 | 7/24/2018 |
| EC242 | SWP-BR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 65 | Before-Remediation | 21.5 | 11.5 | 1 | 7/24/2018 |
| 00623 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 24 | Non-remediated | 55.7 | 27 | 5 | 7/10/2018 |
| 00635 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 37 | Non-remediated | 51.3 | 25 | 10 | 7/10/2018 |
| 00641 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 37 | Non-remediated | 56.0 | 27 | 7 | 7/10/2018 |
| 00656 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 41 | Non-remediated | 63.5 | 29 | 5 | 7/10/2018 |
| 00681 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 46 | Non-remediated | 69.8 | 34 | 7 | 7/10/2018 |
| 00688 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 48 | Non-remediated | 40.6 | 24 | 6 | 7/10/2018 |
| 00709 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 57 | Non-remediated | 52.2 | 24 | 3 | 7/10/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| 00753 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 70 | Non-remediated | 55.2 | 27 | 6 | 7/10/2018 |
| 00756 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 70 | Non-remediated | 60.2 | 28 | 6 | 7/10/2018 |
| 00762 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 71 | Non-remediated | 62.4 | 30 | 10 | 7/10/2018 |
| 00763 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 71 | Non-remediated | 64.5 | 30.5 | 7 | 7/10/2018 |
| 00776 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 73 | Non-remediated | 63.6 | 30 | 10 | 7/10/2018 |
| 00799 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 82 | Non-remediated | 58.1 | 31.5 | 11 | 7/10/2018 |
| 00805 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 82 | Non-remediated | 72.5 | 36 | 6 | 7/10/2018 |
| 00808 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 83 | Non-remediated | 56.9 | 28 | 3 | 7/10/2018 |
| 00814 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 83 | Non-remediated | 71.5 | 37 | 9 | 7/10/2018 |
| 00815 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 83 | Non-remediated | 70.0 | 37 | 8 | 7/10/2018 |
| 00827 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 101 | Non-remediated | 58.8 | 27.5 | 4 | 7/10/2018 |
| 00829 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 101 | Non-remediated | 65.3 | 34 | 8 | 7/10/2018 |
| 00848 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 107 | Non-remediated | 67.9 | 33 | 6 | 7/10/2018 |
| 00852 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 109 | Non-remediated | 63.7 | 31 | 20 | 4/27/2018 |
| 00857 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 109 | Non-remediated | 75.1 | 37 | 12 | 7/10/2018 |
| 00864 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 113 | Non-remediated | 61.2 | 27 | 10 | 7/10/2018 |
| 00868 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 92 | Non-remediated | 71.0 | 35 | 9 | 7/10/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| 00875 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 94 | Non-remediated | 54.6 | 25 | 11 | 7/10/2018 |
| 00881 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 97 | Non-remediated | 21.7 | 10 | 1 | 7/10/2018 |
| 00889 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 115 | Non-remediated | 59.6 | 28.5 | 8 | 7/10/2018 |
| 00890 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 115 | Non-remediated | 63.6 | 32 | 12 | 7/10/2018 |
| 00894 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 115 | Non-remediated | 81.9 | 40 | 6 | 7/10/2018 |
| 00925 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 162 | Non-remediated | 51.6 | 24.5 | 5 | 7/10/2018 |
| 00929 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 162 | Non-remediated | 63.4 | 28 | 9 | 7/10/2018 |
| 00932 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 162 | Non-remediated | 73.2 | 34.5 | 10 | 7/10/2018 |
| 00933 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 162 | Non-remediated | 77.8 | 34.5 | 11 | 7/10/2018 |
| 00956 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 176 | Non-remediated | 72.8 | 35.5 | 4 | 7/10/2018 |
| 00977 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 192 | Non-remediated | 52.5 | 28 | 7 | 7/10/2018 |
| 00980 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 192 | Non-remediated | 56.6 | 28 | 3 | 7/10/2018 |
| 01004 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 199 | Non-remediated | 86.0 | 39.5 | 5 | 7/10/2018 |
| 01014 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 204 | Non-remediated | 84.0 | 37 | 9 | 7/10/2018 |
| 01042 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 219 | Non-remediated | 70.9 | 33 | 13 | 7/10/2018 |
| 01047 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 219 | Non-remediated | 75.2 | 36 | 5 | 7/10/2018 |
| 01053 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 230 | Non-remediated | 25.2 | 11 | 1 | 4/27/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| 01054 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 230 | Non-remediated | 54.5 | 26 | 3 | 7/10/2018 |
| 01067 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 233 | Non-remediated | 77.0 | 35 | 7 | 7/10/2018 |
| 01076 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 236 | Non-remediated | 63.7 | 28 | 7 | 4/27/2018 |
| 01089 | SWP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | SWP | 239 | Non-remediated | 57.3 | 28.5 | 13 | 7/10/2018 |
| 01098 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 241 | Non-remediated | 78.0 | 44 | 14 | 7/23/2018 |
| 01105 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 242 | Non-remediated | 85.0 | 48.5 | 21 | 7/23/2018 |
| 01106 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 244 | Non-remediated | 36.0 | 22 | 2 | 7/23/2018 |
| 01114 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 246 | Non-remediated | 69.0 | 39.5 | 12 | 7/26/2018 |
| 01123 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 255 | Non-remediated | 85.5 | 43 | 12 | 7/10/2018 |
| 01144 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 261 | Non-remediated | 74.0 | 45 | 15 | 7/23/2018 |
| 01152 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 202 | Non-remediated | 70.0 | 41 | 10 | 7/23/2018 |
| 01168 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 286 | Non-remediated | 90.4 | 40.5 | 14 | 7/25/2018 |
| 01178 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 324 | Non-remediated | 71.0 | 41 | 19 | 7/23/2018 |
| 01196 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 345 | Non-remediated | 75.0 | 42.5 | 9 | 7/23/2018 |
| 01214 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 345 | Non-remediated | 93.5 | 52.5 | 13 | 7/23/2018 |
| 01220 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 345 | Non-remediated | 89.0 | 52 | 19 | 7/23/2018 |
| 01246 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 327 | Non-remediated | 53.5 | 31 | 3 | 7/23/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| 01248 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 327 | Non-remediated | 49.5 | 30 | 6 | 7/23/2018 |
| 01276 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 341 | Non-remediated | 89.5 | 51.5 | 18 | 7/23/2018 |
| 01297 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 15 | Non-remediated | 83.0 | 45 | 16 | 7/23/2018 |
| 01298 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 16 | Non-remediated | 82.0 | 48.5 | 14 | 7/23/2018 |
| 01302 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 4 | Non-remediated | 72.0 | 41.5 | 6 | 7/23/2018 |
| 01305 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 22 | Non-remediated | 81.0 | 47.5 | 7 | 7/23/2018 |
| 01313 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 207 | Non-remediated | 77.5 | 46.5 | 18 | 7/23/2018 |
| 01385 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 277 | Non-remediated | 67.4 | 31 | 9 | 7/10/2018 |
| 01405 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 294 | Non-remediated | 59.0 | 36.5 | 10 | 7/23/2018 |
| 01409 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 294 | Non-remediated | 80.5 | 50 | 10 | 7/23/2018 |
| 01417 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 297 | Non-remediated | 65.6 | 33 | 8 | 7/10/2018 |
| 01419 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 297 | Non-remediated | 70.1 | 35 | 8 | 7/10/2018 |
| 01420 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 297 | Non-remediated | 77.6 | 37.5 | 11 | 7/10/2018 |
| 01428 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 291 | Non-remediated | 57.0 | 35 | 7 | 7/23/2018 |
| 01435 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 291 | Non-remediated | 70.2 | 33.5 | 7 | 7/10/2018 |
| 01437 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 291 | Non-remediated | 68.5 | 41 | 15 | 7/23/2018 |
| 01449 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 300 | Non-remediated | 74.9 | 33.5 | 6 | 7/10/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| 01451 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 300 | Non-remediated | 87.0 | 50 | 24 | 7/23/2018 |
| 01454 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 306 | Non-remediated | 66.0 | 39 | 10 | 7/23/2018 |
| 01467 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 304 | Non-remediated | 81.0 | 47 | 19 | 7/23/2018 |
| 01474 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 308 | Non-remediated | 87.0 | 49 | 15 | 7/23/2018 |
| 01491 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 309 | Non-remediated | 77.5 | 46.5 | 12 | 7/23/2018 |
| 01512 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 246 | Non-remediated | 45.5 | 25 | 6 | 7/23/2018 |
| EC129 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 37 | Non-remediated | 57.5 | 34.5 | 9 | 7/23/2018 |
| EC132 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 33 | Non-remediated | 60.5 | 35 | 4 | 7/23/2018 |
| EC145 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 52 | Non-remediated | 62.0 | 37.5 | 7 | 7/23/2018 |
| EC151 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 30 | Non-remediated | 58.0 | 32 | 6 | 7/23/2018 |
| EC188 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 92 | Non-remediated | 15.5 | 8.5 | 1 | 7/23/2018 |
| EC222 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 236 | Non-remediated | 35.5 | 19 | 1 | 7/23/2018 |
| EC226 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 55 | Non-remediated | 24.5 | 14 | 1 | 7/23/2018 |
| EC236 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 217 | Non-remediated | 14.5 | 8 | 1 | 7/23/2018 |
| EC240 | SWP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | SWP | 82 | Non-remediated | 17.5 | 9.5 | 1 | 7/23/2018 |
| 02740 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 560 | Non-remediated | 79.5 | 44 | 9 | 7/24/2018 |
| 02741 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 560 | Non-remediated | 81.0 | 46 | 8 | 7/24/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| 02756 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 685 | Non-remediated | 84.5 | 46.5 | 24 | 7/24/2018 |
| 02758 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 685 | Non-remediated | 86.0 | 47 | 18 | 7/24/2018 |
| 02775 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 696 | Non-remediated | 77.0 | 43.5 | 24 | 7/24/2018 |
| 02783 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 696 | Non-remediated | 84.5 | 46 | 25 | 7/24/2018 |
| 02802 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 692 | Non-remediated | 78.0 | 43.5 | 19 | 7/24/2018 |
| 02803 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 692 | Non-remediated | 80.0 | 42.5 | 19 | 7/24/2018 |
| 02807 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 692 | Non-remediated | 81.5 | 45 | 27 | 7/24/2018 |
| 02810 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 692 | Non-remediated | 86.0 | 45 | 25 | 7/24/2018 |
| 02812 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 692 | Non-remediated | 94.0 | 51 | 23 | 7/24/2018 |
| 02846 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 700 | Non-remediated | 80.0 | 45 | 16 | 7/24/2018 |
| 02849 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 700 | Non-remediated | 88.5 | 44 | 17 | 7/24/2018 |
| 02866 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 730 | Non-remediated | 85.5 | 47 | 22 | 7/24/2018 |
| 02873 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 707 | Non-remediated | 91.5 | 49 | 30 | 7/24/2018 |
| 02883 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 705 | Non-remediated | 70.0 | 40.5 | 14 | 7/24/2018 |
| 02897 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 705 | Non-remediated | 82.0 | 46 | 17 | 7/24/2018 |
| 02906 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 705 | Non-remediated | 88.5 | 46 | 31 | 7/24/2018 |
| 02911 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 640 | Non-remediated | 76.5 | 43 | 13 | 7/24/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| 02913 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 640 | Non-remediated | 72.5 | 36 | 13 | 7/24/2018 |
| 02916 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 640 | Non-remediated | 80.0 | 45.5 | 16 | 7/24/2018 |
| 02937 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 633 | Non-remediated | 82.0 | 48.5 | 19 | 7/24/2018 |
| 02958 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 653 | Non-remediated | 21.5 | 11.5 | 1 | 7/24/2018 |
| 02961 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 654 | Non-remediated | 82.5 | 47.5 | 18 | 7/24/2018 |
| 02963 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 655 | Non-remediated | 75.5 | 41.5 | 22 | 7/24/2018 |
| 02966 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 656 | Non-remediated | 92.5 | 53 | 18 | 7/24/2018 |
| 02974 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 519 | Non-remediated | 96.0 | 53.5 | 21 | 7/24/2018 |
| 02989 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 566 | Non-remediated | 39.0 | 22.5 | 3 | 7/24/2018 |
| 03007 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 579 | Non-remediated | 31.0 | 16.5 | 3 | 7/24/2018 |
| 03025 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 577 | Non-remediated | 71.5 | 38 | 21 | 7/24/2018 |
| 03026 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 577 | Non-remediated | 71.5 | 40 | 14 | 7/24/2018 |
| 03033 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 577 | Non-remediated | 83.5 | 48 | 14 | 7/24/2018 |
| 03051 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 588 | Non-remediated | 91.0 | 49 | 21 | 7/24/2018 |
| 03052 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 588 | Non-remediated | 93.0 | 49 | 27 | 7/24/2018 |
| 03058 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 590 | Non-remediated | 75.5 | 43 | 15 | 7/24/2018 |
| 03062 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 591 | Non-remediated | 81.0 | 45 | 19 | 7/24/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| 03076 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 617 | Non-remediated | 68.0 | 39.5 | 15 | 7/24/2018 |
| 03080 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 617 | Non-remediated | 82.5 | 46 | 18 | 7/26/2018 |
| 03098 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 667 | Non-remediated | 72.5 | 40.5 | 19 | 7/24/2018 |
| 03102 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 667 | Non-remediated | 80.5 | 44 | 16 | 7/24/2018 |
| 03109 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 667 | Non-remediated | 94.0 | 47 | 24 | 7/24/2018 |
| 03124 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 672 | Non-remediated | 87.0 | 52.5 | 14 | 7/24/2018 |
| 03128 | TIP-NR BOX 1 | <i>Elliptio complanata</i> | Random | 1 | TIP | 680 | Non-remediated | 72.0 | 40.5 | 12 | 7/24/2018 |
| 03133 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 680 | Non-remediated | 95.5 | 49.5 | 25 | 7/25/2018 |
| 03140 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 675 | Non-remediated | 73.0 | 40.5 | 14 | 7/25/2018 |
| 03142 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 675 | Non-remediated | 77.0 | 42.5 | 17 | 7/25/2018 |
| 03144 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 675 | Non-remediated | 82.0 | 46 | 36 | 7/25/2018 |
| 03145 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 676 | Non-remediated | 61.5 | 34.5 | 18 | 7/25/2018 |
| 03160 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 710 | Non-remediated | 64.0 | 36.5 | 25 | 7/25/2018 |
| 03165 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 710 | Non-remediated | 81.5 | 45 | 33 | 7/25/2018 |
| 03180 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 732 | Non-remediated | 95.5 | 50.5 | 30 | 7/25/2018 |
| 03181 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 733 | Non-remediated | 16.0 | 8 | 1 | 7/25/2018 |
| 03190 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 733 | Non-remediated | 85.0 | 44 | 22 | 7/25/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| 03211 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 725 | Non-remediated | 70.0 | 36 | 19 | 7/25/2018 |
| 03224 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 725 | Non-remediated | 80.0 | 40.5 | 19 | 7/25/2018 |
| 03225 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 725 | Non-remediated | 80.0 | 43.5 | 22 | 7/25/2018 |
| 03238 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 727 | Non-remediated | 62.0 | 34.5 | 18 | 7/31/2018 |
| 03245 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 727 | Non-remediated | 67.5 | 38 | 9 | 7/25/2018 |
| 03253 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 727 | Non-remediated | 73.5 | 41 | 12 | 7/25/2018 |
| 03261 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 727 | Non-remediated | 80.0 | 44.5 | 19 | 7/25/2018 |
| 03273 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 751 | Non-remediated | 63.0 | 36 | 16 | 7/25/2018 |
| 03282 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 751 | Non-remediated | 81.9 | 39 | 26 | 7/31/2018 |
| 03283 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 751 | Non-remediated | 82.0 | 42.5 | 23 | 7/31/2018 |
| 03288 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 754 | Non-remediated | 64.5 | 36 | 14 | 7/25/2018 |
| 03292 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 754 | Non-remediated | 68.0 | 37 | 21 | 7/25/2018 |
| 03298 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 754 | Non-remediated | 71.5 | 39 | 19 | 7/25/2018 |
| 03309 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 754 | Non-remediated | 79.5 | 44 | 23 | 7/25/2018 |
| 03314 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 766 | Non-remediated | 40.5 | 22 | 4 | 7/25/2018 |
| 03315 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 766 | Non-remediated | 43.0 | 23.5 | 4 | 7/25/2018 |
| 03316 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 766 | Non-remediated | 52.0 | 28.5 | 10 | 7/25/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| 03317 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 766 | Non-remediated | 60.5 | 36 | 16 | 7/25/2018 |
| 03325 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 766 | Non-remediated | 72.5 | 39.5 | 30 | 7/25/2018 |
| 03333 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 766 | Non-remediated | 86.0 | 43.5 | 37 | 7/25/2018 |
| 03340 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 752 | Non-remediated | 66.5 | 38.5 | 18 | 7/25/2018 |
| 03382 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 745 | Non-remediated | 83.5 | 45.5 | 24 | 7/25/2018 |
| 03386 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 746 | Non-remediated | 76.0 | 40 | 16 | 7/25/2018 |
| 03402 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 747 | Non-remediated | 78.5 | 43 | 23 | 7/25/2018 |
| 03412 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 748 | Non-remediated | 86.0 | 48 | 22 | 7/25/2018 |
| 03413 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 748 | Non-remediated | 93.5 | 49.5 | 28 | 7/25/2018 |
| 03428 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 757 | Non-remediated | 74.0 | 40.5 | 17 | 7/25/2018 |
| 03433 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 758 | Non-remediated | 80.5 | 43 | 25 | 7/25/2018 |
| 03442 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 764 | Non-remediated | 71.0 | 39 | 20 | 7/25/2018 |
| 03463 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 770 | Non-remediated | 44.0 | 25 | 3 | 7/25/2018 |
| 03466 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 770 | Non-remediated | 63.5 | 35.5 | 10 | 7/25/2018 |
| 03468 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 770 | Non-remediated | 65.5 | 37 | 19 | 7/25/2018 |
| 03469 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 770 | Non-remediated | 68.5 | 38.5 | 26 | 7/25/2018 |
| 03479 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 770 | Non-remediated | 79.0 | 42.5 | 19 | 7/25/2018 |

