

Section 8

Monitoring Framework

EC 1105-2-209 entitled, *Implementing Ecosystem Restoration Projects in Connection with Dredging* (DA, 1995), provides guidance for projects implemented under Section 204 of the Water Resources Development Act of 1992. The guidance states that reasonable follow-up and monitoring studies to assure performance criteria or environmental compliance are met, are allowable. This section outlines the proposed monitoring framework for the Poplar Island Restoration Project.

8.1 Purpose

Monitoring of the Poplar Island Restoration Project will be performed to (1) ensure regulatory compliance, (2) document the creation of beneficial habitat, (3) confirm the expected findings of no negative impacts, and (4) provide operational input on the success of habitat creation and potential changes that will increase the habitat value and utilization. This monitoring framework, like the study process and project design, is the result of a collaborative effort. It has been developed to provide a monitoring framework that meets the regulatory agency, resource agency, and construction compliance requirements for the Poplar Island Restoration Project.

Agencies providing expertise and information on monitoring elements include EPA, NMFS, USFWS, the National Biological Survey (NBS), DNR (including the Maryland Geologic Survey(MGS)), MDE, MES, MPA, and the USACE. A multi-disciplinary team was used to develop the monitoring framework in order to contain costs, to ensure comprehensive monitoring, and to provide concurrent peer review of the monitoring effort.

The development of the monitoring framework is a dynamic process, and monitoring elements will evolve to fit changing conditions and findings. The specifics of each monitoring element will be controlled by the final project details. Changes in the monitoring framework will continue to be presented to the team of resource and regulatory agencies for their review and comment. The intention of this monitoring framework is that it be flexible to meet the needs of the project and the resource agencies over time. Each element will be evaluated at the end of each monitoring year, and the monitoring team will decide upon appropriate changes as necessary.

These monitoring needs require existing (baseline) data collection in the year prior to initiation of construction, as well as at various points during the life of the project. The baseline monitoring will utilize and enhance the data collected during the feasibility study as part of the NEPA requirements. The current data identifies and describes existing conditions and projected impacts to the degree sufficient for the EIS. The baseline monitoring data will include information not

previously collected for the NEPA efforts. The baseline data documents existing conditions in the vicinity of the proposed island that will be used to assess future conditions both during and after island reconstruction. Baseline data collection was initiated in the fall of 1995 to gather a full year of data before construction of the project, currently planned to begin in the summer of 1996.

8.2 Monitoring Elements

8.2.1 Sediment Quality Monitoring

The objectives of this monitoring element are as follows:

- (1) To monitor physical parameters and the concentrations of metals and other chemicals in sediment which could be indicators of accompanying effects to benthic infauna and potential bioaccumulation through the food chain
- (2) To provide operational input on wetlands function and the need for soil conditioning to increase pH and reduce metals mobilization in the uplands

The hypothesis being evaluated is that project conditions will not significantly change the metals concentrations in sediments within Poplar Harbor. In order to evaluate this hypothesis, baseline sediment samples will be collected and analyzed for grain size, trace metals, carbon, nitrogen, and sulfur. Sample stations will be established at the same 11 points as the benthic monitoring and water quality monitoring stations described later. A farfield reference station will also be sampled. At intervals, sediments will again be collected from the same stations, analyzed, and the results compared to the baseline data.

The second sampling episode is scheduled to occur after the first placement of dredged material within the project cells and subsequent episodes are presently scheduled each year thereafter. As with all monitoring elements, the monitoring committee will undertake periodic reviews to determine ongoing sediment quality monitoring needs.

Two adjunct studies may provide additional sediment quality data helpful to the monitoring program. MGS has collected and analyzed sediments from 60 additional stations in the vicinity of Poplar Island and will make the data available to the monitoring team. This data has the potential to serve as a baseline for expanded sediment monitoring if ever needed. The other data set will result from periodic testing of sediments in the channels proposed for dredging by the USACE, Baltimore District. Dredged material samples will be analyzed and compared to reference samples collected from Poplar Harbor and another site south of the project. The USACE analyses will focus for the most part on the Priority Pollutant List less the volatile compounds.

