



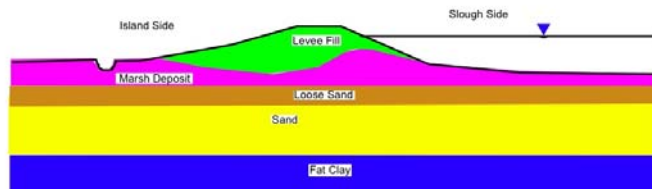
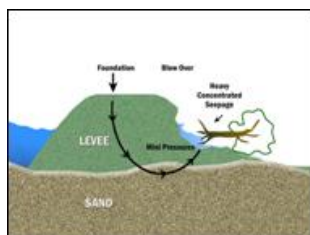
US Army Corps  
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## Water Resources Infrastructure R&D Program

# Effects of Woody Vegetation on Levees

### Description

At the request of the USACE Headquarters (HQ), in July 2007, the U.S. Army Engineer Research and Development Center (ERDC) conducted an extensive literature review focusing on the effects of woody vegetation on levees. The findings of the review found that no documented evidence exists to prove trees negatively influence levee integrity; however, research is very limited that specifically addresses woody vegetation on levees. The literature review was then extended to include subjects pertaining to root systems, slope stability, hydraulic processes, and wind force that would prove helpful in future. Based on the results of the literature review, the USACE HQ recognized that without further research, the question of the effects of woody vegetation on levees would remain unanswered. In April 2008, USACE HQ requested that ERDC begin research on this issue. The overall objective of the research is to answer what appears to be a simple question: *What is the effect of vegetation, specifically woody vegetation, on levees?*



This question will be addressed through the following efforts. Task 1 - Literature Review of all existing efforts to date documenting research related to woody vegetation on levees. Task 2 - Collect Information of Root System Architecture – The general root architecture is known for many plant species, but specific root characteristics and their interaction with soil are widely varying, affected by many factors, and not well understood. Furthermore, the interaction of a root system with soils on an engineered levee is largely unknown. Information regarding rooting conditions and root system variability is available through various botanical sources and will be assembled in one database. The database will assist researchers in identifying the proper tools to use at specific sites. Task 3 – Development of Methodology, Selection of Study Sites, and Initial Testing of Selected Tools – Task 3 research is an initial testing of geophysical tools and modeling software proposed in FY08.

Task 3 begins the research phase of the proposal and will focus on the collection and evaluation of data associated with a) implications of vegetation roots on levees relative to stability and seepage or piping, b) forces necessary to overturn trees of various species, age, and substrate, and c) vegetation community structures likely to optimize performance relative to erosion control, slope stability, inspection requirements, maintenance, and environmental quality. Future research will build on information gathered from Tasks 1-3. Task 4 – Refinement of Methodology, Expansion of Study Sites, and Continuation of Research – Task 4 will expand the research defined in Task 3. The evaluation and interpretation of the gathered data will offer scientific support for USACE levee guidelines.

**Benefits** The research will lend scientific support to USACE guidelines for vegetation on levees. Previous scientific research ignored safety issues associated with levees; however, the proposed research will address safety concerns in addition to advancing the scientific realm of root system interaction with various soil horizons.

**Status** An exhaustive literature review on the effects of woody vegetation on levees has been completed and is available. A database consisting of different tree species for identifying root characteristics has been established. There have been numerous coordination meetings with Sacramento Area Flood Control Agency (SAFCA), CA Department of Water Resources (DWR), and various interested parties from State and local agencies to universities. Additionally, extensive coordination has occurred with International parties. The work plan is completed and has undergone external peer review. Numerous potential field sites for testing have been visited and identified for FY09 efforts.

**Distribution Source(s)** Results of this research effort will be distributed through ERDC technical reports.

**Available Documentation** Literature review on the effects of woody vegetation on levees is completed and will be posted to a website in FY09. Copies of the report can be obtained by contacting Dr. Maureen K. Corcoran.

**Available Training** Training is not applicable for this effort.

**Available Support** Support can be obtained by contacting Dr. Maureen K. Corcoran at ERDC-GSL.

**Application** Results of this research will directly support current USACE-HQ guidance.

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**Partners** ERDC-CHL, ERDC-EL, ERDC-ITL