Appendix A1 - Part 1

| Shell Identification | Site Location | Species | Box Name | Box Number | Pool | Site ID-Quadrat | Stratum | Shell Length (mm) | Shell Height (mm) | 1st Read | Date of 1st Read |
|----------------------|---------------|----------------------------|----------|------------|------|-----------------|----------------|-------------------|-------------------|----------|------------------|
| EC287 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 699 | Non-remediated | 65.5 | 37.5 | 13 | 7/25/2018 |
| EC295 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 589 | Non-remediated | 97.5 | 54 | 13 | 7/25/2018 |
| EC303 | TIP-NR BOX 2 | <i>Elliptio complanata</i> | Random | 2 | TIP | 621 | Non-remediated | 67.5 | 40 | 15 | 7/25/2018 |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use Reason Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|--------------------|---|
| 00200 | 12 | See Comment Note | 11 | 11 | yes | yes | | Reader 2 evaluation dates 8/8 to 8/17/18 and |
| 00212 | 8 | See Comment Note | 8 | 8 | yes | yes | | 10/11 and 12/18 for all thin-sectioned shells |
| 00215 | 1 | See Comment Note | 1 | 1 | yes | yes | | |
| 00229 | 17 | See Comment Note | 19.5 | 20 | yes | yes | | |
| 00234 | 28 | See Comment Note | 30.5 | 31 | yes | yes | | |
| 00247 | 15 | See Comment Note | 15.5 | 16 | yes | yes | | |
| 00257 | 7 | See Comment Note | 9 | 9 | yes | yes | | |
| 00278 | 13 | See Comment Note | 13.5 | 14 | yes | yes | | |
| 00282 | 17 | See Comment Note | 17.5 | 18 | yes | yes | | |
| 00311 | 6 | See Comment Note | 6 | 6 | yes | yes | | |
| 00317 | 3 | See Comment Note | 2.5 | 3 | yes | yes | | |
| 00318 | 6 | See Comment Note | 6 | 6 | yes | yes | | |
| 00331 | 1 | See Comment Note | 1 | 1 | yes | yes | | |
| 00332 | 1 | See Comment Note | 1 | 1 | yes | yes | | |
| 00333 | 12 | See Comment Note | 13 | 13 | yes | yes | | |
| 00337 | 3 | See Comment Note | 4 | 4 | yes | yes | | |
| 00339 | 17 | See Comment Note | 16.5 | 17 | yes | yes | | |
| 00343 | 2 | See Comment Note | 1.5 | 2 | yes | yes | | |
| 00346 | 9 | See Comment Note | 10 | 10 | yes | yes | | |
| 00347 | 9 | See Comment Note | 9 | 9 | yes | yes | | |
| 00353 | 19 | See Comment Note | 19 | 19 | yes | yes | | |
| 00361 | 1 | See Comment Note | 1 | 1 | yes | yes | | |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use | Reason | Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|-----|--------|---------|---------------|
| 00369 | 18 | See Comment Note | 18.5 | 19 | yes | yes | | | | |
| 00373 | 12 | See Comment Note | 12 | 12 | yes | yes | | | | |
| 00374 | 20 | See Comment Note | 22.5 | 23 | yes | yes | | | | |
| 00376 | 15 | See Comment Note | 17 | 17 | yes | yes | | | | |
| 00377 | 15 | See Comment Note | 16 | 16 | yes | yes | | | | |
| 00392 | 1 | See Comment Note | 1 | 1 | yes | yes | | | | |
| 00411 | 7 | See Comment Note | 7 | 7 | yes | yes | | | | |
| 00412 | 12 | See Comment Note | 12.5 | 13 | yes | yes | | | | |
| 00414 | 15 | See Comment Note | 16 | 16 | yes | yes | | | | |
| 00420 | 24 | See Comment Note | 23.5 | 24 | yes | yes | | | | |
| 00421 | 15 | See Comment Note | 15 | 15 | yes | yes | | | | |
| 00422 | 7 | See Comment Note | 6 | 6 | yes | yes | | | | |
| 00423 | 16 | See Comment Note | 15.5 | 16 | yes | yes | | | | |
| 00424 | 9 | See Comment Note | 9.5 | 10 | yes | yes | | | | |
| 00425 | 1 | See Comment Note | 1 | 1 | yes | yes | | | | |
| 00426 | 3 | See Comment Note | 3.5 | 4 | yes | yes | | | | |
| 00432 | 22 | See Comment Note | 22 | 22 | yes | yes | | | | |
| 00447 | 15 | See Comment Note | 16.5 | 17 | yes | yes | | | | |
| 00483 | 5 | See Comment Note | 5.5 | 6 | yes | yes | | | | |
| 00484 | 9 | See Comment Note | 8.5 | 9 | yes | yes | | | | |
| 00487 | 12 | See Comment Note | 12.5 | 13 | yes | yes | | | | |
| 00509 | 7 | See Comment Note | 7.5 | 8 | yes | yes | | | | |
| 00511 | 8 | See Comment Note | 8 | 8 | yes | yes | | | | |
| 00512 | 15 | See Comment Note | 15.5 | 16 | yes | yes | | | | |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use Reason Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|--------------------|---------------|
| 00513 | 17 | See Comment Note | 17.5 | 18 | yes | yes | | |
| 00516 | 9 | See Comment Note | 11 | 11 | yes | yes | | |
| 00520 | 12 | See Comment Note | 12.5 | 13 | yes | yes | | |
| 00522 | 18 | See Comment Note | 18 | 18 | yes | yes | | |
| 00524 | 18 | See Comment Note | 17.5 | 18 | yes | yes | | |
| 00525 | 18 | See Comment Note | 16 | 16 | yes | yes | | |
| 00526 | 14 | See Comment Note | 14.5 | 15 | yes | yes | | |
| 00540 | 18 | See Comment Note | 18 | 18 | yes | yes | | |
| 00543 | 11 | See Comment Note | 11.5 | 12 | yes | yes | | |
| 00546 | 7 | See Comment Note | 8 | 8 | yes | yes | | |
| 00550 | 18 | See Comment Note | 18 | 18 | yes | yes | | |
| 00564 | 17 | See Comment Note | 18 | 18 | yes | yes | | |
| 00568 | 18 | See Comment Note | 20.5 | 21 | yes | yes | | |
| 00575 | 11 | See Comment Note | 13 | 13 | yes | yes | | |
| 00577 | 19 | See Comment Note | 18 | 18 | yes | yes | | |
| 00584 | 17 | See Comment Note | 19.5 | 20 | yes | yes | | |
| 00587 | 24 | See Comment Note | 22 | 22 | yes | yes | | |
| 00589 | 30 | See Comment Note | 27.5 | 28 | yes | yes | | |
| 00591 | 6 | See Comment Note | 8 | 8 | yes | yes | | |
| 00594 | 15 | See Comment Note | 15.5 | 16 | yes | yes | | |
| 00597 | 13 | See Comment Note | 13 | 13 | yes | yes | | |
| 00599 | 29 | See Comment Note | 26.5 | 27 | yes | yes | | |
| 00601 | 26 | See Comment Note | 26 | 26 | yes | yes | | |
| 00605 | 4 | See Comment Note | 4 | 4 | yes | yes | | |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use | Reason | Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|-----|--------|---------|---------------|
| 00609 | 13 | See Comment Note | 11 | 11 | yes | yes | | | | |
| 00613 | 20 | See Comment Note | 24.5 | 25 | yes | yes | | | | |
| 00614 | 16 | See Comment Note | 14 | 14 | yes | yes | | | | |
| 00617 | 6 | See Comment Note | 6 | 6 | yes | yes | | | | |
| 00620 | 25 | See Comment Note | 23.5 | 24 | yes | yes | | | | |
| 00621 | 17 | See Comment Note | 17.5 | 18 | yes | yes | | | | |
| 00622 | 22 | See Comment Note | 21 | 21 | yes | yes | | | | |
| EC101 | 11 | See Comment Note | 11 | 11 | yes | yes | | | | |
| EC22 | 8 | See Comment Note | 8.5 | 9 | yes | yes | | | | |
| EC29 | 14 | See Comment Note | 14.5 | 15 | yes | yes | | | | |
| EC36 | 14 | See Comment Note | 14.5 | 15 | yes | yes | | | | |
| EC37 | 16 | See Comment Note | 16 | 16 | yes | yes | | | | |
| EC38 | 13 | See Comment Note | 13.5 | 14 | yes | yes | | | | |
| EC54 | 19 | See Comment Note | 17.5 | 18 | yes | yes | | | | |
| EC69 | 21 | See Comment Note | 19.5 | 20 | yes | yes | | | | |
| EC75 | 13 | See Comment Note | 11.5 | 12 | yes | yes | | | | |
| EC76 | 7 | See Comment Note | 9 | 9 | yes | yes | | | | |
| EC87 | 1 | See Comment Note | 1 | 1 | yes | yes | | | | |
| EC90 | 2 | See Comment Note | 1.5 | 2 | yes | yes | | | | |
| EC96 | 1 | See Comment Note | 1 | 1 | yes | yes | | | | |
| 00206 | 14 | See Comment Note | 14.5 | 15 | yes | yes | | | | |
| 00207 | 13 | See Comment Note | 12.5 | 13 | yes | yes | | | | |
| 00209 | 10 | See Comment Note | 10 | 10 | yes | yes | | | | |
| 00210 | 1 | See Comment Note | 1 | 1 | yes | yes | | | | |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use Reason Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|--------------------|---------------|
| 00218 | 17 | See Comment Note | 17.5 | 18 | yes | yes | | |
| 00219 | 14 | See Comment Note | 13.5 | 14 | yes | yes | | |
| 00222 | 16 | See Comment Note | 15.5 | 16 | yes | yes | | |
| 00223 | 25 | See Comment Note | 23 | 23 | yes | yes | | |
| 00224 | 9 | See Comment Note | 9 | 9 | yes | yes | | |
| 00227 | 8 | See Comment Note | 8.5 | 9 | yes | yes | | |
| 00232 | 14 | See Comment Note | 13 | 13 | yes | yes | | |
| 00233 | 11 | See Comment Note | 11 | 11 | yes | yes | | |
| 00235 | 15 | See Comment Note | 16 | 16 | yes | yes | | |
| 00237 | 1 | See Comment Note | 1 | 1 | yes | yes | | |
| 00241 | 8 | See Comment Note | 9 | 9 | yes | yes | | |
| 00243 | 5 | See Comment Note | 5 | 5 | yes | yes | | |
| 00261 | 2 | See Comment Note | 2 | 2 | yes | yes | | |
| 00269 | 25 | See Comment Note | 23.5 | 24 | yes | yes | | |
| 00270 | 19 | See Comment Note | 18.5 | 19 | yes | yes | | |
| 00274 | 13 | See Comment Note | 13.5 | 14 | yes | yes | | |
| 00276 | 26 | See Comment Note | 27 | 27 | yes | yes | | |
| 00286 | 7 | See Comment Note | 9 | 9 | yes | yes | | |
| 00290 | 10 | See Comment Note | 11 | 11 | yes | yes | | |
| 00308 | 12 | See Comment Note | 12 | 12 | yes | yes | | |
| 00313 | 5 | See Comment Note | 6 | 6 | yes | yes | | |
| 00380 | 19 | See Comment Note | 19 | 19 | yes | yes | | |
| 00381 | 6 | See Comment Note | 6 | 6 | yes | yes | | |
| 00383 | 15 | See Comment Note | 16 | 16 | yes | yes | | |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use | Reason | Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|-----|--------|---------|---------------|
| 00397 | 6 | See Comment Note | 6.5 | 7 | yes | yes | | | | |
| 00398 | 14 | See Comment Note | 14.5 | 15 | yes | yes | | | | |
| 00402 | 11 | See Comment Note | 12.5 | 13 | yes | yes | | | | |
| 00403 | 13 | See Comment Note | 15 | 15 | yes | yes | | | | |
| 00404 | 8 | See Comment Note | 7.5 | 8 | yes | yes | | | | |
| 00405 | 14 | See Comment Note | 14 | 14 | yes | yes | | | | |
| 00429 | 8 | See Comment Note | 8 | 8 | yes | yes | | | | |
| 00431 | 2 | See Comment Note | 2.5 | 3 | yes | yes | | | | |
| 00434 | 3 | See Comment Note | 3.5 | 4 | yes | yes | | | | |
| 00436 | 9 | See Comment Note | 8.5 | 9 | yes | yes | | | | |
| 00442 | 12 | See Comment Note | 12 | 12 | yes | yes | | | | |
| 00444 | 32 | See Comment Note | 32.5 | 33 | yes | yes | | | | |
| 00445 | 7 | See Comment Note | 7 | 7 | yes | yes | | | | |
| 00450 | 14 | See Comment Note | 14.5 | 15 | yes | yes | | | | |
| 00451 | 8 | See Comment Note | 7 | 7 | yes | yes | | | | |
| 00453 | 11 | See Comment Note | 11 | 11 | yes | yes | | | | |
| 00454 | 15 | See Comment Note | 13.5 | 14 | yes | yes | | | | |
| 00455 | 23 | See Comment Note | 23.5 | 24 | yes | yes | | | | |
| 00457 | 22 | See Comment Note | 23.5 | 24 | yes | yes | | | | |
| 00461 | 23 | See Comment Note | 25 | 25 | yes | yes | | | | |
| 00462 | 18 | See Comment Note | 18.5 | 19 | yes | yes | | | | |
| 00463 | 22 | See Comment Note | 22 | 22 | yes | yes | | | | |
| 00464 | 12 | See Comment Note | 12 | 12 | yes | yes | | | | |
| 00465 | 25 | See Comment Note | 27 | 27 | yes | yes | | | | |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use Reason Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|--------------------|---------------|
| 00467 | 16 | See Comment Note | 17 | 17 | yes | yes | | |
| 00468 | 16 | See Comment Note | 16.5 | 17 | yes | yes | | |
| 00469 | 18 | See Comment Note | 22.5 | 23 | yes | yes | | |
| 00470 | 27 | See Comment Note | 29 | 29 | yes | yes | | |
| 00471 | 21 | See Comment Note | 25 | 25 | yes | yes | | |
| 00474 | 26 | See Comment Note | 27 | 27 | yes | yes | | |
| 00475 | 21 | See Comment Note | 23.5 | 24 | yes | yes | | |
| 00493 | 17 | See Comment Note | 20 | 20 | yes | yes | | |
| 00494 | 18 | See Comment Note | 19.5 | 20 | yes | yes | | |
| 00499 | 14 | See Comment Note | 14.5 | 15 | yes | yes | | |
| 00500 | 18 | See Comment Note | 20 | 20 | yes | yes | | |
| 00501 | 21 | See Comment Note | 24 | 24 | yes | yes | | |
| 00505 | 24 | See Comment Note | 25 | 25 | yes | yes | | |
| 00535 | 19 | See Comment Note | 20 | 20 | yes | yes | | |
| 00536 | 20 | See Comment Note | 20.5 | 21 | yes | yes | | |
| EC105 | 29 | See Comment Note | 28 | 28 | yes | yes | | |
| EC107 | 14 | See Comment Note | 15.5 | 16 | yes | yes | | |
| EC110 | 17 | See Comment Note | 18 | 18 | yes | yes | | |
| EC112 | 8 | See Comment Note | 8 | 8 | yes | yes | | |
| EC113 | 19 | See Comment Note | 19 | 19 | yes | yes | | |
| EC116 | 30 | See Comment Note | 31.5 | 32 | yes | yes | | |
| EC117 | 21 | See Comment Note | 21 | 21 | yes | yes | | |
| EC34 | 12 | See Comment Note | 11 | 11 | yes | yes | | |
| EC44 | 17 | See Comment Note | 16 | 16 | yes | yes | | |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use Reason Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|--|---------------|
| EC47 | 23 | See Comment Note | 24 | 24 | yes | yes | | |
| EC48 | 17 | See Comment Note | 16.5 | 17 | yes | yes | | |
| EC50 | 31 | See Comment Note | 30.5 | 31 | yes | yes | | |
| EC51 | 28 | See Comment Note | 32 | 32 | yes | yes | | |
| EC52 | 13 | See Comment Note | 13 | 13 | yes | yes | | |
| EC58 | 20 | See Comment Note | 21.5 | 22 | yes | yes | | |
| EC59 | 16 | See Comment Note | 15 | 15 | yes | yes | | |
| EC65 | 19 | See Comment Note | 23 | 23 | yes | yes | | |
| EC66 | 4 | See Comment Note | 3.5 | 4 | yes | yes | | |
| EC71 | 18 | See Comment Note | 18.5 | 19 | yes | yes | | |
| EC77 | 9 | See Comment Note | 9.5 | 10 | yes | yes | | |
| EC78 | 9 | See Comment Note | 11.5 | 12 | yes | yes | | |
| EC79 | 22 | See Comment Note | 23.5 | 24 | yes | yes | | |
| EC80 | 17 | See Comment Note | 17.5 | 18 | yes | yes | | |
| 03014 | 2 | See Comment Note | 1.5 | 2 | no | yes | Non-random box; excluded from age structure analysis | |
| 03020 | 2 | See Comment Note | 2 | 2 | no | yes | Non-random box; excluded from age structure analysis | |
| 03021 | 5 | See Comment Note | 5 | 5 | no | yes | Non-random box; excluded from age structure analysis | |
| 03126 | 33 | See Comment Note | 32.5 | 33 | no | yes | Non-random box; excluded from age structure analysis | |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use Reason Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|--|---------------|
| 03134 | 37 | See Comment Note | 37 | 37 | no | yes | Non-random box; excluded from age structure analysis | |
| 03194 | 33 | See Comment Note | 38.5 | 39 | no | yes | Non-random box; excluded from age structure analysis | |
| 1058 | 1 | See Comment Note | 1 | 1 | no | yes | Non-random box; excluded from age structure analysis | |
| 1072 | 24 | See Comment Note | 23 | 23 | no | yes | Non-random box; excluded from age structure analysis | |
| 1180 | 20 | See Comment Note | 26 | 26 | no | yes | Non-random box; excluded from age structure analysis | |
| 1190 | 15 | See Comment Note | 15.5 | 16 | no | yes | Non-random box; excluded from age structure analysis | |
| 1221 | 20 | See Comment Note | 19.5 | 20 | no | yes | Non-random box; excluded from age structure analysis | |
| 1281 | 33 | See Comment Note | 30 | 30 | no | yes | Non-random box; excluded from age structure analysis | |
| 1335 | 15 | See Comment Note | 15 | 15 | no | yes | Non-random box; excluded from age structure analysis | |
| 1363 | 30 | See Comment Note | 24.5 | 25 | no | yes | Non-random box; excluded from age structure analysis | |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use Reason Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|--|---------------|
| 1376 | 12 | See Comment Note | 12.5 | 13 | no | yes | Non-random box; excluded from age structure analysis | |
| 1390 | 22 | See Comment Note | 24 | 24 | no | yes | Non-random box; excluded from age structure analysis | |
| 1391 | 39 | See Comment Note | 31 | 31 | no | yes | Non-random box; excluded from age structure analysis | |
| 1458 | 1 | See Comment Note | 1.5 | 2 | no | yes | Non-random box; excluded from age structure analysis | |
| 771 | 4 | See Comment Note | 4.5 | 5 | no | yes | Non-random box; excluded from age structure analysis | |
| 807 | 5 | See Comment Note | 6 | 6 | no | yes | Non-random box; excluded from age structure analysis | |
| EC160 | 28 | See Comment Note | 27 | 27 | no | yes | Non-random box; excluded from age structure analysis | |
| EC196 | 21 | See Comment Note | 21 | 21 | no | yes | Non-random box; excluded from age structure analysis | |
| EC198 | 28 | See Comment Note | 26 | 26 | no | yes | Non-random box; excluded from age structure analysis | |
| EC217 | 35 | See Comment Note | 33.5 | 34 | no | yes | Non-random box; excluded from age structure analysis | |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use Reason Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|--|---------------|
| EC227 | 24 | See Comment Note | 22.5 | 23 | no | yes | Non-random box; excluded from age structure analysis | |
| EC228 | 27 | See Comment Note | 23 | 23 | no | yes | Non-random box; excluded from age structure analysis | |
| EC289 | 17 | See Comment Note | 18.5 | 19 | no | yes | Non-random box; excluded from age structure analysis | |
| EC293 | 25 | See Comment Note | 26.5 | 27 | no | yes | Non-random box; excluded from age structure analysis | |
| EC314 | 3 | See Comment Note | 2.5 | 3 | no | yes | Non-random box; excluded from age structure analysis | |
| EC333 | 36 | See Comment Note | 36 | 36 | no | yes | Non-random box; excluded from age structure analysis | |
| 01826 | 25 | See Comment Note | 20 | 20 | no | yes | Non-random box; excluded from age structure analysis | |
| 01858 | 17 | See Comment Note | 16.5 | 17 | no | yes | Non-random box; excluded from age structure analysis | |
| 02161 | 19 | See Comment Note | 17.5 | 18 | no | yes | Non-random box; excluded from age structure analysis | |
| 02286 | 1 | See Comment Note | 1 | 1 | no | yes | Non-random box; excluded from age structure analysis | |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use Reason Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|--|---------------|
| 02372 | 28 | See Comment Note | 24 | 24 | no | yes | Non-random box; excluded from age structure analysis | |
| 02504 | 24 | See Comment Note | 22 | 22 | no | yes | Non-random box; excluded from age structure analysis | |
| 02554 | 21 | See Comment Note | 20.5 | 21 | no | yes | Non-random box; excluded from age structure analysis | |
| 02582 | 2 | See Comment Note | 2 | 2 | no | yes | Non-random box; excluded from age structure analysis | |
| 217 | 32 | See Comment Note | 26.5 | 27 | no | yes | Non-random box; excluded from age structure analysis | |
| 244 | 2 | See Comment Note | 2 | 2 | no | yes | Non-random box; excluded from age structure analysis | |
| 264 | 3 | See Comment Note | 2.5 | 3 | no | yes | Non-random box; excluded from age structure analysis | |
| 267 | 32 | See Comment Note | 30 | 30 | no | yes | Non-random box; excluded from age structure analysis | |
| 287 | 15 | See Comment Note | 14.5 | 15 | no | yes | Non-random box; excluded from age structure analysis | |
| 315 | 24 | See Comment Note | 24.5 | 25 | no | yes | Non-random box; excluded from age structure analysis | |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use Reason Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|--|---------------|
| 325 | 2 | See Comment Note | 2 | 2 | no | yes | Non-random box; excluded from age structure analysis | |
| 341 | 31 | See Comment Note | 29 | 29 | no | yes | Non-random box; excluded from age structure analysis | |
| 378 | 27 | See Comment Note | 26 | 26 | no | yes | Non-random box; excluded from age structure analysis | |
| 395 | 27 | See Comment Note | 23.5 | 24 | no | yes | Non-random box; excluded from age structure analysis | |
| 409 | 3 | See Comment Note | 3 | 3 | no | yes | Non-random box; excluded from age structure analysis | |
| 417 | 6 | See Comment Note | 6 | 6 | no | yes | Non-random box; excluded from age structure analysis | |
| 486 | 12 | See Comment Note | 12 | 12 | no | yes | Non-random box; excluded from age structure analysis | |
| 488 | 14 | See Comment Note | 14.5 | 15 | no | yes | Non-random box; excluded from age structure analysis | |
| 532 | 26 | See Comment Note | 26.5 | 27 | no | yes | Non-random box; excluded from age structure analysis | |
| EC100 | 22 | See Comment Note | 22 | 22 | no | yes | Non-random box; excluded from age structure analysis | |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use Reason Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|--|---------------|
| EC124 | 1 | See Comment Note | 1 | 1 | no | yes | Non-random box; excluded from age structure analysis | |
| EC33 | 26 | See Comment Note | 28 | 28 | no | yes | Non-random box; excluded from age structure analysis | |
| EC342 | 24 | See Comment Note | 20 | 20 | no | yes | Non-random box; excluded from age structure analysis | |
| EC391 | 26 | See Comment Note | 25 | 25 | no | yes | Non-random box; excluded from age structure analysis | |
| EC60 | 10 | See Comment Note | 7 | 7 | no | yes | Non-random box; excluded from age structure analysis | |
| EC88 | 22 | See Comment Note | 20 | 20 | no | yes | Non-random box; excluded from age structure analysis | |
| 01688 | 18 | See Comment Note | 16 | 16 | yes | yes | | |
| 01715 | 19 | See Comment Note | 20 | 20 | yes | yes | | |
| 01757 | 21 | See Comment Note | 21 | 21 | yes | yes | | |
| 01771 | 27 | See Comment Note | 28.5 | 29 | yes | yes | | |
| 01779 | 4 | See Comment Note | 4 | 4 | yes | yes | | |
| 01783 | 29 | See Comment Note | 22 | 22 | yes | yes | | |
| 01787 | 5 | See Comment Note | 4 | 4 | yes | yes | | |
| 01803 | 10 | See Comment Note | 10.5 | 11 | yes | yes | | |
| 01811 | 12 | See Comment Note | 12 | 12 | yes | yes | | |
| 01818 | 15 | See Comment Note | 15 | 15 | yes | yes | | |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use | Reason | Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|-----|--------|---------|---------------|
| 01825 | 15 | See Comment Note | 15.5 | 16 | yes | yes | | | | |
| 01832 | 4 | See Comment Note | 4 | 4 | yes | yes | | | | |
| 01841 | 7 | See Comment Note | 7 | 7 | yes | yes | | | | |
| 01867 | 16 | See Comment Note | 17 | 17 | yes | yes | | | | |
| 01883 | 32 | See Comment Note | 29 | 29 | yes | yes | | | | |
| 01888 | 8 | See Comment Note | 7.5 | 8 | yes | yes | | | | |
| 01889 | 8 | See Comment Note | 7 | 7 | yes | yes | | | | |
| 01901 | 4 | See Comment Note | 4 | 4 | yes | yes | | | | |
| 01904 | 21 | See Comment Note | 21 | 21 | yes | yes | | | | |
| 01948 | 2 | See Comment Note | 2.5 | 3 | yes | yes | | | | |
| 01949 | 15 | See Comment Note | 15.5 | 16 | yes | yes | | | | |
| 01976 | 20 | See Comment Note | 19 | 19 | yes | yes | | | | |
| 01985 | 6 | See Comment Note | 4.5 | 5 | yes | yes | | | | |
| 02022 | 1 | See Comment Note | 1 | 1 | yes | yes | | | | |
| 02038 | 22 | See Comment Note | 21.5 | 22 | yes | yes | | | | |
| 02063 | 2 | See Comment Note | 2 | 2 | yes | yes | | | | |
| 02065 | 5 | See Comment Note | 5 | 5 | yes | yes | | | | |
| 02072 | 6 | See Comment Note | 8 | 8 | yes | yes | | | | |
| 02085 | 9 | See Comment Note | 10.5 | 11 | yes | yes | | | | |
| 02096 | 22 | See Comment Note | 22 | 22 | yes | yes | | | | |
| 02106 | 33 | See Comment Note | 27.5 | 28 | yes | yes | | | | |
| 02110 | 20 | See Comment Note | 21 | 21 | yes | yes | | | | |
| 02120 | 11 | See Comment Note | 12.5 | 13 | yes | yes | | | | |
| 02143 | 8 | See Comment Note | 8.5 | 9 | yes | yes | | | | |

