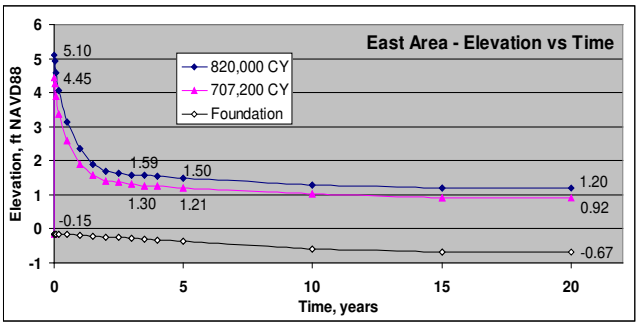
# Quantification of DM Layer Thickness over Time as Applied in TLP Wetland Nourishment Projects

Dredging Operations Environmental Research (DOER) Program

U.S. ARMY CORPS OF ENGINEERS BUILDING STRONG®

## Problem

Thin layer placement of dredged material for wetlands nourishment and restoration is currently experiencing a renaissance. This is due, in part, to the USACE's diminishing capacity to place material dredged from navigation channels along with realization of the deleterious effects sea level rise is having on wetland assets. In designing constructed wetlands or marsh nourishment projects, it is critical to know how much material should be placed in order to achieve a functional elevation for the future. After placement, the dredged material elevation is reduced by primary consolidation, secondary compression and desiccation. The "Primary consolidation, Secondary compression, and Desiccation of Dredged Fill" (PSDDF) model was developed for USACE to calculate the total settlement of a dredged fill layer. However, the model does not currently account for wetland and intertidal environments where dense root structures may support the soil column and restrict consolidation but may enhance desiccation at elevations above the inundation. Similarly, the effects of cyclic and seasonal inundation on the consolidation is unknown. The present state of understanding and modeling of the effects of evapotranspiration and buried wetland biomass (grasses, etc. covered during thin layer placement) on dredged material consolidation is also limited.




## Study Description

This RT will collect sediments from various thin layer placement projects and conduct settling and consolidation tests as inputs to PSDFF to predict dredged material settlement rates over time. Sediments will be subjected to varying controlled conditions in the laboratory (inundation cycles/varying biomass configurations, with and without vegetation, etc.) to gain a better understanding of soil/water/biomass interactions and subsequent impacts on placement density, plant compression, and evapotranspiration induced settlement. Guidance will be developed to account for these processes and then applied to the PSDDF model. The modeling process will be applied to predict elevation change at ongoing thin layer placement sites and compared to actual conditions over time for field verification of the modified PSDDF model. Ground based LIDAR will be used to assess wetland elevation over time.

## Products

An award winning conference paper, Application of laboratory and modeling tools to design thin layer placement projects for marsh nourishment, (Bailey et al. 2017) was presented at WEDA describing application of PSDDF to thin layer placement in NJ. Other products will include two journal articles detailing overall efforts, two technical notes documenting the laboratory experiments, and a technical report on comprehensive field and laboratory analyses. A DOTS webinar may also be conducted to explain the functionality of the model and how it could be employed in the design process for marsh creation.

## Summary

This research task includes bench scale testing and field data collection to improve our understanding of dredged material consolidation behavior after thin layer placement. The RT will result in a better understanding of the physical processes involved in placement, dewatering and settlement of dredged material in wetland environments, examining the effects of vegetation on placement density, and plant transpiration and rooting on consolidation and its dynamics. It will provide more robust application of the PSDDF model to calculate dredged material settlement over time in order to optimize attainment of the design elevation(s) to facilitate maintenance of sustainable wetlands via thin layer placement of dredged material. These improvements will allow USACE planners and other agencies involved in ecosystem restoration to better design wetland creation projects to reach target elevations, resulting in fewer projects that fail as a result of missed target elevations.

*Balancing operational and environmental initiatives and meeting complex challenges of dredging and dredged material placement in support of the navigation mission.*

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