

# FACT SHEET

## HUDSON RIVER

### FRESHWATER MUSSELS



### Population Surveys

Past and continuing discharges of polychlorinated biphenyls (PCBs) from the Hudson River PCBs Superfund Site ("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.

**Why Study Mussels:** The Hudson River supports populations of native freshwater pearly mussels (Unionidae). The mussel beds they form provide habitat for other species. In the Upper Hudson River and other ecosystems, freshwater pearly mussels are major contributors to benthic invertebrate biomass and serve important functions by filtering water, cycling nutrients, enhancing habitat complexity, and providing food for wildlife.

Remedial dredging in the upper Hudson River from 2009-2015 harmed freshwater mussels through physical removal of mussels themselves, along with the sediments they lived in. Additionally, the thickness and types of backfill and cap material placed in dredged areas of the river can smother mussels, while reconstructed habitat can be unsuitable for mussels to recolonize, survive, grow and reproduce.

**Study Purpose:** The Trustees quantitatively surveyed 6 pools of the Upper Hudson River in 2013 and 2015 with the goal of investigating the effects of the dredging remedy on freshwater mussels. The studies were designed to quantitatively characterize species composition, population size, relative abundance, population structure (i.e., length and external age) and ecological services (i.e., biomass, carbon storage and filtration). The surveys provide an estimate of mussel density and the total number of mussels present in before-remediation (pre-dredging), after-remediation (post-dredging) and non-remediated (no dredging) areas of a given pool and pool-wide, and serve to inform the baseline condition for potential future restoration actions. Results of the two-year quantitative survey have been released. A report describing the results of the thin-section aging results (internal age) is being released concurrently.

**Study Area:** Five pools - Thompson Island, Fort Miller, Northumberland, Stillwater and Upper Mechanicville - were surveyed within the Site boundaries. The Feeder Dam Pool upstream of the remedy was the reference location. The surveys targeted non-remediated and before-remediation areas in the Fort Miller and Stillwater Pools and non-remediated and after-remediation areas in the Thompson Island and Northumberland Pools. Non-remediated areas were surveyed in the Upper Mechanicville Pool and in the reference Feeder Dam Pool upstream of the Site.

**Results:** Over 4,000 native freshwater Unionid mussels were collected during the survey. Nine species were identified: *Elliptio complanata*, *Lampsilis cariosa*\*, *Lampsilis radiata*, *Lasmogonia costata*, *Leptodea fragilis*, *Ligumia nasuta*\*, *Pyganodon cataracta*, *Strophitus undulatus*, and *Utterbackiana implicata*\*, including three listed in New York State as Species of Greatest Conservation Need (\*). Historical records document the presence of five species from this stretch of river. This study expands the known species list from five to eleven.



**Results (Continued):** Mussel density in the non-remediated and before-remediation areas of the same pool were similar, while densities in the after-remediation areas were markedly lower (91-94% fewer) than non-remediated areas of the same pool. Densities in the non-remediated areas of the Upper Mechanicville Pool were much lower than in the first four pools downstream of the two GE plants or in the upstream reference pool.

Mussel populations were substantially smaller in the after-remediation areas, altering the amount of ecosystem services generated. Only 2-3% of the pool-wide biomass (*tissue mass x density*) remained in the after-remediation areas of Thompson Island and Northumberland Pools. Filtration rates following remediation of the Thompson Island and Northumberland Pools were reduced by at least 10 times relative to filtration rates in non-remediated sections of the same pool, and by about 4.5->10 times compared to before-remediation and non-remediated areas of Fort Miller and Stillwater Pools.

**Study Conclusions:** Significant populations of freshwater mussels were found in the Upper Hudson River. High quality and similar mussel assemblages were present in areas not targeted for remediation from the four uppermost pools and the portions of two pools sampled prior to remediation. Dredging of river substrates removed most of the mussels in remediated areas and the associated services they perform. Estimates of mean mussel density, tissue biomass, tissue production, and filtration capacity were at least 10 times lower in after-remediation (dredged) areas than in non-remediated (no dredging) areas of the Thompson Island and Northumberland Pools. These results are indicative of major impacts to native freshwater mussels from the dredging remedy. Natural recovery of these Upper Hudson mussel populations post-remediation is anticipated to be slow, on the order of decades.

**Relevance to Injury:** The survey report provides compelling evidence that the density and ecosystem services of freshwater mussels is substantially lower in remediated areas of the Upper Hudson relative to before-remediation and non-remediation areas. The results of these studies will be used to determine and quantify injury to freshwater mussels as a consequence of the dredging remedy and to identify necessary restoration actions.

This report is available here: <https://pub-data.diver.orr.noaa.gov/admin-record/6306/Population%20Assessment%20and%20Potential%20Functional%20Roles%20of%20Native%20Mussels%20in%20the%20Upper%20Hudson%20River%20-Final.pdf>

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**New Hudson River Natural Resource Damage Assessment Documents Website:**

<https://www.diver.orr.noaa.gov/web/guest/diver-admin-record/6306>