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| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use | Reason | Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|-----|--------|---------|---------------|
| 02151 | 24 | See Comment Note | 22 | 22 | yes | yes | | | | |
| 02157 | 19 | See Comment Note | 20 | 20 | yes | yes | | | | |
| 02164 | 21 | See Comment Note | 19 | 19 | yes | yes | | | | |
| 02176 | 15 | See Comment Note | 16.5 | 17 | yes | yes | | | | |
| 02182 | 18 | See Comment Note | 20 | 20 | yes | yes | | | | |
| 02191 | 13 | See Comment Note | 14 | 14 | yes | yes | | | | |
| 02203 | 8 | See Comment Note | 10.5 | 11 | yes | yes | | | | |
| 02207 | 16 | See Comment Note | 15 | 15 | yes | yes | | | | |
| 02216 | 20 | See Comment Note | 19 | 19 | yes | yes | | | | |
| 02221 | 15 | See Comment Note | 14 | 14 | yes | yes | | | | |
| 02250 | 14 | See Comment Note | 14 | 14 | yes | yes | | | | |
| 02270 | 14 | See Comment Note | 13.5 | 14 | yes | yes | | | | |
| 02275 | 13 | See Comment Note | 13.5 | 14 | yes | yes | | | | |
| 02283 | 2 | See Comment Note | 1.5 | 2 | yes | yes | | | | |
| 02285 | 19 | See Comment Note | 19.5 | 20 | yes | yes | | | | |
| 02288 | 20 | See Comment Note | 22 | 22 | yes | yes | | | | |
| 02306 | 12 | See Comment Note | 12.5 | 13 | yes | yes | | | | |
| 02307 | 15 | See Comment Note | 15.5 | 16 | yes | yes | | | | |
| 02311 | 5 | See Comment Note | 4.5 | 5 | yes | yes | | | | |
| 02344 | 27 | See Comment Note | 27 | 27 | yes | yes | | | | |
| 02345 | 31 | See Comment Note | 31 | 31 | yes | yes | | | | |
| 02360 | 18 | See Comment Note | 20 | 20 | yes | yes | | | | |
| 02368 | 9 | See Comment Note | 9.5 | 10 | yes | yes | | | | |
| 02373 | 1 | See Comment Note | 1 | 1 | yes | yes | | | | |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use | Reason | Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|-----|--------|---------|---------------|
| 02374 | 2 | See Comment Note | 2 | 2 | yes | yes | | | | |
| 02390 | 8 | See Comment Note | 9 | 9 | yes | yes | | | | |
| 02418 | 18 | See Comment Note | 18 | 18 | yes | yes | | | | |
| 02423 | 22 | See Comment Note | 20 | 20 | yes | yes | | | | |
| 02450 | 20 | See Comment Note | 19.5 | 20 | yes | yes | | | | |
| 02452 | 17 | See Comment Note | 17.5 | 18 | yes | yes | | | | |
| 02456 | 23 | See Comment Note | 22 | 22 | yes | yes | | | | |
| 02464 | 12 | See Comment Note | 13 | 13 | yes | yes | | | | |
| 02467 | 31 | See Comment Note | 27.5 | 28 | yes | yes | | | | |
| 02469 | 17 | See Comment Note | 18.5 | 19 | yes | yes | | | | |
| 02482 | 8 | See Comment Note | 7.5 | 8 | yes | yes | | | | |
| 02495 | 8 | See Comment Note | 8.5 | 9 | yes | yes | | | | |
| 02521 | 5 | See Comment Note | 5 | 5 | yes | yes | | | | |
| 02536 | 7 | See Comment Note | 6.5 | 7 | yes | yes | | | | |
| 02541 | 8 | See Comment Note | 8.5 | 9 | yes | yes | | | | |
| 02549 | 18 | See Comment Note | 18.5 | 19 | yes | yes | | | | |
| 02553 | 19 | See Comment Note | 19 | 19 | yes | yes | | | | |
| 02563 | 18 | See Comment Note | 19 | 19 | yes | yes | | | | |
| 02568 | 18 | See Comment Note | 19 | 19 | yes | yes | | | | |
| 02585 | 3 | See Comment Note | 2.5 | 3 | yes | yes | | | | |
| 02606 | 17 | See Comment Note | 17.5 | 18 | yes | yes | | | | |
| 02641 | 20 | See Comment Note | 19.5 | 20 | yes | yes | | | | |
| 02651 | 22 | See Comment Note | 21.5 | 22 | yes | yes | | | | |
| 02674 | 19 | See Comment Note | 20 | 20 | yes | yes | | | | |

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| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use Reason Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|--------------------|---------------|
| 02677 | 6 | See Comment Note | 6 | 6 | yes | yes | | |
| 02706 | 4 | See Comment Note | 5 | 5 | yes | yes | | |
| 02714 | 9 | See Comment Note | 9.5 | 10 | yes | yes | | |
| 02716 | 13 | See Comment Note | 14.5 | 15 | yes | yes | | |
| 02733 | 26 | See Comment Note | 25 | 25 | yes | yes | | |
| EC382 | 3 | See Comment Note | 2.5 | 3 | yes | yes | | |
| EC385 | 3 | See Comment Note | 2.5 | 3 | yes | yes | | |
| EC392 | 5 | See Comment Note | 5.5 | 6 | yes | yes | | |
| 00737 | 18 | See Comment Note | 15.5 | 16 | yes | yes | | |
| 00860 | 5 | See Comment Note | 5 | 5 | yes | yes | | |
| 00861 | 8 | See Comment Note | 7 | 7 | yes | yes | | |
| 00904 | 6 | See Comment Note | 6 | 6 | yes | yes | | |
| 00906 | 10 | See Comment Note | 10.5 | 11 | yes | yes | | |
| 00908 | 22 | See Comment Note | 18 | 18 | yes | yes | | |
| 00909 | 9 | See Comment Note | 8.5 | 9 | yes | yes | | |
| 00919 | 16 | See Comment Note | 16.5 | 17 | yes | yes | | |
| 00921 | 9 | See Comment Note | 9 | 9 | yes | yes | | |
| 00922 | 15 | See Comment Note | 15 | 15 | yes | yes | | |
| 00923 | 13 | See Comment Note | 11.5 | 12 | yes | yes | | |
| 00935 | 8 | See Comment Note | 9 | 9 | yes | yes | | |
| 00938 | 10 | See Comment Note | 8 | 8 | yes | yes | | |
| 00946 | 7 | See Comment Note | 8 | 8 | yes | yes | | |
| 00961 | 20 | See Comment Note | 16.5 | 17 | yes | yes | | |
| 00962 | 11 | See Comment Note | 10.5 | 11 | yes | yes | | |

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| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use Reason Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|--------------------|---------------|
| 00963 | 26 | See Comment Note | 21.5 | 22 | yes | yes | | |
| 00970 | 22 | See Comment Note | 17 | 17 | yes | yes | | |
| 00986 | 1 | See Comment Note | 1 | 1 | yes | yes | | |
| 00988 | 8 | See Comment Note | 8.5 | 9 | yes | yes | | |
| 00990 | 6 | See Comment Note | 6 | 6 | yes | yes | | |
| 00997 | 8 | See Comment Note | 8.5 | 9 | yes | yes | | |
| 00998 | 14 | See Comment Note | 12 | 12 | yes | yes | | |
| 01001 | 19 | See Comment Note | 17 | 17 | yes | yes | | |
| 01026 | 5 | See Comment Note | 5.5 | 6 | yes | yes | | |
| 01027 | 22 | See Comment Note | 16 | 16 | yes | yes | | |
| 01073 | 31 | See Comment Note | 23 | 23 | yes | yes | | |
| 01075 | 26 | See Comment Note | 20 | 20 | yes | yes | | |
| 01124 | 3 | See Comment Note | 3.5 | 4 | yes | yes | | |
| 01125 | 14 | See Comment Note | 13 | 13 | yes | yes | | |
| 01126 | 28 | See Comment Note | 25.5 | 26 | yes | yes | | |
| 01170 | 18 | See Comment Note | 11 | 11 | yes | yes | | |
| 01173 | 3 | See Comment Note | 8 | 8 | yes | yes | | |
| 01174 | 19 | See Comment Note | 17 | 17 | yes | yes | | |
| 01176 | 17 | See Comment Note | 15.5 | 16 | yes | yes | | |
| 01185 | 18 | See Comment Note | 15.5 | 16 | yes | yes | | |
| 01187 | 3 | See Comment Note | 2.5 | 3 | yes | yes | | |
| 01188 | 16 | See Comment Note | 15.5 | 16 | yes | yes | | |
| 01222 | 3 | See Comment Note | 2 | 2 | yes | yes | | |
| 01228 | 1 | See Comment Note | 1 | 1 | yes | yes | | |

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| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use | Reason | Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|-----|--------|---------|---------------|
| 01229 | 6 | See Comment Note | 5 | 5 | yes | yes | | | | |
| 01233 | 13 | See Comment Note | 11.5 | 12 | yes | yes | | | | |
| 01235 | 20 | See Comment Note | 15 | 15 | yes | yes | | | | |
| 01260 | 10 | See Comment Note | 9 | 9 | yes | yes | | | | |
| 01261 | 1 | See Comment Note | 1 | 1 | yes | yes | | | | |
| 01336 | 21 | See Comment Note | 18 | 18 | yes | yes | | | | |
| 01338 | 1 | See Comment Note | 1 | 1 | yes | yes | | | | |
| 01343 | 23 | See Comment Note | 18.5 | 19 | yes | yes | | | | |
| 01347 | 26 | See Comment Note | 20.5 | 21 | yes | yes | | | | |
| 01360 | 1 | See Comment Note | 1 | 1 | yes | yes | | | | |
| 01362 | 12 | See Comment Note | 11 | 11 | yes | yes | | | | |
| 01364 | 18 | See Comment Note | 18 | 18 | yes | yes | | | | |
| 01377 | 8 | See Comment Note | 8 | 8 | yes | yes | | | | |
| 01378 | 17 | See Comment Note | 15.5 | 16 | yes | yes | | | | |
| 01389 | 28 | See Comment Note | 24.5 | 25 | yes | yes | | | | |
| 01393 | 27 | See Comment Note | 26 | 26 | yes | yes | | | | |
| 01394 | 17 | See Comment Note | 15 | 15 | yes | yes | | | | |
| 01395 | 40 | See Comment Note | 32.5 | 33 | yes | yes | | | | |
| 01398 | 15 | See Comment Note | 13 | 13 | yes | yes | | | | |
| 01400 | 9 | See Comment Note | 9 | 9 | yes | yes | | | | |
| 01401 | 4 | See Comment Note | 3 | 3 | yes | yes | | | | |
| 01402 | 16 | See Comment Note | 16.5 | 17 | yes | yes | | | | |
| 01403 | 12 | See Comment Note | 12 | 12 | yes | yes | | | | |
| 01413 | 8 | See Comment Note | 7.5 | 8 | yes | yes | | | | |

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| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use Reason Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|--|---------------|
| 01416 | 20 | See Comment Note | 15.5 | 16 | yes | yes | | |
| 01457 | 9 | See Comment Note | 10.5 | 11 | yes | yes | | |
| 01495 | 1 | See Comment Note | 1 | 1 | yes | yes | | |
| 01499 | 28 | See Comment Note | 23 | 23 | yes | yes | | |
| 01504 | 16 | See Comment Note | 16 | 16 | yes | yes | | |
| EC136 | 7 | See Comment Note | 7 | 7 | yes | yes | | |
| EC137 | 9 | See Comment Note | 9.5 | 10 | yes | yes | | |
| EC161 | 7 | See Comment Note | 8 | 8 | yes | yes | | |
| EC162 | 2 | See Comment Note | 3 | 3 | yes | yes | | |
| EC164 | 2 | See Comment Note | 2 | 2 | yes | yes | | |
| EC166 | 2 | See Comment Note | 1.5 | 2 | yes | yes | | |
| EC169 | 1 | See Comment Note | 1 | 1 | yes | yes | | |
| EC170 | | See Comment Note | <1 | <1 | no | no | No growth annuli, ~Age 0.5; excluded from Age Structure and von Bertalanffy analyses | |
| EC178 | | See Comment Note | <1 | <1 | no | no | No growth annuli, ~Age 0.5; excluded from Age Structure and von Bertalanffy analyses | |
| EC179 | 1 | See Comment Note | 1 | 1 | yes | yes | | |
| EC180 | | See Comment Note | <1 | <1 | no | no | No growth annuli, ~Age 0.5; excluded from Age Structure and von Bertalanffy analyses | |
| EC181 | 3 | See Comment Note | 3 | 3 | yes | yes | | |
| EC191 | 1 | See Comment Note | 1 | 1 | yes | yes | | |
| EC197 | 27 | See Comment Note | 24 | 24 | yes | yes | | |
| EC202 | 1 | See Comment Note | 1 | 1 | yes | yes | | |