8.2.2 Wetland Vegetation Monitoring

The objectives of this monitoring element are as follows:

- (1) To measure and evaluate differences in plant community species composition, densities or production among the Poplar Island restored marshes, those of the remnant islands, and nearby reference marshes
- (2) To measure and evaluate differences in plant community species composition, densities, or production associated with age (seral stage) of the restored marshes
- (3) To measure and evaluate differences in plant species composition or zonation associated with age (seral stage) or topographic changes of restored marshes
- (4) To provide operational input on survival of plant species and methods to increase planting success

The hypotheses being evaluated are as follows:

- (1) There are no differences in plant community species composition, densities or production among the Poplar Island restored wetlands, those of the remnant islands, and nearby reference wetlands.
- (2) There are no differences in plant community species composition, densities, or production associated with age (seral stage of the restored wetlands).
- (3) There are no differences in plant species composition or zonation associated with age (seral stage) or topographic changes of restored wetlands.

In order to evaluate these hypotheses, vegetation surveys and collections will be performed in up to six permanently marked reference plots and at existing vegetated areas on the remnant islands at the end of the growing season during the baseline year. As each wetland cell is completed, sampling plots will be established in that cell. Transects will be established through each plot and will be permanently marked. Plant shoot densities, vegetative cover, plant survival, above- and below-ground biomass, large-scale vegetation delineation and survival estimates, and a complete lists of species present will be monitored. Sufficient data will be collected using transect and quadrat sampling procedures established by the Federal Interagency Committee for Tidal Delineation (1989) in order to test the hypotheses stated above. The number of vegetation samples take will be determined based on the variability of the data; the more variable the data, the larges the number of samples that will be required. Vegetative cover monitoring in the created wetlands will be conducted twice a year during the first two growing seasons following planting. All parameters will be measured in the initial wetland cell at annual intervals through year 5, and

in years 7, 10, 15, and 20. For later cells, this extended monitoring schedule may be modified by the monitoring committee.

Sediment movement and vegetation establishment, zonation, and spread will also be examined through topographic measurement along transects, fixed photo stations along the dikes, aerial photography, and comparison of surveys. These measures will be repeated after planting of the first cell and at the intervals established above.

8.2.3 Water Quality Monitoring

The objectives of this monitoring element are as follows:

- (1) To characterize water quality in the project area to evaluate whether long-term water quality changes have resulted from the project
- (2) To comply with Water Quality Certification turbidity monitoring requirements during construction

The hypotheses being evaluated are as follows:

- (1) There will be no significant long-term change in water quality at Poplar Island. (A short-term change is expected.)
- (2) Turbidity levels outside of a defined mixing zone will remain in compliance with the Water Quality Certification limitations during construction activities.

In order to evaluate these hypotheses, 11 stations will be monitored seasonally the year prior to dike construction. The same parameters as are evaluated in the Chesapeake Bay Program will be used for water quality testing. This will be repeated after completion of the dike at a frequency of once per month. Evaluations will be made annually on whether the monitoring should be continued.

Turbidity monitoring is also likely to be required during the construction period to measure compliance with turbidity limits specified in the project Water Quality Certificate.

Return water flow and runoff from dredged material placed within the site will be closely monitored at the discharge to maintain prescribed water quality standards.

8.2.4 Benthics Monitoring

The objectives of this monitoring element are as follows:

- (1) To characterize the benthic community in the project area
- (2) To verify reestablishment of the community, if disturbed, after construction
- (3) To provide information on epibenthic colonization on the dike
- (4) To assure there is no accumulation of contaminants in the tissue of benthic organisms in and around Poplar Island due to project conditions

The hypotheses being evaluated are as follows:

- (1) There will be achievement of the benthic restoration goal (an abundance and diversity goal for benthic systems developed as part of the Chesapeake Bay Program) in Poplar Harbor within 2 years of exterior dike construction.
- (2) There will be no accumulation of contaminants in benthic tissue as a result of project conditions.
- (3) The project will promote an epibenthic community on the exterior dikes and stone habitat enhancement structures. This will enhance the habitat restoration impacts of the project and may offset the loss of the snag field to the recreational fishery.

