Identifying the Influence of Soil Conditions and Site Placement on Beneficial Use Floodplain Forest Restoration Design and Outcomes

Reference SONs: *2023-1897/1909*

#1909: *Land Cover Associations on Sites Constructed using Dredged Material*

#1897: *Physical and Biological Soil Characteristics Influencing Floodplain Forest Restoration Success*

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Research Need

Floodplain forests across the U.S. have significantly declined due to historic harvest, riverine management, and both agricultural and urban development. The USACE management of river systems and availability of dredged sediment provides opportunities for floodplain forest restoration, where dredged sediment can be beneficially used (BU) to offset forest loss by constructing islands to restore geomorphic diversity. USACE districts in the Upper Mississippi River System (UMRS) have spent millions creating floodplain forest islands and planting desirable tree species, but achieving consistent vegetative success has proven difficult and numerous sites fail to meet restoration goals.

Opportunities to investigate the influencing characteristics of dredged sediment placement sites and soil properties on floodplain vegetation outcomes are needed to inform and improve the restoration success of floodplain forest creation projects across the USACE.

Project Purpose & Objectives

The project will: 1) Identity the soil physical, chemical, and biological properties in created floodplain forests that promote vegetation restoration success and, 2) Determine land cover associations between floodplain vegetation and placement site geomorphic characteristics to better predict long-term vegetative outcomes.

Primary project objectives are to:

- Develop a comprehensive geodatabase of dredged sediment placement and BU restoration sites within the UMRS.

- Evaluate land cover associations of placement sites to identify historic site characteristics that influence present vegetation communities.

- Assess floodplain vegetation health in relation to soil physical, chemical, and microbial properties to identify soil conditions that promote successful floodplain forest development.

- Provide recommendations on design criteria for floodplain forest creation.

Value of Research and Development (Payoff)

- Provide guidelines and refine design criteria for the successful creation of floodplain forest islands.
- Better anticipate near, future, and long-term project outcomes based on current available data.
- Predict the development of desired vegetation in BU floodplain creation projects, saving millions in project costs and adaptive management.
- Support ecosystem, navigation, and flood risk management benefits, helping create a more resilient floodplain system.

Products and Deliverables

Journal Articles (JAs)

Influence of site placement characteristics on BU floodplain vegetation outcomes. 2026. Soil Science Society of America Journal.

Technical Reports (TRs)

Recommendations for Successful Floodplain Forest Establishment and Development through the Beneficial Use of Dredged Material. 2026.

Other Reports/Models/Tools/Datasets

Geodatabase of BU Sites in the UMRS. 2026.

UMRS Soil/Vegetation Field Database. 2026.

- Field data for soil and vegetation sampling results will be incorporated into the BU geodatabase. Data will also be provided as appendices/supplementals to Tech Reports/Journal Articles and as spreadsheets for reference in the geodatabase.

Conference Presentations/Webinars/Workshops

UMRS BU Floodplain Forest Restoration Workshop. 2024.

Enhancing Carbon Storage Through the Beneficial Use of Dredged Sediment. Soil Science Society of America International Meeting. 2024.

Soil Physical, Microbial, and Chemical Characteristics Influencing Floodplain Forest Resilience and Restoration Success. Soil Science Society of America International Meeting. 2026.

Upper Mississippi Conservation Committee (UMRCC) Presentation. 2026.

"Utilizing UMRS BU Database for Project Outcomes". Webinar. 2026.

"Influence of site placement characteristics on the trajectory of BU floodplain forest creation projects". Webinar. 2026.

Communication (Social Media, Videos, Podcasts, Photos, etc.)

PAO video for release. 2025.

Images

Figure 1: Vegetation assessments at a natural floodplain forest reference site

Figure 2: Soil assessments at a BU floodplain forest site

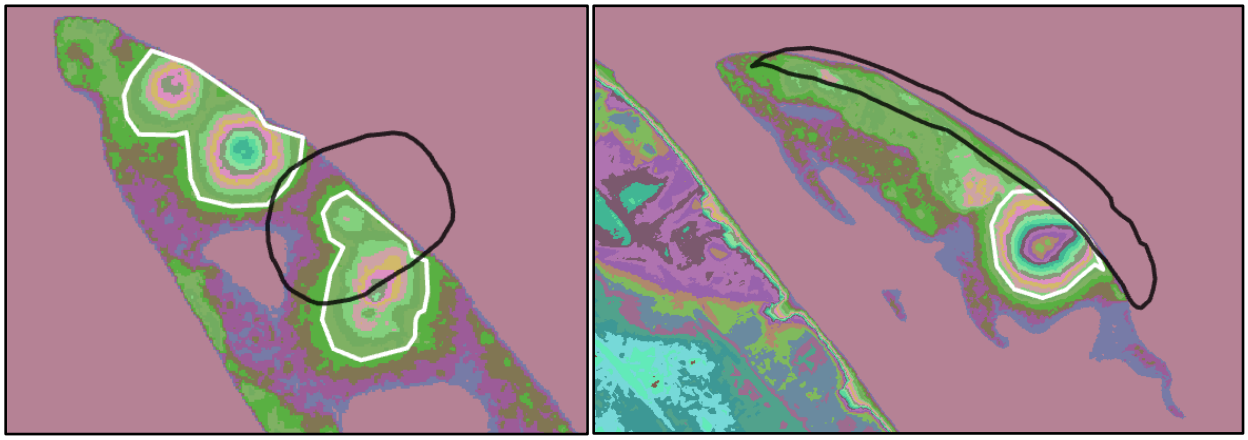

Figure 3a&b: Example of digitized and corrected locations of historical sediment placements in floodplain forests in the UMRS for addition to database. Black outlines note the current assumed locations of sediment placement as suggested by historical data. White outlines refine and correct the locations of the placement sites based on lidar imagery for more accurate location identification.

Figure 4: Vegetation and soils assessments within the UMRS