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| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use Reason Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|--|---------------|
| EC203 | | See Comment Note | <1 | <1 | no | no | No growth annuli, ~Age 0.5; excluded from Age Structure and von Bertalanffy analyses | |
| EC204 | | See Comment Note | <1 | <1 | no | no | No growth annuli, ~Age 0.5; excluded from Age Structure and von Bertalanffy analyses | |
| EC209 | 21 | See Comment Note | 20.5 | 21 | yes | yes | | |
| EC211 | 2 | See Comment Note | 2.5 | 3 | yes | yes | | |
| EC232 | 1 | See Comment Note | 1 | 1 | yes | yes | | |
| EC242 | 1 | See Comment Note | 1 | 1 | yes | yes | | |
| 00623 | 6 | See Comment Note | 5.5 | 6 | yes | yes | | |
| 00635 | 11 | See Comment Note | 10.5 | 11 | yes | yes | | |
| 00641 | 10 | See Comment Note | 8.5 | 9 | yes | yes | | |
| 00656 | 6 | See Comment Note | 5.5 | 6 | yes | yes | | |
| 00681 | 14 | See Comment Note | 10.5 | 11 | yes | yes | | |
| 00688 | 10 | See Comment Note | 8 | 8 | yes | yes | | |
| 00709 | 3 | See Comment Note | 3 | 3 | yes | yes | | |
| 00753 | 11 | See Comment Note | 8.5 | 9 | yes | yes | | |
| 00756 | 7 | See Comment Note | 6.5 | 7 | yes | yes | | |
| 00762 | 11 | See Comment Note | 10.5 | 11 | yes | yes | | |
| 00763 | 16 | See Comment Note | 11.5 | 12 | yes | yes | | |
| 00776 | 12 | See Comment Note | 11 | 11 | yes | yes | | |
| 00799 | 19 | See Comment Note | 15 | 15 | yes | yes | | |
| 00805 | 19 | See Comment Note | 12.5 | 13 | yes | yes | | |
| 00808 | 6 | See Comment Note | 4.5 | 5 | yes | yes | | |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use | Reason | Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|-----|--------|---------|---------------|
| 00814 | 16 | See Comment Note | 12.5 | 13 | yes | yes | | | | |
| 00815 | 12 | See Comment Note | 10 | 10 | yes | yes | | | | |
| 00827 | 5 | See Comment Note | 4.5 | 5 | yes | yes | | | | |
| 00829 | 18 | See Comment Note | 13 | 13 | yes | yes | | | | |
| 00848 | 20 | See Comment Note | 13 | 13 | yes | yes | | | | |
| 00852 | 24 | See Comment Note | 22 | 22 | yes | yes | | | | |
| 00857 | 26 | See Comment Note | 19 | 19 | yes | yes | | | | |
| 00864 | 20 | See Comment Note | 15 | 15 | yes | yes | | | | |
| 00868 | 20 | See Comment Note | 14.5 | 15 | yes | yes | | | | |
| 00875 | 16 | See Comment Note | 13.5 | 14 | yes | yes | | | | |
| 00881 | 1 | See Comment Note | 1 | 1 | yes | yes | | | | |
| 00889 | 17 | See Comment Note | 12.5 | 13 | yes | yes | | | | |
| 00890 | 14 | See Comment Note | 13 | 13 | yes | yes | | | | |
| 00894 | 20 | See Comment Note | 13 | 13 | yes | yes | | | | |
| 00925 | 6 | See Comment Note | 5.5 | 6 | yes | yes | | | | |
| 00929 | 9 | See Comment Note | 9 | 9 | yes | yes | | | | |
| 00932 | 23 | See Comment Note | 16.5 | 17 | yes | yes | | | | |
| 00933 | 20 | See Comment Note | 15.5 | 16 | yes | yes | | | | |
| 00956 | 15 | See Comment Note | 9.5 | 10 | yes | yes | | | | |
| 00977 | 14 | See Comment Note | 10.5 | 11 | yes | yes | | | | |
| 00980 | 4 | See Comment Note | 3.5 | 4 | yes | yes | | | | |
| 01004 | 20 | See Comment Note | 12.5 | 13 | yes | yes | | | | |
| 01014 | 24 | See Comment Note | 16.5 | 17 | yes | yes | | | | |
| 01042 | 14 | See Comment Note | 13.5 | 14 | yes | yes | | | | |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use | Reason | Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|-----|--------|---------|---------------|
| 01047 | 20 | See Comment Note | 12.5 | 13 | yes | yes | | | | |
| 01053 | 1 | See Comment Note | 1 | 1 | yes | yes | | | | |
| 01054 | 7 | See Comment Note | 5 | 5 | yes | yes | | | | |
| 01067 | 18 | See Comment Note | 12.5 | 13 | yes | yes | | | | |
| 01076 | 5 | See Comment Note | 6 | 6 | yes | yes | | | | |
| 01089 | 14 | See Comment Note | 13.5 | 14 | yes | yes | | | | |
| 01098 | 20 | See Comment Note | 17 | 17 | yes | yes | | | | |
| 01105 | 29 | See Comment Note | 25 | 25 | yes | yes | | | | |
| 01106 | 2 | See Comment Note | 2 | 2 | yes | yes | | | | |
| 01114 | 12 | See Comment Note | 12 | 12 | yes | yes | | | | |
| 01123 | 26 | See Comment Note | 19 | 19 | yes | yes | | | | |
| 01144 | 22 | See Comment Note | 18.5 | 19 | yes | yes | | | | |
| 01152 | 17 | See Comment Note | 13.5 | 14 | yes | yes | | | | |
| 01168 | 18 | See Comment Note | 16 | 16 | yes | yes | | | | |
| 01178 | 19 | See Comment Note | 19 | 19 | yes | yes | | | | |
| 01196 | 12 | See Comment Note | 10.5 | 11 | yes | yes | | | | |
| 01214 | 27 | See Comment Note | 20 | 20 | yes | yes | | | | |
| 01220 | 21 | See Comment Note | 20 | 20 | yes | yes | | | | |
| 01246 | 3 | See Comment Note | 3 | 3 | yes | yes | | | | |
| 01248 | 6 | See Comment Note | 6 | 6 | yes | yes | | | | |
| 01276 | 18 | See Comment Note | 18 | 18 | yes | yes | | | | |
| 01297 | 26 | See Comment Note | 21 | 21 | yes | yes | | | | |
| 01298 | 27 | See Comment Note | 20.5 | 21 | yes | yes | | | | |
| 01302 | 12 | See Comment Note | 9 | 9 | yes | yes | | | | |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use | Reason | Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|-----|--------|---------|---------------|
| 01305 | 11 | See Comment Note | 9 | 9 | yes | yes | | | | |
| 01313 | 21 | See Comment Note | 19.5 | 20 | yes | yes | | | | |
| 01385 | 19 | See Comment Note | 14 | 14 | yes | yes | | | | |
| 01405 | 8 | See Comment Note | 9 | 9 | yes | yes | | | | |
| 01409 | 18 | See Comment Note | 14 | 14 | yes | yes | | | | |
| 01417 | 14 | See Comment Note | 11 | 11 | yes | yes | | | | |
| 01419 | 12 | See Comment Note | 10 | 10 | yes | yes | | | | |
| 01420 | 15 | See Comment Note | 13 | 13 | yes | yes | | | | |
| 01428 | 6 | See Comment Note | 6.5 | 7 | yes | yes | | | | |
| 01435 | 18 | See Comment Note | 12.5 | 13 | yes | yes | | | | |
| 01437 | 17 | See Comment Note | 16 | 16 | yes | yes | | | | |
| 01449 | 17 | See Comment Note | 11.5 | 12 | yes | yes | | | | |
| 01451 | 25 | See Comment Note | 24.5 | 25 | yes | yes | | | | |
| 01454 | 13 | See Comment Note | 11.5 | 12 | yes | yes | | | | |
| 01467 | 21 | See Comment Note | 20 | 20 | yes | yes | | | | |
| 01474 | 15 | See Comment Note | 15 | 15 | yes | yes | | | | |
| 01491 | 12 | See Comment Note | 12 | 12 | yes | yes | | | | |
| 01512 | 5 | See Comment Note | 5.5 | 6 | yes | yes | | | | |
| EC129 | 6 | See Comment Note | 7.5 | 8 | yes | yes | | | | |
| EC132 | 5 | See Comment Note | 4.5 | 5 | yes | yes | | | | |
| EC145 | 8 | See Comment Note | 7.5 | 8 | yes | yes | | | | |
| EC151 | 7 | See Comment Note | 6.5 | 7 | yes | yes | | | | |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use Reason Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|--|---------------|
| EC188 | | See Comment Note | <1 | <1 | no | no | No growth annuli, ~Age 0.5; excluded from Age Structure and von Bertalanffy analyses | |
| EC222 | 1 | See Comment Note | 1 | 1 | yes | yes | | |
| EC226 | 1 | See Comment Note | 1 | 1 | yes | yes | | |
| EC236 | | See Comment Note | <1 | <1 | no | no | No growth annuli, ~Age 0.5; excluded from Age Structure and von Bertalanffy analyses | |
| EC240 | | See Comment Note | <1 | <1 | no | no | No growth annuli, ~Age 0.5; excluded from Age Structure and von Bertalanffy analyses | |
| 02740 | 16 | See Comment Note | 12.5 | 13 | yes | yes | | |
| 02741 | 9 | See Comment Note | 8.5 | 9 | yes | yes | | |
| 02756 | 23 | See Comment Note | 23.5 | 24 | yes | yes | | |
| 02758 | 20 | See Comment Note | 19 | 19 | yes | yes | | |
| 02775 | 26 | See Comment Note | 25 | 25 | yes | yes | | |
| 02783 | 25 | See Comment Note | 25 | 25 | yes | yes | | |
| 02802 | 18 | See Comment Note | 18.5 | 19 | yes | yes | | |
| 02803 | 20 | See Comment Note | 19.5 | 20 | yes | yes | | |
| 02807 | 30 | See Comment Note | 28.5 | 29 | yes | yes | | |
| 02810 | 45 | See Comment Note | 35 | 35 | yes | yes | | |
| 02812 | 21 | See Comment Note | 22 | 22 | yes | yes | | |
| 02846 | 26 | See Comment Note | 21 | 21 | yes | yes | | |
| 02849 | 33 | See Comment Note | 25 | 25 | yes | yes | | |
| 02866 | 15 | See Comment Note | 18.5 | 19 | yes | yes | | |
| 02873 | 28 | See Comment Note | 29 | 29 | yes | yes | | |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use | Reason | Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|-----|--------|---------|---------------|
| 02883 | 23 | See Comment Note | 18.5 | 19 | yes | yes | | | | |
| 02897 | 34 | See Comment Note | 25.5 | 26 | yes | yes | | | | |
| 02906 | 31 | See Comment Note | 31 | 31 | yes | yes | | | | |
| 02911 | 20 | See Comment Note | 16.5 | 17 | yes | yes | | | | |
| 02913 | 19 | See Comment Note | 16 | 16 | yes | yes | | | | |
| 02916 | 16 | See Comment Note | 16 | 16 | yes | yes | | | | |
| 02937 | 18 | See Comment Note | 18.5 | 19 | yes | yes | | | | |
| 02958 | 1 | See Comment Note | 1 | 1 | yes | yes | | | | |
| 02961 | 20 | See Comment Note | 19 | 19 | yes | yes | | | | |
| 02963 | 22 | See Comment Note | 22 | 22 | yes | yes | | | | |
| 02966 | 19 | See Comment Note | 18.5 | 19 | yes | yes | | | | |
| 02974 | 24 | See Comment Note | 22.5 | 23 | yes | yes | | | | |
| 02989 | 3 | See Comment Note | 3 | 3 | yes | yes | | | | |
| 03007 | 3 | See Comment Note | 3 | 3 | yes | yes | | | | |
| 03025 | 15 | See Comment Note | 18 | 18 | yes | yes | | | | |
| 03026 | 15 | See Comment Note | 14.5 | 15 | yes | yes | | | | |
| 03033 | 18 | See Comment Note | 16 | 16 | yes | yes | | | | |
| 03051 | 22 | See Comment Note | 21.5 | 22 | yes | yes | | | | |
| 03052 | 21 | See Comment Note | 24 | 24 | yes | yes | | | | |
| 03058 | 16 | See Comment Note | 15.5 | 16 | yes | yes | | | | |
| 03062 | 17 | See Comment Note | 18 | 18 | yes | yes | | | | |
| 03076 | 9 | See Comment Note | 12 | 12 | yes | yes | | | | |
| 03080 | 22 | See Comment Note | 20 | 20 | yes | yes | | | | |
| 03098 | 15 | See Comment Note | 17 | 17 | yes | yes | | | | |

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| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use Reason Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|---|---------------|
| 03102 | 19 | See Comment Note | 17.5 | 18 | yes | yes | | |
| 03109 | 31 | See Comment Note | 27.5 | 28 | yes | yes | | |
| 03124 | 14 | See Comment Note | 14 | 14 | yes | yes | | |
| 03128 | 16 | See Comment Note | 14 | 14 | yes | yes | | |
| 03133 | 28 | See Comment Note | 26.5 | 27 | yes | yes | | |
| 03140 | 15 | See Comment Note | 14.5 | 15 | yes | yes | | |
| 03142 | 14 | See Comment Note | 15.5 | 16 | yes | yes | | |
| 03144 | 19 | See Comment Note | 27.5 | 28 | yes | yes | | |
| 03145 | 8 | See Comment Note | 13 | 13 | yes | yes | | |
| 03160 | 16 | See Comment Note | 20.5 | 21 | yes | yes | | |
| 03165 | 27 | See Comment Note | 30 | 30 | yes | yes | | |
| 03180 | 20 | See Comment Note | 25 | 25 | yes | yes | | |
| 03181 | 1 | See Comment Note | 1 | 1 | yes | yes | | |
| 03190 | 14 | See Comment Note | 18 | 18 | yes | yes | | |
| 03211 | 16 | See Comment Note | 17.5 | 18 | yes | yes | | |
| 03224 | 21 | See Comment Note | 20 | 20 | yes | yes | | |
| 03225 | 19 | See Comment Note | 20.5 | 21 | yes | yes | | |
| 03238 | 9 | See Comment Note | 13.5 | 14 | yes | yes | | |
| 03245 | 9 | See Comment Note | 9 | 9 | yes | yes | | |
| 03253 | | See Comment Note | ≥12 | ≥12 | no | no | Section too thick to accurately count annuli to estimate mussel age; therefore, it was excluded from Age Structure and von Bertalanffy analyses | |
| 03261 | 16 | See Comment Note | 17.5 | 18 | yes | yes | | |
| 03273 | 14 | See Comment Note | 15 | 15 | yes | yes | | |

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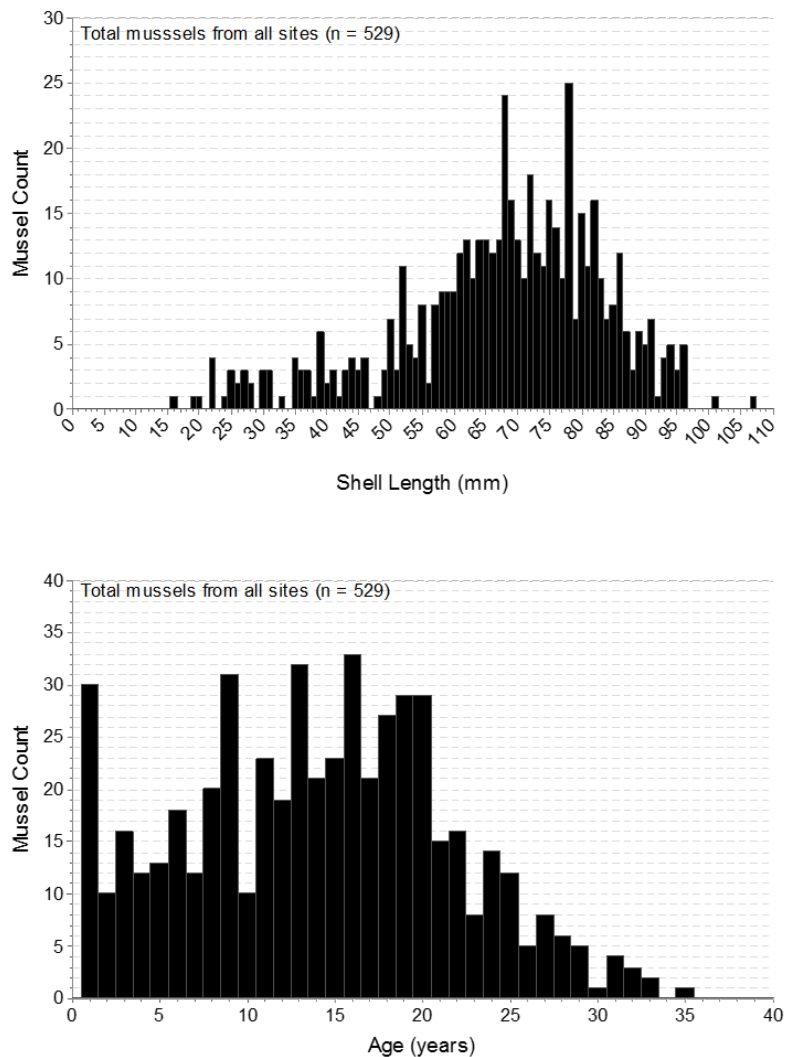
| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use Reason Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|---|---------------|
| 03282 | 27 | See Comment Note | 26.5 | 27 | yes | yes | | |
| 03283 | 24 | See Comment Note | 23.5 | 24 | yes | yes | | |
| 03288 | 10 | See Comment Note | 12 | 12 | yes | yes | | |
| 03292 | 18 | See Comment Note | 19.5 | 20 | yes | yes | | |
| 03298 | 18 | See Comment Note | 18.5 | 19 | yes | yes | | |
| 03309 | 19 | See Comment Note | 21 | 21 | yes | yes | | |
| 03314 | 5 | See Comment Note | 4.5 | 5 | yes | yes | | |
| 03315 | 3 | See Comment Note | 3.5 | 4 | yes | yes | | |
| 03316 | 7 | See Comment Note | 8.5 | 9 | yes | yes | | |
| 03317 | 9 | See Comment Note | 12.5 | 13 | yes | yes | | |
| 03325 | 22 | See Comment Note | 26 | 26 | yes | yes | | |
| 03333 | 27 | See Comment Note | 32 | 32 | yes | yes | | |
| 03340 | 16 | See Comment Note | 17 | 17 | yes | yes | | |
| 03382 | 24 | See Comment Note | 24 | 24 | yes | yes | | |
| 03386 | 19 | See Comment Note | 17.5 | 18 | yes | yes | | |
| 03402 | 17 | See Comment Note | 20 | 20 | yes | yes | | |
| 03412 | 18 | See Comment Note | 20 | 20 | yes | yes | | |
| 03413 | 26 | See Comment Note | 27 | 27 | yes | yes | | |
| 03428 | | See Comment Note | ≥17 | ≥17 | no | no | Section too thick to accurately count annuli to estimate mussel age; therefore, it was excluded from Age Structure and von Bertalanffy analyses | |
| 03433 | 20 | See Comment Note | 22.5 | 23 | yes | yes | | |
| 03442 | 19 | See Comment Note | 19.5 | 20 | yes | yes | | |
| 03463 | 3 | See Comment Note | 3 | 3 | yes | yes | | |

Appendix A1 - Part 2

| Shell Identification | 2nd Read | Date of 2nd Read | Mean Age | Mean Rounded Age | Used for age structure analyses? | Used for length-age growth curves? | Use Reason Comment | Aging Comment |
|----------------------|----------|------------------|----------|------------------|----------------------------------|------------------------------------|---|---------------|
| 03466 | 7 | See Comment Note | 8.5 | 9 | yes | yes | | |
| 03468 | 14 | See Comment Note | 16.5 | 17 | yes | yes | | |
| 03469 | 12 | See Comment Note | 19 | 19 | yes | yes | | |
| 03479 | 20 | See Comment Note | 19.5 | 20 | yes | yes | | |
| EC287 | 12 | See Comment Note | 12.5 | 13 | yes | yes | | |
| EC295 | | See Comment Note | ≥13 | ≥13 | no | no | Section too thick to accurately count annuli to estimate mussel age; therefore, it was excluded from Age Structure and von Bertalanffy analyses | |
| EC303 | 11 | See Comment Note | 13 | 13 | yes | yes | | |

Appendix A2 Length and Age Frequency Histograms of Randomly Selected Hudson River *Elliptio complanata*¹⁸

Figure A2.1 Length and age frequency histograms of randomly selected *Elliptio complanata* from four Hudson River pools (n = 6) in the before-remediation (BR) and non-remediated (NR) strata. Surveyed areas include the Thompson Island Pool (River Section 1, Reach 8; TIP, NR), Fort Miller Pool (River Section 2, Reach 7; FMP, BR and NR), Northumberland Pool (River Section 2, Reach 6; NUP, NR), and Stillwater Pool (River Section 3, Reach 5; SWP, BR and NR).