In order to evaluate these hypotheses, 11 benthic infauna stations will be monitored once in the summer, once in the fall, and once in the spring in the year prior to dike construction. Three replicate samples per station will be collected. Community composition, abundance, and diversity will be measured and recorded. After the dike is constructed, the 11 infauna stations will be monitored during 3 seasons, along with 2 stations on the exterior dike to evaluate epibenthic colonization. Evaluations will be made annually on whether monitoring should be continued.

Benthic tissue samples will be collected when the benthic sampling occurs. The tissue samples will be analyzed for a complete scan of organic contaminants and metals. These samples will first be collected in the baseline year, then again no more than 3 years after that, and then again 1 year after the first uplands have begun to dewater. At least two benthic tissue stations will be located within the created wetlands at Poplar Island to measure contaminant concentrations in the tissue of the organisms most likely to be affected by any mobilization of metals from the dewatering of the uplands. After the results from each sampling event are known, evaluations will be made on whether monitoring should be continued.

8.2.5 Fisheries Use of Exterior Proximal Waters

The objective of this modeling element is to measure and evaluate differences in fish and decapod populations and densities before and after the project.

The hypotheses being evaluated are as follows:

- (1) There is no difference in fish or decapod species composition or density within the Poplar Island Harbor area prior to island construction compared to after island construction (A change is expected.)
- (2) There is no difference in faunal species composition or density in areas immediately adjacent to and outside of the dike prior to construction compared to after construction.

In order to evaluate these hypotheses, Poplar Harbor and areas on the reference islands east of the island footprint will be sampled using trawls, gill nets, throw traps, and crab pots. Additionally, gill nets will be used in the snag area on the western side of the remnant islands. This monitoring will provide baseline data on fish and decapod utilization. Species composition, abundance, and size will be recorded. Trawling will be performed in early spring, summer, and fall; gill netting will be performed during spring and fall; crab pots will be set in early summer; and throw trap sampling will be done during early fall. This monitoring will first be performed in the baseline year, then again after construction of the first cell, then annually for 3 years, then every 3 to 5 years.

8.2.6 Wetlands Use By Fish

The objective of this monitoring element is to measure and evaluate differences in decapod and fish densities and community species composition over time in the restored marshes, the reference marshes, and the remnant marshes at Poplar Island.

The hypotheses being evaluated are as follows:

- (1) There are no differences between decapod or fish densities or community species composition among the Poplar Island restored wetlands compared to those prior to restoration. (A change is expected.)
- (2) There are no differences between decapod or fish densities or community species composition among restored Poplar Island wetlands compared to nearby reference wetlands.
- (3) There are no differences in decapod or fish densities or community species composition associated with age (seral stage) of restored Poplar Island wetlands. (A change is expected)

In order to evaluate these hypotheses, fish, shrimp, and crab use of the wetlands will be sampled in reference marshes, created marshes, and remnant marshes. Replicate fyke nets will be used, with six replicate stations per treatment type (reference, remnant, created) where possible. Sampling for fauna will be performed during early spring, summer, and fall. Environmental parameters will also be analyzed. Species, size, and abundance data will be recorded. This monitoring will first be performed in the baseline year, again after completion of the first cell, then annually for 3 years, then every 3 to 5 years.

8.2.7 Wetlands Use By Wildlife

The objectives of this monitoring element are as follows:

- (1) To measure and evaluate species and numbers of migratory waterbirds nesting on the island
- (2) To compare densities and species composition of migratory waterbirds on the restored marshes, the remnant marshes, and nearby reference marshes
- (3) To evaluate differences in wildlife utilization with the seral age of the marsh
- (4) To evaluate use of the island by terrapin

The hypotheses being evaluated are as follows:

- (1) The species and numbers of migratory waterbirds nesting on the islands in the Poplar Island group show no numerical change or site relocation comparing pre- versus post-restoration of Poplar Island. (An increase is expected.)
- (2) Densities and species composition of migratory waterbirds using (feeding, roosting) the wetlands do not differ among restored wetlands on Poplar Island, remaining island reference wetlands, or nearby mainland reference wetlands.
- (3) Age (or seral stage) of restored sites have no influence on their relative attractiveness as nesting sites (uplands) or feeding sites (wetlands) to migratory waterbirds.
- (4) Use of restored upland sites by nesting terrapins is no different from use at either remnant island or mainland reference wetlands.

