**Impoundment Restoration at John Heinz NWR**

**Monitoring approaches for Marsh Restoration and/or Living Shorelines**

*[You must use Appendix A to complete this table]*

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| **Marsh Restoration and/or Living Shorelines** | | | | | | |
| **Metric (include units)** | **Difference to Recommended Methods and Protocols (if any)** | **Spatial extent of metric monitoring** | **Baseline yr** | **Frequency/ Timing** | **Data Limitations/ Considerations** |
| Percent Cover of biomass by species or cover type (% ranging from 0-100) | Due to inability to establish transects/quadrats for current open water conditions we will use  visual estimates for entire impoundment from shoreline, trails, boardwalks, and tower. Currently the lack of ability to manage water level affects current biomass as it is open water and not marsh. | 145 Acre Impoundment | 2019 | July 2019 This will be completed annually.. | The open water is largely covered by duckweed (*Lemna minor*) and spatterdock (*Nuphar advena*) with patches of cattails (*Typha* sp.) and phragmites (*Phragmites australis*). Unseasonably high water levels.  The mudflats are covered with dense phragmites (*Phragmites australis*) with patches of cattails (*Typha* sp.) and spatterdock (*Nuphar advena*). Occasional pickerelweed.  The shoreline is a dense covering of phragmites (*Phragmites australis*) with patches of cattails (*Typha* sp.) and spatterdock (*Nuphar advena*). Some patches of marsh-mallow. |
| Elevation (cm) | Since this project will improve water management in an impoundment, we do not expect significant changes in elevation. We have data from previous bathymetry surveys to compare over the long term, this was completed by USFWS in 2017. | NA | NA | NA | NA |
| Shoreline Position | The shoreline is an establish dike trail. We do not expect any change in position due to wave energy, etc. | NA | NA | NA | NA |
| Water level | Since this project is not a full total tidal restoration, we will continue to use current gauges installed in the impoundment to monitor water levels. Water levels will be managed with the pump to help mimic tidal marsh conditions. The tidal marsh conditions are monitored by data loggers on the Marsh boardwalk. | The entire 145 acre impoundment will be visually observed to determine water level and percent mud flats. | 2019 | July 2019 This will be completed quarterly. | fdgd |
| Oyster reef restored (acres)[if applicable] | Not applicable | Not applicable | N/A | N/A | NotNNNot applicable |