¹⁸ Mussel shells from 2013 and 2015 surveys of HRNRT 2020.

Figure A2.2

Length and age frequency histograms of randomly selected *Elliptio complanata* from the Hudson River at the Fort Miller Pool (River Section 2, Reach 7; FMP, combined before-remediation and non-remediated).

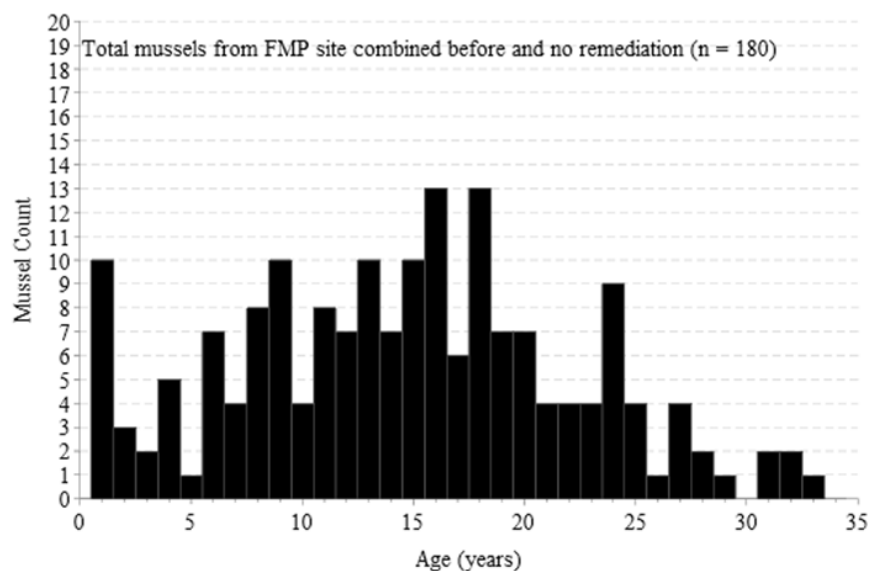
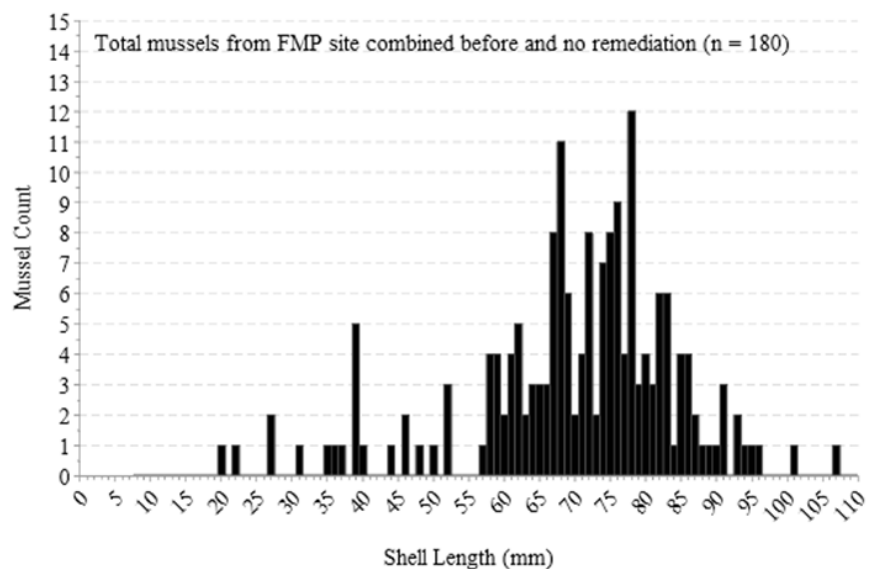


Figure A2.3 Length and age frequency histograms of randomly selected *Elliptio complanata* from the Hudson River at the Fort Miller Pool (River Section 2, Reach 7; FMP, before-remediation).

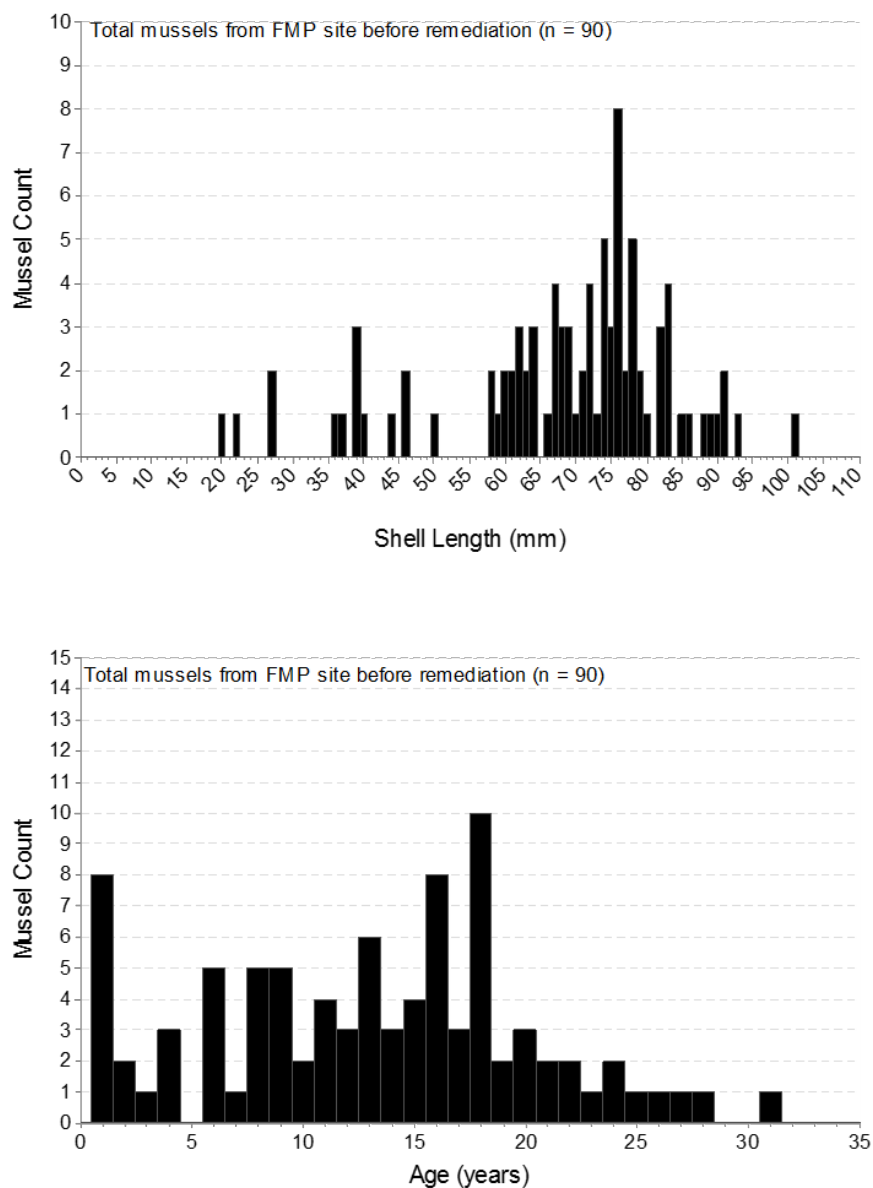


Figure A2.4

Length and age frequency histograms of randomly selected *Elliptio complanata* from the Hudson River at the Fort Miller Pool (River Section 2, Reach 7; FMP, non-remediated).

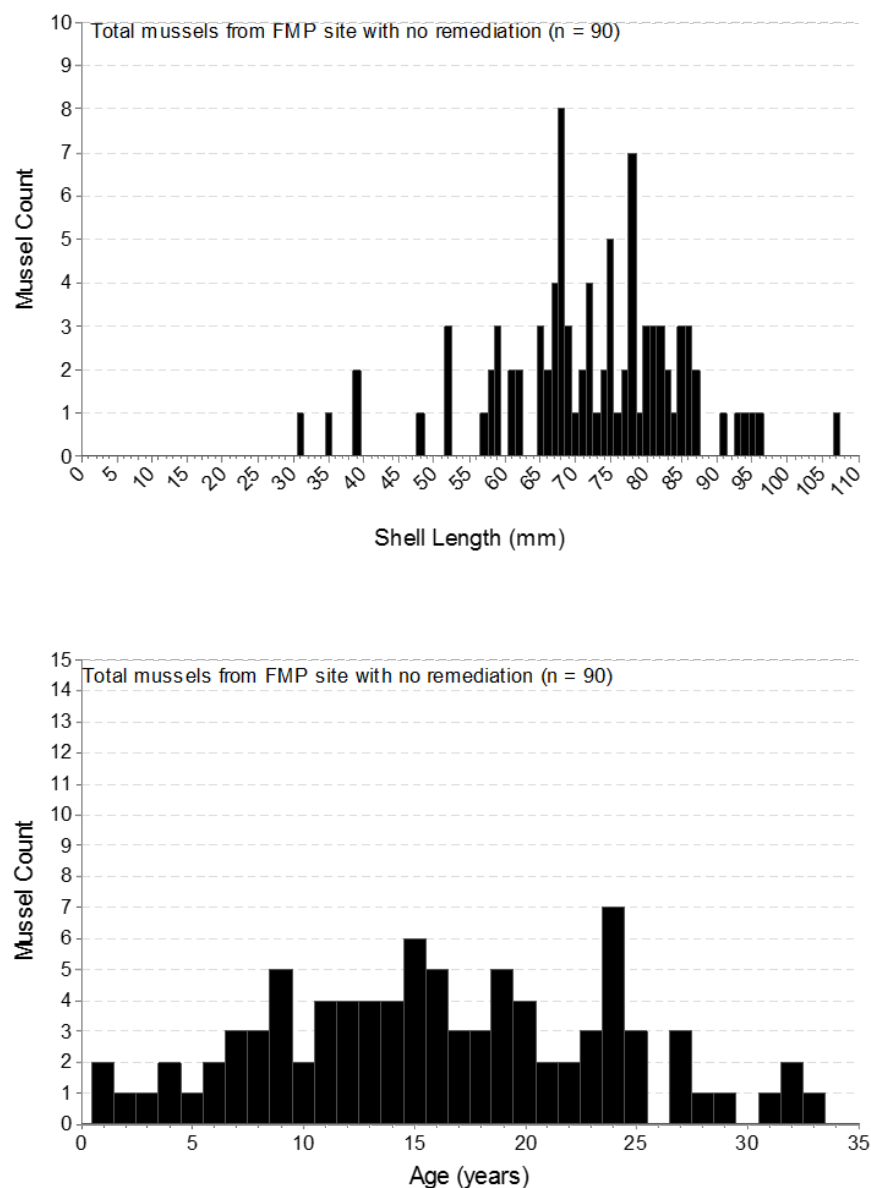


Figure A2.5 Length and age frequency histograms of randomly selected *Elliptio complanata* from the Hudson River at the Stillwater Pool (River Section 3, Reach 5; SWP, combined before-remediation and non-remediated).

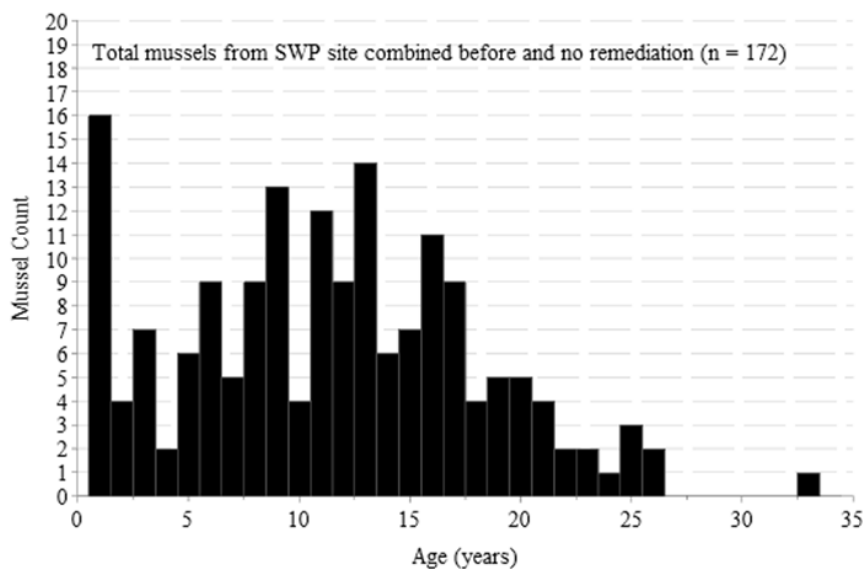
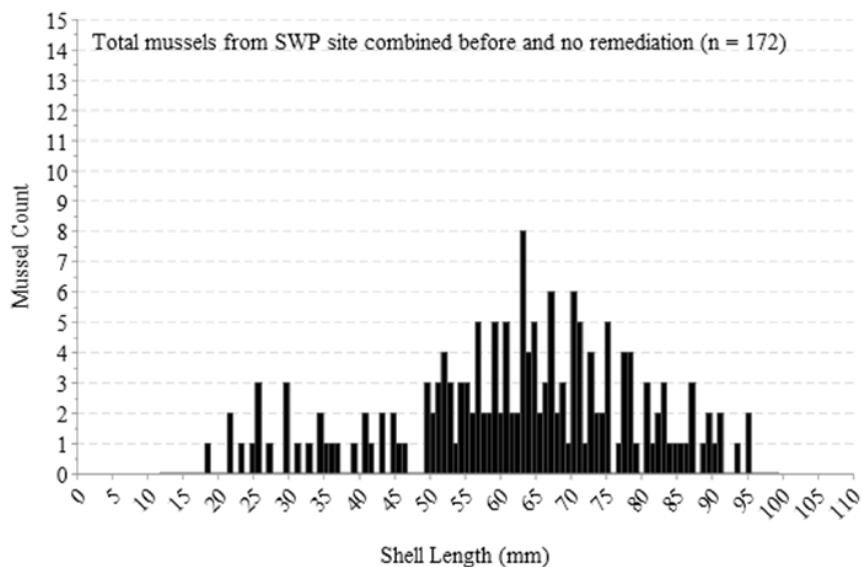


Figure A2.6

Length and age frequency histograms of randomly selected *Elliptio complanata* from the Hudson River at the Stillwater Pool (River Section 3, Reach 5; SWP, before-remediation).

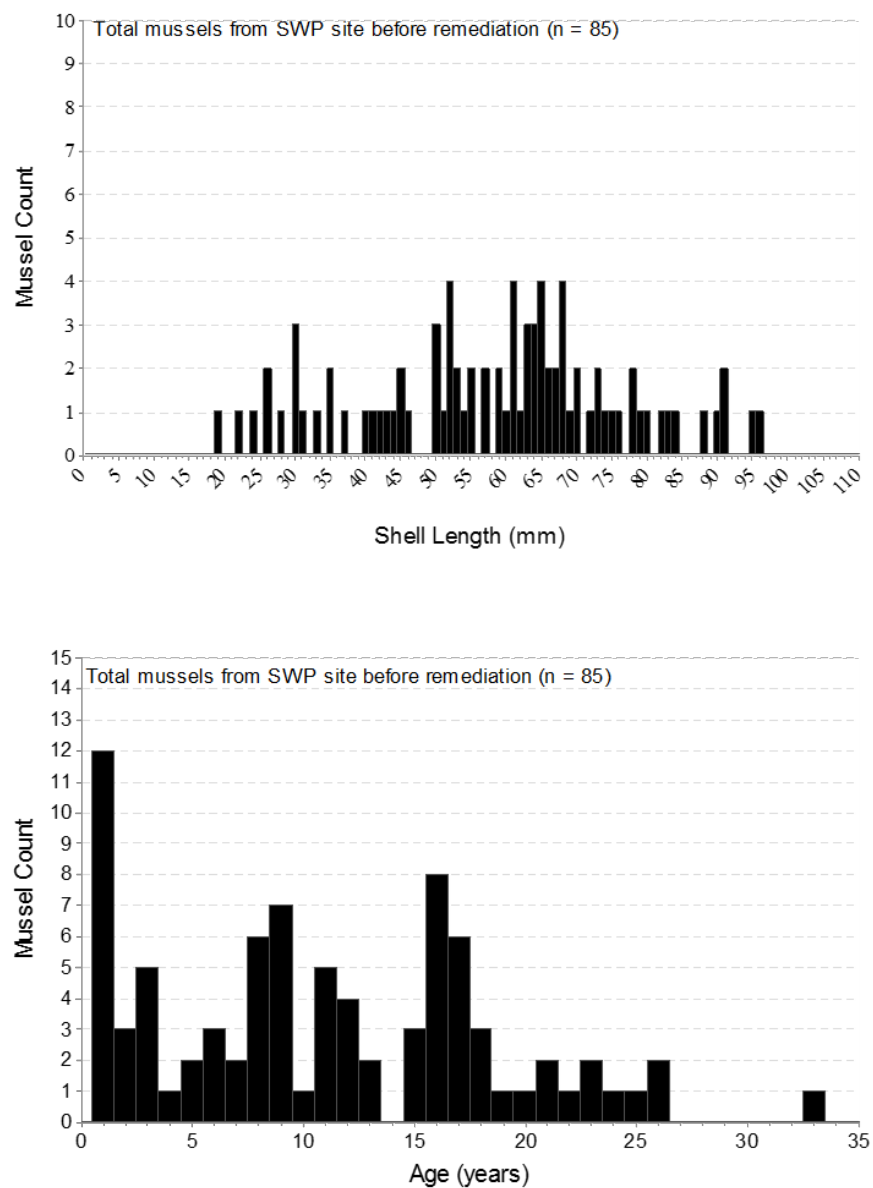


Figure A2.7 Length and age frequency histograms of randomly selected *Elliptio complanata* from the Hudson River at the Stillwater Pool (River Section 3, Reach 5; SWP, non-remediated).