In order to evaluate these hypotheses, the number of species and species densities of migratory waterbirds and terrapins on the remnant island marshes and in nearby reference marshes will be quantified. Nest counts will be conducted in the spring using key indicator species. Wetland plots in reference wetlands, created wetlands, and remnant wetlands will also be used to evaluate bird

use. This will be performed one to two times per month in the spring and August to mid-September. Uplands transects will also be established for terrapin searches, which will be conducted at weekly intervals from June 1 to July 15. Indicator species are bald eagles, black ducks, little blue herons, least and common terns, snowy egrets, migrant shorebirds, and terrapins. Contingent upon available funding, the wildlife monitoring component should be reevaluated in the year 2008 to determine whether additional monitoring is warranted.

8.2.8 Shellfish Bed Sedimentation

The objective of this monitoring element is to provide information on the change in sedimentation rates on nearby chartered oyster bars. The hypothesis being evaluated is that there is no increase in sedimentation rates on the chartered oyster bars during construction of the exterior dikes at Poplar Island when compared to sedimentation rates prior to dike construction.

If monitoring indicates that the oyster bar is being impacted by sedimentation, bagless dredging or similar action will be used to mitigate the impact.

8.3 Management of Monitoring

USACE, Baltimore District personnel will manage the monitoring effort described above. In accordance with EC 1105-2-209, monitoring costs will be limited to 5 percent of the construction costs and will be cost shared in the same ratio as the overall project (75 percent Federal, 25 percent non-Federal). Some contributory effort by other Federal and State resource agencies is possible, but cannot be programmed at this time.

It is estimated that dredged material will be placed at the site for a period of 24 years; based on this assumption, the above monitoring framework is anticipated to be in effect for approximately 30 years. Table 8-1 illustrates the years in which the various elements are expected to be monitored.

The monitoring team that has been instrumental in developing this framework, will be asked to continue as an monitoring oversight committee and to advise sight managers. In the immediate future, the team will be asked to review and finalize specific sampling plans for approved studies and to establish QA/QC requirements and data quality objectives. Regular monitoring reports will be issued and monitoring data will be available online. The District will work to establish a Poplar Island "Home Page" on the Internet with links to monitoring data.

POPLAR ISLAND PROPOSED MONITORING SCHEDULE ACCORDING TO FRAMEWORK

STUDY ELEMENT	MONITORING YEAR																					
	1995 1	1996 2	1997 3	1998 4	1999 5	2000 6	2001 7	2002 8	2003 9	2004 10	2005 11	2006 12	2007 13	2008 14	2009 15	2010 16	2011 17	2012 18	2013 19	2014 20	2015 21	2020 26
Sediment Quality	X			X	X	X	X	X	X	X	X	X	X									
Wetland Vegetation	X						X	X	X	X			X								X	X
Water Quality Monitoring Turbidity	X		X	X			X			X			X			X					X	X
		X	X	X																		
Benthics	X		X	X			X			X			X			X					X	X
Fisheries Use of Exterior Proximal Waters	X							X	X	X			X			X					X	X
Wetlands Use by Fish	X							X	X	X			X			X					X	X
Wetlands Use by Wildlife	X				X			X			X			X								
Shellfish Bed Sedimentation	X	X	X																			
Technical Integration	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Project Management	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	X- MONITORING TO BE PERFORMED																					

NOTES: 1. All monitoring elements will be evaluated annually to determine whether continued monitoring in each discipline is necessary. Some elements may be added or deleted as time goes on and conditions change.

2. Initiation of wetlands monitoring is contingent on completion of the wetlands plantings for the first cell.