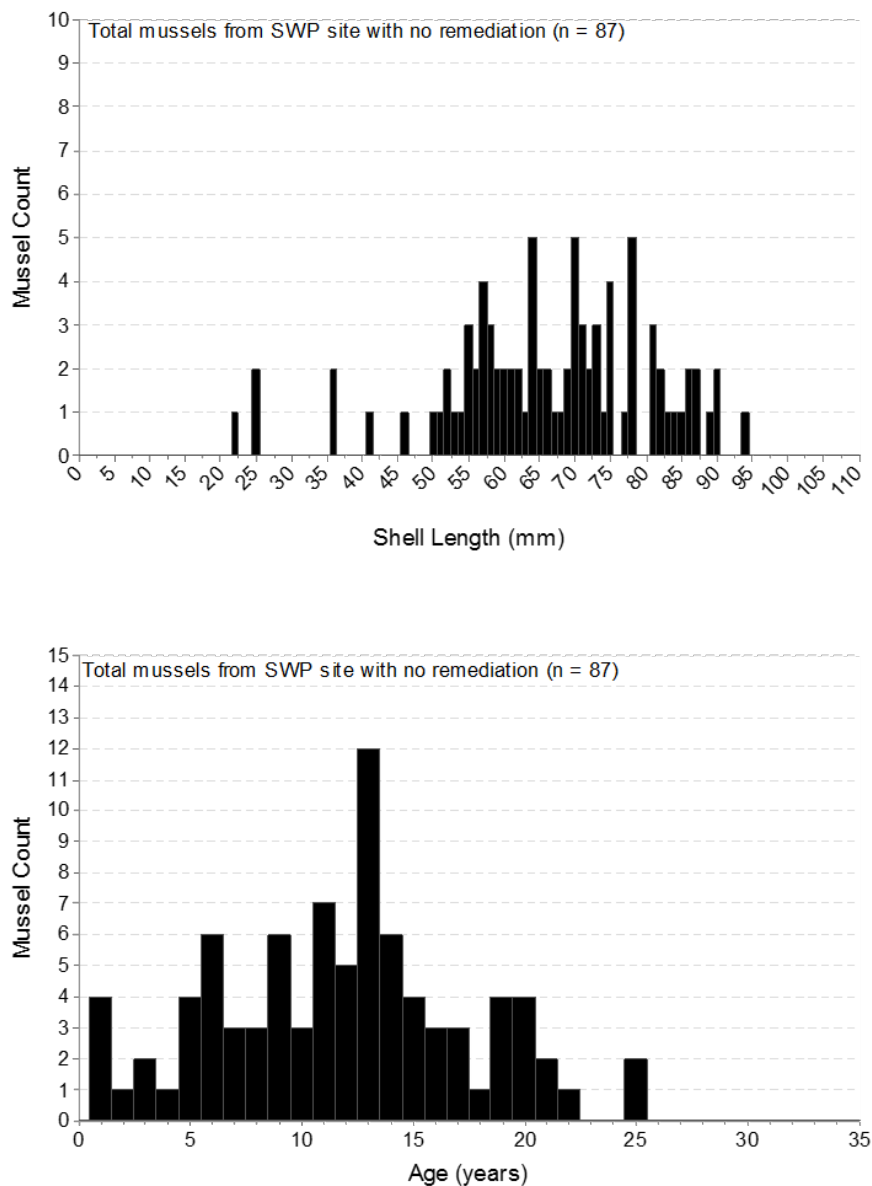


Figure A2.8

Length and age frequency histograms of randomly selected *Elliptio complanata* from the Hudson River at the Northumberland Pool (River Section 2, Reach 6; NUP, non-remediated).

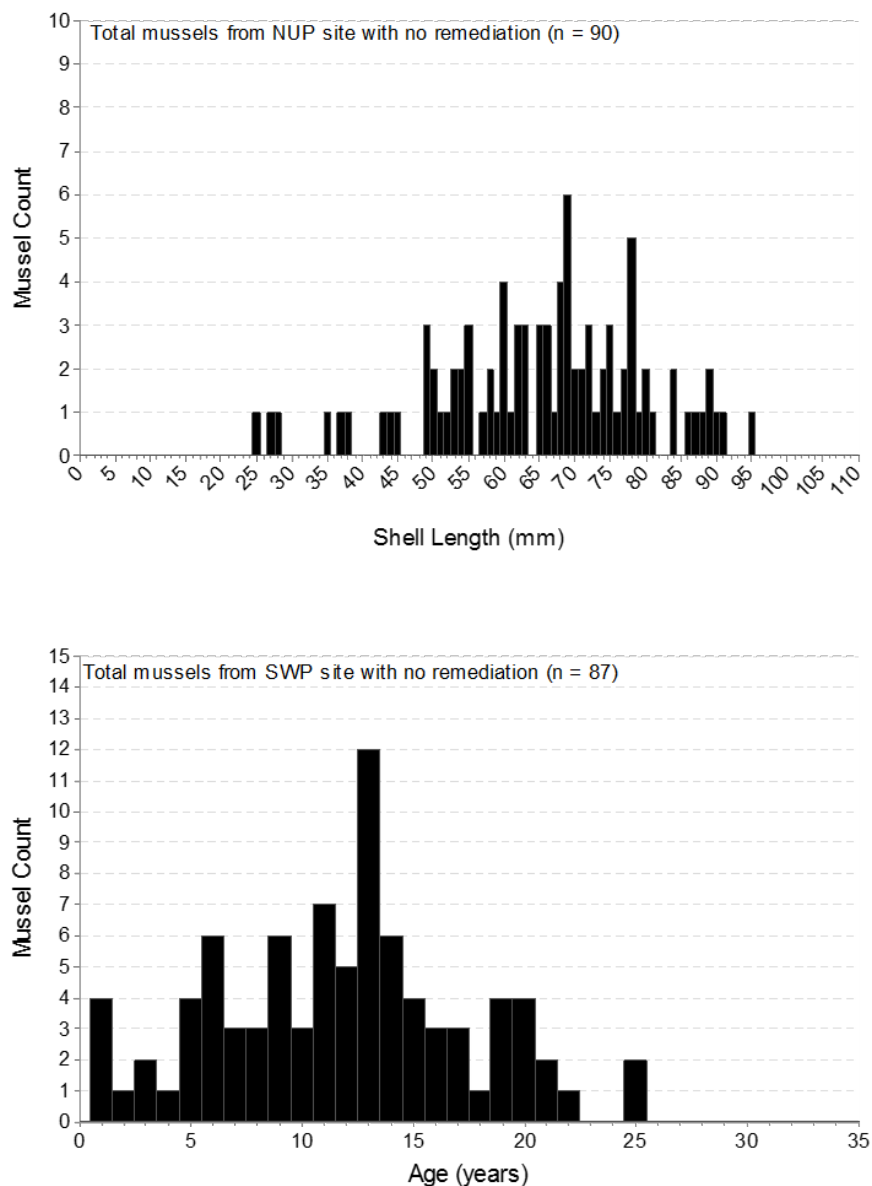
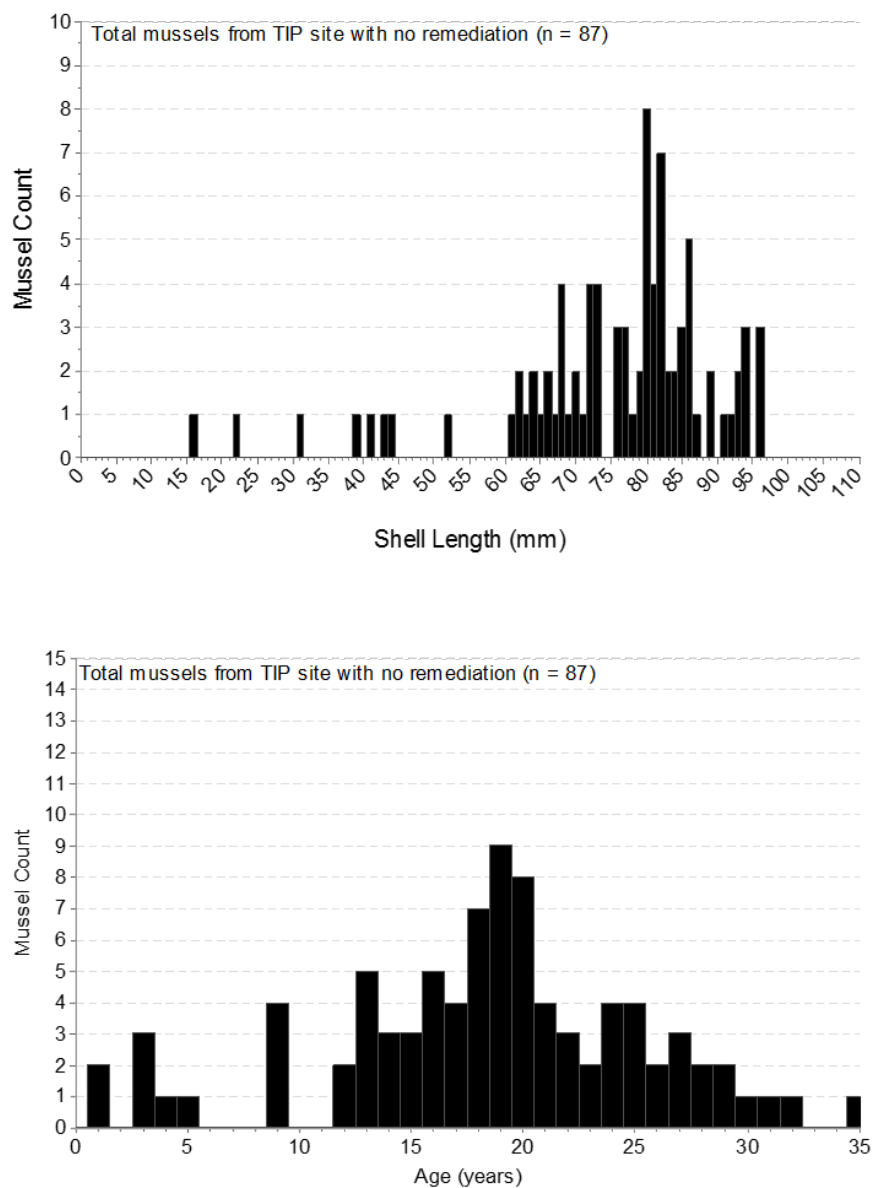


Figure A2.9 Length and age frequency histograms of randomly selected *Elliptio complanata* from the Hudson River at the Thompson Island Pool (River Section 1, Reach 8; TIP, non-remediated).



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Appendix A3 Age Class Structure of Randomly Selected Hudson *Elliptio complanata*¹⁹

Table A3.1 Percentages of total *Elliptio complanata* (n = 529) selected randomly within age classes from *all* four Hudson River pools (n = 6) in the before-remediation (BR) and non-remediated (NR) strata. Pools include the Thompson Island Pool (River Section 1, Reach 8; TIP, NR), Fort Miller Pool (River Section 2, Reach 7; FMP, BR and NR), Northumberland Pool (River Section 2, Reach 6; NUP, NR), and Stillwater Pool (River Section 3, Reach 5; SWP, BR and NR). Age (years) represents rounded mean age from two evaluators.

| Age | n | Percentage of Total Mussels |
|-----|----|-----------------------------|
| 1 | 30 | 5.67 |
| 2 | 10 | 1.89 |
| 3 | 16 | 3.02 |
| 4 | 12 | 2.27 |
| 5 | 13 | 2.46 |
| 6 | 18 | 3.40 |
| 7 | 12 | 2.27 |
| 8 | 20 | 3.78 |
| 9 | 31 | 5.86 |
| 10 | 10 | 1.89 |
| 11 | 23 | 4.35 |
| 12 | 19 | 3.59 |
| 13 | 32 | 6.05 |
| 14 | 21 | 3.97 |
| 15 | 23 | 4.35 |
| 16 | 33 | 6.24 |
| 17 | 21 | 3.97 |
| 18 | 27 | 5.10 |
| 19 | 29 | 5.48 |
| 20 | 29 | 5.48 |
| 21 | 15 | 2.84 |
| 22 | 16 | 3.02 |
| 23 | 8 | 1.51 |

¹⁹ Shells from 2013 and 2015 survey of HRNRT 2020.

| Age | n | Percentage of Total Mussels |
|-----|----|--------------------------------|
| 24 | 14 | 2.65 |
| 25 | 12 | 2.27 |
| 26 | 5 | 0.95 |
| 27 | 8 | 1.51 |
| 28 | 6 | 1.13 |
| 29 | 5 | 0.95 |
| 30 | 1 | 0.19 |
| 31 | 4 | 0.76 |
| 32 | 3 | 0.57 |
| 33 | 2 | 0.38 |
| 34 | 0 | 0.00 |
| 35 | 1 | 0.19 |

Table A3.2 Percentages of total *Elliptio complanata* (n = 180) selected randomly within age classes from the Hudson River at the Fort Miller Pool (River Section 2, Reach 7; FMP, combined before-remediation and non-remediated).

| Age | n | Percentage of Total Mussels |
|-----|----|--------------------------------|
| 1 | 10 | 5.56 |
| 2 | 3 | 1.67 |
| 3 | 2 | 1.11 |
| 4 | 5 | 2.78 |
| 5 | 1 | 0.56 |
| 6 | 7 | 3.89 |
| 7 | 4 | 2.22 |
| 8 | 8 | 4.44 |
| 9 | 10 | 5.56 |
| 10 | 4 | 2.22 |
| 11 | 8 | 4.44 |
| 12 | 7 | 3.89 |
| 13 | 10 | 5.56 |
| 14 | 7 | 3.89 |
| 15 | 10 | 5.56 |
| 16 | 13 | 7.22 |
| 17 | 6 | 3.33 |
| 18 | 13 | 7.22 |
| 19 | 7 | 3.89 |
| 20 | 7 | 3.89 |
| 21 | 4 | 2.22 |
| 22 | 4 | 2.22 |
| 23 | 4 | 2.22 |
| 24 | 9 | 5.00 |
| 25 | 4 | 2.22 |
| 26 | 1 | 0.56 |
| 27 | 4 | 2.22 |
| 28 | 2 | 1.11 |
| 29 | 1 | 0.56 |
| 30 | 0 | 0.00 |
| 31 | 2 | 1.11 |
| 32 | 2 | 1.11 |
| 33 | 1 | 0.56 |

Table A3.3

Percentages of total *Elliptio complanata* (n = 90) selected randomly within age classes from the Hudson River at the Fort Miller Pool (River Section 2, Reach 7; FMP, before-remediation).

| Age | n | Percentage of Total Mussels |
|-----|----|--------------------------------|
| 1 | 8 | 8.89 |
| 2 | 2 | 2.22 |
| 3 | 1 | 1.11 |
| 4 | 3 | 3.33 |
| 5 | 0 | 0.00 |
| 6 | 5 | 5.56 |
| 7 | 1 | 1.11 |
| 8 | 5 | 5.56 |
| 9 | 5 | 5.56 |
| 10 | 2 | 2.22 |
| 11 | 4 | 4.44 |
| 12 | 3 | 3.33 |
| 13 | 6 | 6.67 |
| 14 | 3 | 3.33 |
| 15 | 4 | 4.44 |
| 16 | 8 | 8.89 |
| 17 | 3 | 3.33 |
| 18 | 10 | 11.11 |
| 19 | 2 | 2.22 |
| 20 | 3 | 3.33 |
| 21 | 2 | 2.22 |
| 22 | 2 | 2.22 |
| 23 | 1 | 1.11 |
| 24 | 2 | 2.22 |
| 25 | 1 | 1.11 |
| 26 | 1 | 1.11 |
| 27 | 1 | 1.11 |
| 28 | 1 | 1.11 |
| 29 | 0 | 0.00 |
| 30 | 0 | 0.00 |
| 31 | 1 | 1.11 |

Table A3.4 Percentages of total *Elliptio complanata* (n = 90) selected randomly within age classes from the Hudson River at the Fort Miller Pool (River Section 2, Reach 7; FMP, non-remediated).

| Age | n | Percentage of Total Mussels |
|-----|---|-----------------------------|
| 1 | 2 | 2.22 |
| 2 | 1 | 1.11 |
| 3 | 1 | 1.11 |
| 4 | 2 | 2.22 |
| 5 | 1 | 1.11 |
| 6 | 2 | 2.22 |
| 7 | 3 | 3.33 |
| 8 | 3 | 3.33 |
| 9 | 5 | 5.56 |
| 10 | 2 | 2.22 |
| 11 | 4 | 4.44 |
| 12 | 4 | 4.44 |
| 13 | 4 | 4.44 |
| 14 | 4 | 4.44 |
| 15 | 6 | 6.67 |
| 16 | 5 | 5.56 |
| 17 | 3 | 3.33 |
| 18 | 3 | 3.33 |
| 19 | 5 | 5.56 |
| 20 | 4 | 4.44 |
| 21 | 2 | 2.22 |
| 22 | 2 | 2.22 |
| 23 | 3 | 3.33 |
| 24 | 7 | 7.78 |
| 25 | 3 | 3.33 |
| 26 | 0 | 0.00 |
| 27 | 3 | 3.33 |
| 28 | 1 | 1.11 |
| 29 | 1 | 1.11 |
| 30 | 0 | 0.00 |
| 31 | 1 | 1.11 |
| 32 | 2 | 2.22 |
| 33 | 1 | 1.11 |

Table A3.5

Percentages of total *Elliptio complanata* (n = 172) selected randomly within age classes from the Hudson River at the Stillwater Pool (River Section 3, Reach 5; SWP, before-remediation and non-remediated).

| Age | n | Percentage of Total Mussels |
|-----|----|-----------------------------|
| 1 | 16 | 9.30 |
| 2 | 4 | 2.33 |
| 3 | 7 | 4.07 |
| 4 | 2 | 1.16 |
| 5 | 6 | 3.49 |
| 6 | 9 | 5.23 |
| 7 | 5 | 2.91 |
| 8 | 9 | 5.23 |
| 9 | 13 | 7.56 |
| 10 | 4 | 2.33 |
| 11 | 12 | 6.98 |
| 12 | 9 | 5.23 |
| 13 | 14 | 8.14 |
| 14 | 6 | 3.49 |
| 15 | 7 | 4.07 |
| 16 | 11 | 6.40 |
| 17 | 9 | 5.23 |
| 18 | 4 | 2.33 |
| 19 | 5 | 2.91 |
| 20 | 5 | 2.91 |
| 21 | 4 | 2.33 |
| 22 | 2 | 1.16 |
| 23 | 2 | 1.16 |
| 24 | 1 | 0.58 |
| 25 | 3 | 1.74 |
| 26 | 2 | 1.16 |
| 27 | 0 | 0.00 |
| 28 | 0 | 0.00 |
| 29 | 0 | 0.00 |
| 30 | 0 | 0.00 |
| 31 | 0 | 0.00 |
| 32 | 0 | 0.00 |
| 33 | 1 | 0.58 |

Table A3.6 Percentages of total *Elliptio complanata* (n = 85) selected randomly within age classes from the Hudson River at the Stillwater Pool (River Section 3, Reach 5; SWP, before-remediation).

| Age | n | Percentage of Total Mussels |
|-----|----|--------------------------------|
| 1 | 12 | 14.12 |
| 2 | 3 | 3.53 |
| 3 | 5 | 5.88 |
| 4 | 1 | 1.18 |
| 5 | 2 | 2.35 |
| 6 | 3 | 3.53 |
| 7 | 2 | 2.35 |
| 8 | 6 | 7.06 |
| 9 | 7 | 8.24 |
| 10 | 1 | 1.18 |
| 11 | 5 | 5.88 |
| 12 | 4 | 4.71 |
| 13 | 2 | 2.35 |
| 14 | 0 | 0.00 |
| 15 | 3 | 3.53 |
| 16 | 8 | 9.41 |
| 17 | 6 | 7.06 |
| 18 | 3 | 3.53 |
| 19 | 1 | 1.18 |
| 20 | 1 | 1.18 |
| 21 | 2 | 2.35 |
| 22 | 1 | 1.18 |
| 23 | 2 | 2.35 |
| 24 | 1 | 1.18 |
| 25 | 1 | 1.18 |
| 26 | 2 | 2.35 |
| 27 | 0 | 0.00 |
| 28 | 0 | 0.00 |
| 29 | 0 | 0.00 |
| 30 | 0 | 0.00 |
| 31 | 0 | 0.00 |
| 32 | 0 | 0.00 |
| 33 | 1 | 1.18 |

Table A3.7

Percentages of total *Elliptio complanata* (n = 87) selected randomly within age classes from the Hudson River at the Stillwater Pool (River Section 3, Reach 5; SWP, non-remediated).

| Age | n | Percentage of Total Mussels |
|-----|----|--------------------------------|
| 1 | 4 | 4.60 |
| 2 | 1 | 1.15 |
| 3 | 2 | 2.30 |
| 4 | 1 | 1.15 |
| 5 | 4 | 4.60 |
| 6 | 6 | 6.90 |
| 7 | 3 | 3.45 |
| 8 | 3 | 3.45 |
| 9 | 6 | 6.90 |
| 10 | 3 | 3.45 |
| 11 | 7 | 8.05 |
| 12 | 5 | 5.75 |
| 13 | 12 | 13.79 |
| 14 | 6 | 6.90 |
| 15 | 4 | 4.60 |
| 16 | 3 | 3.45 |
| 17 | 3 | 3.45 |
| 18 | 1 | 1.15 |
| 19 | 4 | 4.60 |
| 20 | 4 | 4.60 |
| 21 | 2 | 2.30 |
| 22 | 1 | 1.15 |
| 23 | 0 | 0.00 |
| 24 | 0 | 0.00 |
| 25 | 2 | 2.30 |

Table A3.8 Percentages of total *Elliptio complanata* (n = 90) selected randomly within age classes from the Hudson River at the Northumberland Pool (River Section 2, Reach 6; NUP, non-remediated).

| Age | n | Percentage of Total Mussels |
|-----|---|-----------------------------|
| 1 | 2 | 2.22 |
| 2 | 3 | 3.33 |
| 3 | 4 | 4.44 |
| 4 | 4 | 4.44 |
| 5 | 5 | 5.56 |
| 6 | 2 | 2.22 |
| 7 | 3 | 3.33 |
| 8 | 3 | 3.33 |
| 9 | 4 | 4.44 |
| 10 | 2 | 2.22 |
| 11 | 3 | 3.33 |
| 12 | 1 | 1.11 |
| 13 | 3 | 3.33 |
| 14 | 5 | 5.56 |
| 15 | 3 | 3.33 |
| 16 | 4 | 4.44 |
| 17 | 2 | 2.22 |
| 18 | 3 | 3.33 |
| 19 | 8 | 8.89 |
| 20 | 9 | 10.00 |
| 21 | 3 | 3.33 |
| 22 | 7 | 7.78 |
| 23 | 0 | 0.00 |
| 24 | 0 | 0.00 |
| 25 | 1 | 1.11 |
| 26 | 0 | 0.00 |
| 27 | 1 | 1.11 |
| 28 | 2 | 2.22 |
| 29 | 2 | 2.22 |
| 30 | 0 | 0.00 |
| 31 | 1 | 1.11 |

Table A3.9

Percentages of total *Elliptio complanata* (n = 87) selected randomly within age classes from the Hudson River at the Thompson Island Pool (River Section 1, Reach 8; TIP, non-remediated).

| Age | n | Percentage of Total Mussels |
|-----|---|--------------------------------|
| 1 | 2 | 2.30 |
| 2 | 0 | 0.00 |
| 3 | 3 | 3.45 |
| 4 | 1 | 1.15 |
| 5 | 1 | 1.15 |
| 6 | 0 | 0.00 |
| 7 | 0 | 0.00 |
| 8 | 0 | 0.00 |
| 9 | 4 | 4.60 |
| 10 | 0 | 0.00 |
| 11 | 0 | 0.00 |
| 12 | 2 | 2.30 |
| 13 | 5 | 5.75 |
| 14 | 3 | 3.45 |
| 15 | 3 | 3.45 |
| 16 | 5 | 5.75 |
| 17 | 4 | 4.60 |
| 18 | 7 | 8.05 |
| 19 | 9 | 10.34 |
| 20 | 8 | 9.20 |
| 21 | 4 | 4.60 |
| 22 | 3 | 3.45 |
| 23 | 2 | 2.30 |
| 24 | 4 | 4.60 |
| 25 | 4 | 4.60 |
| 26 | 2 | 2.30 |
| 27 | 3 | 3.45 |
| 28 | 2 | 2.30 |
| 29 | 2 | 2.30 |
| 30 | 1 | 1.15 |
| 31 | 1 | 1.15 |
| 32 | 1 | 1.15 |
| 33 | 0 | 0.00 |

| Age | n | Percentage of Total Mussels |
|-----|---|--------------------------------|
| 34 | 0 | 0.00 |
| 35 | 1 | 1.15 |

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Appendix A4 Length (mm)-at-Age (years) Scatterplots Randomly Selected Hudson *Elliptio complanata*²⁰

Figure A4.1 Mussel lengths (mm)-at-age (years) scatterplots with fitted lines and regression equations using *randomly* selected thin-sectioned mussel shells from the Hudson River at the Fort Miller Pool (River Section 2, Reach 7; FMP) from before-remediation (BR; n = 90) and non-remediated (NR; n = 90) strata. The regression slopes of FMP (BR) and FMP (NR) of 1.918 and 1.515 mm/year, respectively, are significantly different (n = 180, df = 1, F = 6.39, p = 0.012). Age used as a covariate.

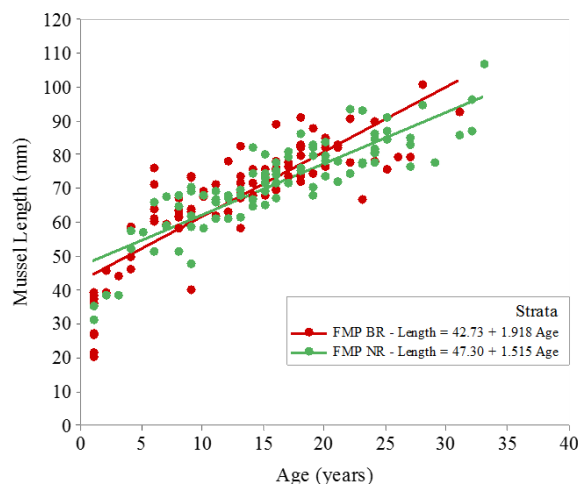
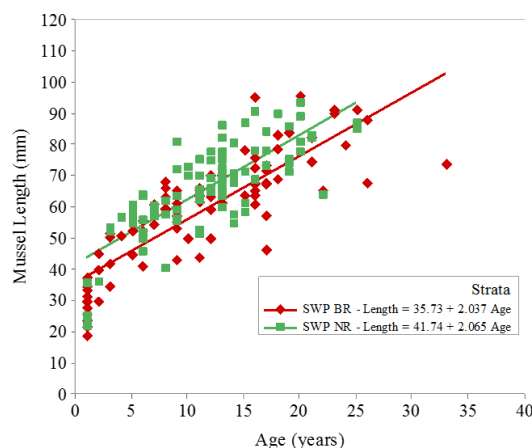


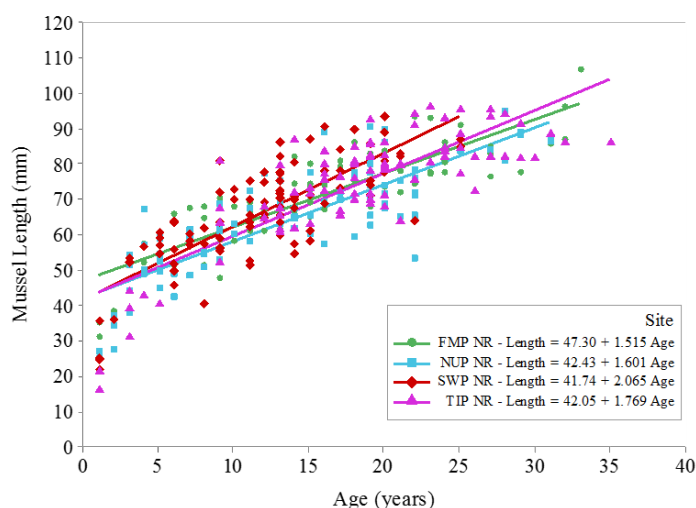
Figure A4.2 Mussel lengths (mm)-at-age (years) scatterplots with fitted lines and regression equations using *randomly* selected thin-sectioned mussel shells from the Hudson River at the Stillwater Pool (River Section 3, Reach 5; SWP) from before-remediation (BR; n = 85) and non-remediated (NR; n = 87) strata. The regression slopes of SWP (BR) and SWP (NR) of 2.037 and 2.065 mm/year, respectively, are not significantly different (n = 172, df = 1, F = 0.01, p = 0.906). Age used as a covariate.



²⁰ Shells from 2013 and 2015 survey of HRNRT 2020.

Figure A4.3

Mussel lengths (mm)-at-age (years) scatterplots with fitted lines and regression equations using *randomly* selected thin-sectioned mussel shells from the Hudson River non-remediated (NR) strata at four pools (site) including the Thompson Island Pool (River Section 1, Reach 8; TIP; $n = 87$), Fort Miller Pool (River Section 2, Reach 7; FMP; $n = 90$), Northumberland Pool (River Section 2, Reach 6; NUP; $n = 90$), and Stillwater Pool (River Section 3, Reach 5; SWP; $n = 90$). The regression slopes from the FMP, NUP, SWP, and TIP are 1.515, 1.601, 2.065, and 1.769 mm/year, respectively, are significantly different ($n = 354$, $df = 3$, $F = 2.86$, $p = 0.037$). See Figs. A4.4 through A4.9 in this appendix for the six specific paired scatterplots and slope comparisons among the NR strata. Age used as a covariate.

**Figure A4.4**

Mussel lengths (mm)-at-age (years) scatterplots with fitted lines and regression equations using *randomly* selected thin-sectioned mussel shells from the Hudson River non-remediated (NR) strata at the Fort Miller Pool (site; River Section 2, Reach 7; FMP; $n = 90$) and Stillwater Pool (site; River Section 3, Reach 5; SWP; $n = 90$). The regression slopes from the FMP and SWP of 1.515 and 2.065 mm/year, respectively, are significantly different ($n = 177$, $df = 1$, $F = 8.38$, $p = 0.004$). Age used as a covariate.

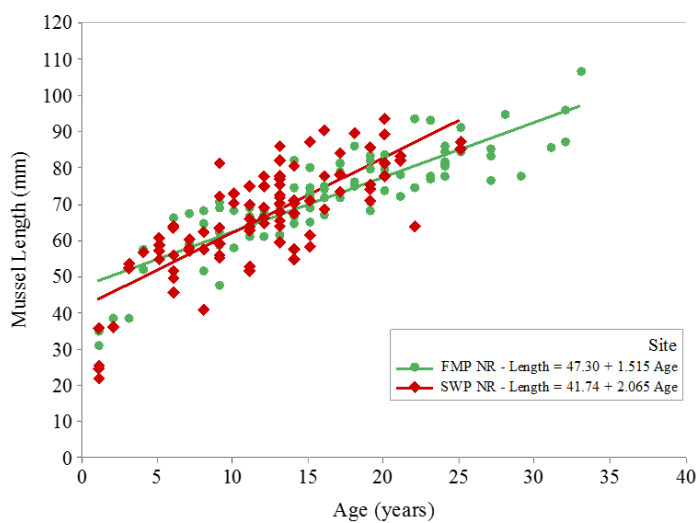


Figure A4.5

Mussel lengths (mm)-at-age (years) scatterplots with fitted lines and regressed equations using randomly selected thin-sectioned mussel shells from the Hudson River non-remediated (NR) strata at the Fort Miller Pool (site; River Section 2, Reach 7; FMP; n = 90) and Northumberland Pool (site; River Section 2, Reach 6; NUP; n = 90). The regression slopes from the FMP and NUP pools of 1.515 and 1.601 mm/year, respectively, are not significantly different (n = 180, df = 1, F = 0.56, p = 0.561). Age used as a covariate.

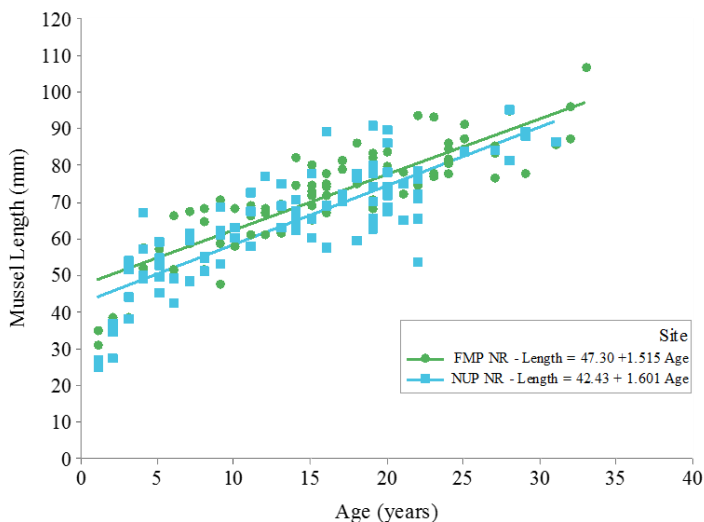


Figure A4.6

Mussel lengths (mm)-at-age (years) scatterplots with fitted lines and regression equations using randomly selected thin-sectioned mussel shells from the Hudson River non-remediated (NR) strata at the Fort Miller Pool (site; River Section 2, Reach 7; FMP; n = 90) and Thompson Island Pool (site; River Section 1, Reach 8; TIP; n = 87). The regression slopes from the FMP and TIP of 1.515 and 1.769 mm/year, respectively, are not significantly different (n = 177, df = 1, F = 2.37, p = 0.125). Age used as a covariate.

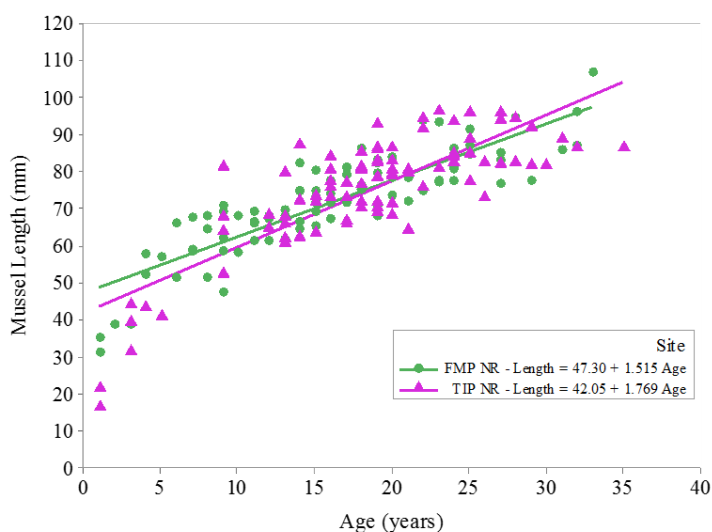
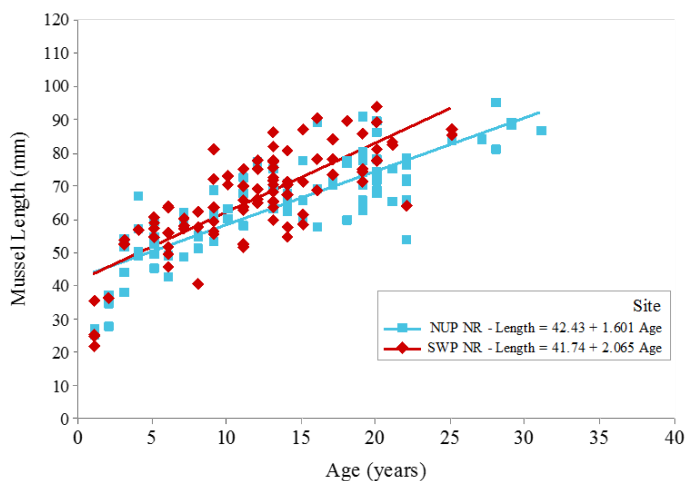


Figure A4.7

Mussel lengths (mm)-at-age (years) scatterplots with fitted lines and regression equations using randomly selected thin-sectioned mussel shells from the Hudson River non-remediated (NR) strata at the Stillwater Pool (site; River Section 3, Reach 5; SWP; $n = 85$) and Northumberland Pool (site; River Section 2, Reach 6; NUP; $n = 90$). The regression slopes from the SWP and NUP pools of 1.601 and 2.065 mm/year, respectively, are significantly different ($n = 177$, $df = 1$, $F = 4.97$, $p = 0.027$). Age used as a covariate.

**Figure A4.8**

Mussel lengths (mm)-at-age (years) scatterplots with fitted lines and regression equations using randomly selected thin-sectioned mussel shells from the Hudson River non-remediated (NR) strata at the Stillwater Pool (site; River Section 3, Reach 5; SWP; $n = 87$) and Thompson Island Pool (site; River Section 1, Reach 8; TIP; $n = 87$). The regression slopes from the SWP, and TIP pools of 2.065 and 1.769 mm/year, respectively, are not significantly different ($n = 174$, $df = 1$, $F = 1.72$, $p = 0.192$). Age used as a covariate.

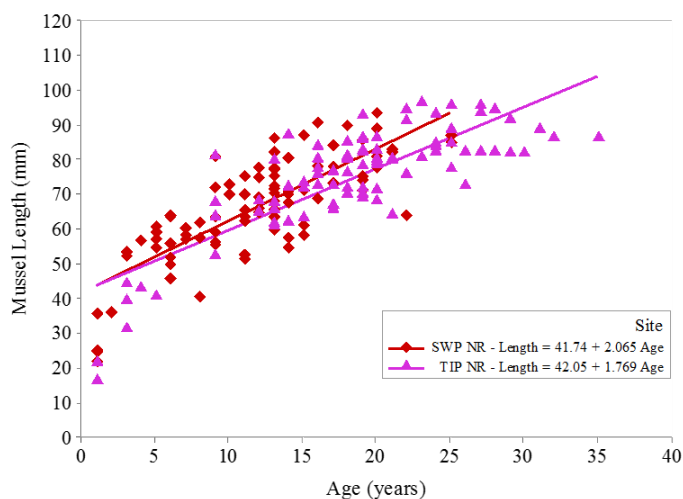
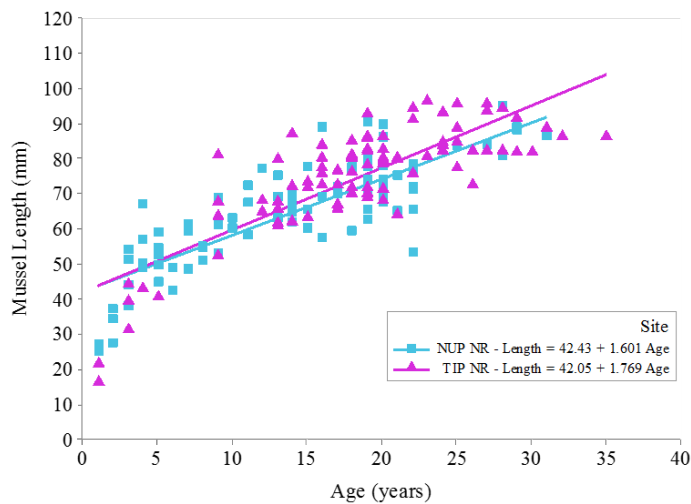


Figure A4.9 Mussel lengths (mm)-at-age (years) scatterplots with fitted lines and regression equations using *randomly* selected thin-sectioned mussel shells from the Hudson River non-remediated (NR) strata at the Northumberland Pool (site; River Section 2, Reach 6; NUP; n = 90) and Thompson Island Pool (site; River Section 1, Reach 8; TIP; n = 87). The regression slopes from the NUP and TIP pools of 1.601 and 1.769 mm/year, respectively, are not significantly different (n = 177, df = 1, F = 0.87, p = 0.353). Age used as a covariate.



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Appendix A5 Mean Lengths-at-Age with 95% Confidence Intervals of Randomly Selected Hudson *Elliptio complanata*²¹

Table A5.1 Mean lengths (mm)-at-age with 95% confidence intervals of total *Elliptio complanata* (n = 529) selected randomly within age classes from *all* four Hudson River pools (n = 6) in the before-remediation (BR) and non-remediated (NR) strata. Pools include the Thompson Island Pool (River Section 1, Reach 8; TIP, NR), Fort Miller Pool (River Section 2, Reach 7; FMP, BR and NR), Northumberland Pool (River Section 2, Reach 6; NUP, NR), and Stillwater Pool (River Section 3, Reach 5; SWP, BR and NR). Age (years) represents rounded mean age from two evaluators. Dash indicates that no mussels were observed within the age class (n = 0); * = confidence limits could not be calculated, because only one mussel was observed within the age class (n = 1).

| Age | n | Mean Length (mm) | 95% Confidence Interval | |
|-----|----|---------------------|-------------------------|-------------|
| | | | Lower Limit | Upper Limit |
| 1 | 30 | 28.1 | 25.9 | 30.4 |
| 2 | 10 | 37.2 | 33.6 | 40.8 |
| 3 | 16 | 44.9 | 41.3 | 48.5 |
| 4 | 12 | 53.1 | 49.4 | 56.7 |
| 5 | 13 | 52.7 | 49.3 | 56.1 |
| 6 | 18 | 56.6 | 52.1 | 61.1 |
| 7 | 12 | 58.6 | 56.1 | 61.2 |
| 8 | 20 | 59.8 | 56.8 | 62.7 |
| 9 | 31 | 61.4 | 58.0 | 64.8 |
| 10 | 10 | 64.8 | 60.4 | 69.2 |
| 11 | 23 | 63.7 | 60.8 | 66.6 |
| 12 | 19 | 66.8 | 63.6 | 70.0 |
| 13 | 32 | 69.7 | 67.2 | 72.1 |
| 14 | 21 | 69.2 | 65.9 | 72.6 |
| 15 | 23 | 70.7 | 67.8 | 73.6 |
| 16 | 33 | 74.3 | 71.4 | 77.2 |
| 17 | 21 | 71.4 | 67.8 | 75.0 |
| 18 | 27 | 78.3 | 75.7 | 80.9 |
| 19 | 29 | 77.6 | 74.8 | 80.4 |
| 20 | 29 | 79.0 | 76.2 | 81.8 |
| 21 | 15 | 77.0 | 73.9 | 80.1 |
| 22 | 16 | 76.2 | 70.6 | 81.9 |
| 23 | 8 | 83.9 | 76.9 | 90.9 |

²¹ Shells from 2013 and 2015 survey of HRNRT 2020.

| Age | n | Mean Length (mm) | 95% Confidence Interval | |
|-----|----|---------------------|-------------------------|-------------|
| | | | Lower Limit | Upper Limit |
| 24 | 14 | 82.8 | 80.4 | 85.1 |
| 25 | 12 | 85.8 | 82.6 | 89.0 |
| 26 | 5 | 77.7 | 70.8 | 84.6 |
| 27 | 8 | 84.8 | 80.2 | 89.4 |
| 28 | 6 | 91.2 | 84.9 | 97.5 |
| 29 | 5 | 85.5 | 80.4 | 90.6 |
| 30 | 1 | 81.5 | * | * |
| 31 | 4 | 88.3 | 85.2 | 91.3 |
| 32 | 3 | 89.7 | 83.4 | 95.9 |
| 33 | 2 | 90.0 | 57.7 | 122.3 |
| 34 | 0 | - | - | - |
| 35 | 1 | 86.0 | * | * |

Table A5.2

Mean lengths (mm)-at-age with 95% confidence intervals of total *Elliptio complanata* (n = 90) selected randomly within age classes from the Hudson River at the Fort Miller Pool (River Section 2, Reach 7; FMP, before-remediation). Dash indicates that no mussels were observed within the age class (n = 0); * = confidence limits could not be calculated, because only one mussel was observed within the age class (n = 1).

| Age | n | Mean Length (mm) | 95% Confidence Interval | |
|-----|----|---------------------|-------------------------|-------------|
| | | | Lower Limit | Upper Limit |
| 1 | 8 | 30.7 | 25.3 | 36.1 |
| 2 | 2 | 42.3 | 35.9 | 48.6 |
| 3 | 1 | 44.0 | * | * |
| 4 | 3 | 51.3 | 44.0 | 58.6 |
| 5 | 0 | - | - | - |
| 6 | 5 | 66.4 | 60.4 | 72.4 |
| 7 | 1 | 59.5 | * | * |
| 8 | 5 | 62.4 | 59.4 | 65.3 |
| 9 | 5 | 62.7 | 50.8 | 74.6 |
| 10 | 2 | 68.3 | 66.8 | 69.7 |
| 11 | 4 | 66.4 | 62.8 | 70.0 |
| 12 | 3 | 67.3 | 56.8 | 77.8 |
| 13 | 6 | 70.2 | 63.7 | 76.6 |
| 14 | 3 | 71.7 | 67.4 | 75.9 |
| 15 | 4 | 71.6 | 68.0 | 75.2 |
| 16 | 8 | 76.3 | 72.3 | 80.3 |
| 17 | 3 | 75.8 | 73.5 | 78.2 |
| 18 | 10 | 80.0 | 76.3 | 83.8 |
| 19 | 2 | 81.0 | 68.3 | 93.7 |
| 20 | 3 | 81.2 | 76.3 | 86.0 |
| 21 | 2 | 82.5 | 81.5 | 83.5 |
| 22 | 2 | 84.0 | 71.3 | 96.7 |
| 23 | 1 | 66.5 | * | * |
| 24 | 2 | 83.8 | 72.5 | 95.0 |
| 25 | 1 | 75.5 | * | * |
| 26 | 1 | 79.0 | * | * |
| 27 | 1 | 79.0 | * | * |
| 28 | 1 | 100.5 | * | * |
| 29 | 0 | - | - | - |
| 30 | 0 | - | - | - |
| 31 | 1 | 92.5 | * | * |

Table A5.3

Mean lengths (mm)-at-age with 95% confidence intervals of total *Elliptio complanata* ($n = 90$) selected randomly within age classes from the Hudson River at the Fort Miller Pool (River Section 2, Reach 7; FMP, non-remediated). Dash indicates that no mussels were observed within the age class ($n = 0$); * = confidence limits could not be calculated, because only one mussel was observed within the age class ($n = 1$).

| Age | n | Mean Length (mm) | 95% Confidence Interval | |
|-----|---|---------------------|-------------------------|-------------|
| | | | Lower Limit | Upper Limit |
| 1 | 2 | 33.0 | 29.1 | 36.9 |
| 2 | 1 | 38.5 | * | * |
| 3 | 1 | 38.5 | * | * |
| 4 | 2 | 54.8 | 49.4 | 60.1 |
| 5 | 1 | 57.0 | * | * |
| 6 | 2 | 58.8 | 44.5 | 73.0 |
| 7 | 3 | 61.7 | 55.9 | 67.4 |
| 8 | 3 | 61.3 | 51.5 | 71.2 |
| 9 | 5 | 61.5 | 53.4 | 69.6 |
| 10 | 2 | 63.0 | 53.2 | 72.8 |
| 11 | 4 | 65.6 | 62.3 | 68.9 |
| 12 | 4 | 66.0 | 62.7 | 69.3 |
| 13 | 4 | 66.8 | 63.3 | 70.2 |
| 14 | 4 | 71.9 | 64.0 | 79.7 |
| 15 | 6 | 72.2 | 68.1 | 76.2 |
| 16 | 5 | 73.0 | 69.5 | 76.5 |
| 17 | 3 | 77.2 | 71.5 | 82.8 |
| 18 | 3 | 79.0 | 72.1 | 85.9 |
| 19 | 5 | 76.6 | 70.6 | 82.6 |
| 20 | 4 | 78.6 | 74.6 | 82.7 |
| 21 | 2 | 75.0 | 69.1 | 80.9 |
| 22 | 2 | 84.0 | 65.4 | 102.6 |
| 23 | 3 | 82.5 | 72.2 | 92.8 |
| 24 | 7 | 81.2 | 78.8 | 83.6 |
| 25 | 3 | 87.5 | 83.8 | 91.2 |
| 26 | 0 | - | - | - |
| 27 | 3 | 81.5 | 76.5 | 86.5 |
| 28 | 1 | 94.5 | * | * |
| 29 | 1 | 77.5 | * | * |
| 30 | 0 | - | - | - |

| Age | n | Mean Length (mm) | 95% Confidence Interval | |
|-----|---|---------------------|-------------------------|-------------|
| | | | Lower Limit | Upper Limit |
| 31 | 1 | 31 | 85.5 | * |
| 32 | 2 | 32 | 91.5 | 82.7 |
| 33 | 1 | 33 | 106.5 | * |

Table A5.4

Mean lengths (mm)-at-age with 95% confidence intervals of total *Elliptio complanata* (n = 85) selected randomly within age classes from the Hudson River at the Stillwater Pool (River Section 3, Reach 5; SWP, before-remediation). Dash indicates that no mussels were observed within the age class ($n = 0$); * = confidence limits could not be calculated, because only one mussel was observed within the age class ($n = 1$).

| Age | n | Mean Length (mm) | 95% Confidence Interval | |
|-----|----|---------------------|-------------------------|-------------|
| | | | Lower Limit | Upper Limit |
| 1 | 12 | 28.0 | 25.0 | 31.1 |
| 2 | 3 | 38.0 | 29.1 | 46.9 |
| 3 | 5 | 45.8 | 39.2 | 52.4 |
| 4 | 1 | 50.5 | * | * |
| 5 | 2 | 48.3 | 40.9 | 55.6 |
| 6 | 3 | 49.4 | 41.0 | 57.8 |
| 7 | 2 | 57.3 | 50.9 | 63.6 |
| 8 | 6 | 63.1 | 60.3 | 65.9 |
| 9 | 7 | 55.3 | 50.1 | 60.4 |
| 10 | 1 | 49.5 | * | * |
| 11 | 5 | 59.9 | 51.7 | 68.1 |
| 12 | 4 | 60.4 | 52.0 | 68.8 |
| 13 | 2 | 65.5 | 56.7 | 74.3 |
| 14 | 0 | - | - | - |
| 15 | 3 | 73.2 | 63.7 | 82.6 |
| 16 | 8 | 70.8 | 63.3 | 78.4 |
| 17 | 6 | 63.7 | 55.4 | 71.9 |
| 18 | 3 | 76.7 | 68.3 | 85.1 |
| 19 | 1 | 83.5 | * | * |
| 20 | 1 | 95.5 | * | * |
| 21 | 2 | 78.3 | 70.9 | 85.6 |
| 22 | 1 | 65.0 | * | * |
| 23 | 2 | 90.3 | 88.8 | 91.7 |
| 24 | 1 | 79.5 | * | * |
| 25 | 1 | 91.0 | * | * |
| 26 | 2 | 77.5 | 57.9 | 97.1 |
| 27 | 0 | - | - | - |
| 28 | 0 | - | - | - |
| 29 | 0 | - | - | - |
| 30 | 0 | - | - | - |

| Age | n | Mean Length (mm) | 95% Confidence Interval | |
|-----|---|---------------------|-------------------------|-------------|
| | | | Lower Limit | Upper Limit |
| 31 | 0 | - | - | - |
| 32 | 0 | - | - | - |
| 33 | 1 | 73.5 | * | * |

Table A5.5

Mean lengths (mm)-at-age with 95% confidence intervals of total *Elliptio complanata* ($n = 87$) selected randomly within age classes from the Hudson River at the Stillwater Pool (River Section 3, Reach 5; SWP, non-remediated). Dash indicates that no mussels were observed within the age class ($n = 0$); * = confidence limits could not be calculated, because only one mussel was observed within the age class ($n = 1$).

| Age | n | Mean Length (mm) | 95% Confidence Interval | |
|-----|----|---------------------|-------------------------|-------------|
| | | | Lower Limit | Upper Limit |
| 1 | 4 | 26.7 | 20.8 | 32.6 |
| 2 | 1 | 36.0 | * | * |
| 3 | 2 | 52.9 | 51.6 | 54.1 |
| 4 | 1 | 56.6 | * | * |
| 5 | 4 | 57.7 | 55.1 | 60.2 |
| 6 | 6 | 54.9 | 48.9 | 60.9 |
| 7 | 3 | 58.4 | 56.5 | 60.3 |
| 8 | 3 | 53.4 | 40.6 | 66.1 |
| 9 | 6 | 64.4 | 56.3 | 72.6 |
| 10 | 3 | 71.0 | 69.2 | 72.8 |
| 11 | 7 | 62.9 | 56.5 | 69.3 |
| 12 | 5 | 70.4 | 65.4 | 75.3 |
| 13 | 12 | 72.4 | 68.0 | 76.7 |
| 14 | 6 | 66.8 | 59.2 | 74.4 |
| 15 | 4 | 69.3 | 56.6 | 82.1 |
| 16 | 3 | 78.9 | 66.5 | 91.3 |
| 17 | 3 | 78.4 | 72.3 | 84.5 |
| 18 | 1 | 89.5 | * | * |
| 19 | 4 | 76.4 | 70.2 | 82.6 |
| 20 | 4 | 85.3 | 78.1 | 92.4 |
| 21 | 2 | 82.5 | 81.5 | 83.5 |
| 22 | 1 | 63.7 | * | * |
| 23 | 0 | - | - | - |
| 24 | 0 | - | - | - |
| 25 | 2 | 86.0 | 84.0 | 88.0 |

Table A5.6

Mean lengths (mm)-at-age with 95% confidence intervals of total *Elliptio complanata* ($n = 90$) selected randomly within age classes from the Hudson River at the Northumberland Pool (River Section 2, Reach 6; NUP, non-remediated). Dash indicates that no mussels were observed within the age class ($n = 0$); * = confidence limits could not be calculated, because only one mussel was observed within the age class ($n = 1$).

| Age | n | Mean Length (mm) | 95% Confidence Interval | |
|-----|---|---------------------|-------------------------|-------------|
| | | | Lower Limit | Upper Limit |
| 1 | 2 | 26.0 | 24.0 | 28.0 |
| 2 | 3 | 33.0 | 27.4 | 38.6 |
| 3 | 4 | 46.9 | 39.7 | 54.0 |
| 4 | 4 | 55.8 | 47.6 | 63.9 |
| 5 | 5 | 52.1 | 47.5 | 56.7 |
| 6 | 2 | 45.8 | 39.4 | 52.1 |
| 7 | 3 | 56.5 | 48.6 | 64.4 |
| 8 | 3 | 53.5 | 51.0 | 56.0 |
| 9 | 4 | 61.1 | 54.9 | 67.4 |
| 10 | 2 | 61.5 | 58.6 | 64.4 |
| 11 | 3 | 66.0 | 57.7 | 74.3 |
| 12 | 1 | 77.0 | * | * |
| 13 | 3 | 69.0 | 62.2 | 75.8 |
| 14 | 5 | 65.9 | 63.1 | 68.7 |
| 15 | 3 | 67.7 | 57.5 | 77.8 |
| 16 | 4 | 71.1 | 58.3 | 84.0 |
| 17 | 2 | 71.0 | 69.0 | 73.0 |
| 18 | 3 | 71.2 | 59.7 | 82.6 |
| 19 | 8 | 75.0 | 68.8 | 81.2 |
| 20 | 9 | 74.6 | 69.2 | 80.0 |
| 21 | 3 | 71.7 | 65.1 | 78.2 |
| 22 | 7 | 70.6 | 64.1 | 77.2 |
| 23 | 0 | - | - | - |
| 24 | 0 | - | - | - |
| 25 | 1 | 83.5 | * | * |
| 26 | 0 | - | - | - |
| 27 | 1 | 84.0 | * | * |
| 28 | 2 | 88.0 | 74.3 | 101.7 |
| 29 | 2 | 88.5 | 87.5 | 89.5 |
| 30 | 0 | - | - | - |
| 31 | 1 | 86.5 | * | * |

Table A5.7

Mean lengths (mm)-at-age with 95% confidence intervals of total *Elliptio complanata* ($n = 87$) selected randomly within age classes from the Hudson River at the Thompson Island Pool (River Section 1, Reach 8; TIP, non-remediated). Dash indicates that no mussels were observed within the age class ($n = 0$); * = confidence limits could not be calculated, because only one mussel was observed within the age class ($n = 1$).

| Age | n | Mean Length (mm) | 95% Confidence Interval | |
|-----|---|---------------------|-------------------------|-------------|
| | | | Lower Limit | Upper Limit |
| 1 | 2 | 18.8 | 13.4 | 24.1 |
| 2 | 0 | - | - | - |
| 3 | 3 | 38.0 | 30.6 | 45.4 |
| 4 | 1 | 43.0 | * | * |
| 5 | 1 | 40.5 | * | * |
| 6 | 0 | - | - | - |
| 7 | 0 | - | - | - |
| 8 | 0 | - | - | - |
| 9 | 4 | 66.0 | 54.3 | 77.7 |
| 10 | 0 | - | - | - |
| 11 | 0 | - | - | - |
| 12 | 2 | 66.3 | 62.8 | 69.7 |
| 13 | 5 | 66.9 | 60.2 | 73.6 |
| 14 | 3 | 73.7 | 59.4 | 87.9 |
| 15 | 3 | 69.2 | 63.1 | 75.3 |
| 16 | 5 | 77.7 | 74.0 | 81.4 |
| 17 | 4 | 70.3 | 65.2 | 75.3 |
| 18 | 7 | 77.7 | 73.7 | 81.7 |
| 19 | 9 | 79.6 | 74.2 | 85.0 |
| 20 | 8 | 78.1 | 74.0 | 82.2 |
| 21 | 4 | 75.9 | 68.1 | 83.6 |
| 22 | 3 | 86.8 | 75.6 | 98.1 |
| 23 | 2 | 88.3 | 73.1 | 103.4 |
| 24 | 4 | 85.8 | 80.9 | 90.6 |
| 25 | 4 | 86.4 | 78.8 | 93.9 |
| 26 | 2 | 77.3 | 67.9 | 86.6 |
| 27 | 3 | 90.3 | 82.0 | 98.6 |
| 28 | 2 | 88.0 | 76.2 | 99.8 |
| 29 | 2 | 86.5 | 76.7 | 96.3 |
| 30 | 1 | 81.5 | * | * |

| Age | n | Mean Length (mm) | 95% Confidence Interval | |
|-----|---|---------------------|-------------------------|-------------|
| | | | Lower Limit | Upper Limit |
| 31 | 1 | 88.5 | * | * |
| 32 | 1 | 86.0 | * | * |
| 33 | 0 | - | - | - |
| 34 | 0 | - | - | - |
| 35 | 1 | 86.0 | * | * |



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