



Engineer Research and
Development Center

Dredging Operations Environmental Research (DOER)

Dr. Todd S. Bridges, ST
Senior Research Scientist,
Environmental Science

Navigation RARG Meeting
Vicksburg, MS
7 April 2015



US Army Corps
of Engineers®



Navigation Dredging: Present and Future

- Cost and time pressures
- Environmental issues present constraints and opportunities
- Risk management principles and practices are key to solution development
- S&T innovation is critical to the future of the Navigation Program



The Goal of DOER

Support sound environmental management and operational practice by advancing science, engineering and technology applied to navigation dredging operations



BUILDING STRONG®

ERDC

Innovative solutions for a safer, better world

DOER Programmatic

- Continuing program in O&M
 - Operating for >15 years
- Organized around Focus Area themes
 - Sediment and Dredging Processes
 - Dredged Material Management
 - Environmental Resource Management
 - Risk Management
- Finite-term research projects, e.g. 1-3 years in length
 - About 40 projects active in a given year
- Proactive R&D to shape debate and practice



DOER Management

Program Management

- Todd Bridges, PM
- Cynthia Banks, Assistant PM

HQ Oversight

- Jeff McKee, Navigation Business Area Lead
- Joe Wilson, Technical Monitor

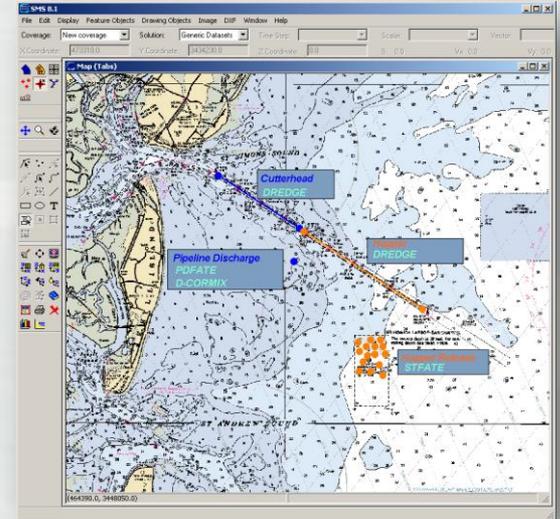
Focus Area Leaders

- Joe Gailani, SDP
- Tim Welp, DMM
- Todd Swannack, ERM
- Todd Bridges, RM



DOER's Strategic Focus

- Increase understanding of key, fundamental processes
- Enhanced modeling capability to support engineering design and operations
- Science that reduces environmental testing burden
- Economical solutions for T&E species and Environmental Windows
- Engineering With Nature for sustainable practice



Sediment and Dredging Processes

Focus Area

Situation: Challenges posed by fiscal/manpower limitations, dredging cost increases, the goal of sustainable dredging and beneficial use, and evolving environmental standards. These issues must be addressed in a timely, cost-effective manner.

Barriers: Complex interactions between sediment and dredging processes. Limited understanding to predict the effectiveness of engineering measures and sediment handling methods. Uncertainties regarding the efficacy of innovative practices.

Solution:

- Expand understanding of critical sediment and dredging processes to improve operational efficiency
- Develop improved engineering tools and models to support multiple project objectives, e.g., cost-efficient engineering, resolve environmental conflicts, expand opportunities for BU
- Evaluate and facilitate transition of new technologies and practices



Turbulence and Transport in Wetting/Drying and Vegetated Regions

Duncan Bryant

Project Objectives

- Investigate processes for sediment transport and deposition in wetlands
- Improve modeling with process knowledge

FY15 Major Tasks Planned

- Physical Modeling of Wetland hydrodynamics and sedimentation

FY15 Products/Deliverables w/ planned dates for completion

- JP - Vegetation-induced wave attenuation and turbulence, and the role of vegetation motion (resubmission May 2015)
- TR – Laboratory studies of waves and currents in vegetated environments (May 2015)
- TR – Sediment Processes in Wax Lake
- JP – Short Time Scale and Seasonal Variation of Wax lake Delta Hydrodynamics

Progress Brief

- Physical modeling will begin in April/May 2015
- Meeting with numerical model developers to assure measurement of necessary values
- Continued analysis of Wax Lake field data collection



Sediment Settling and Flocculation in Wetting/Drying and Vegetated Regions

Jarrell Smith

Project Objectives

- Develop extension of PICS technology for deployment in shallow, vegetated environments
- Inform BU projects of muddy sediment settling velocities in shallow and vegetated environments

FY15 Major Tasks Planned

- Deployment at Hamilton Wetland Restoration Site
- Deployment at 2nd candidate site. Wax Lake, James River, or other candidate.
- Lab experiments with DOER Sediment Migration through Wetlands RT
- JA manuscript

FY15 Products/Deliverables w/ planned dates for completion

- Webinars Coastal & H&H CoPs (Aug 2015)
- JA (EC&SS) (9/2015)

Progress Brief

- Collaboration with EwN at Hamilton Wetland Restoration
- Collaboration with EMRRP at Wax Lake
- Significant outside interest in collaboration:
 - USGS – Center Wetland Res.
 - VIMS
 - KORDI



Geochemical and Other Tracers for Dredged Material Fate

David Perkey and Heidi Wadman

Project Objectives

- Demonstrate & disseminate the value of geochemical techniques to identify source(s), track movement, and determine infilling rates of sediments so that effective management and policy decisions can be made for an area of interest

FY15 Major Tasks Planned

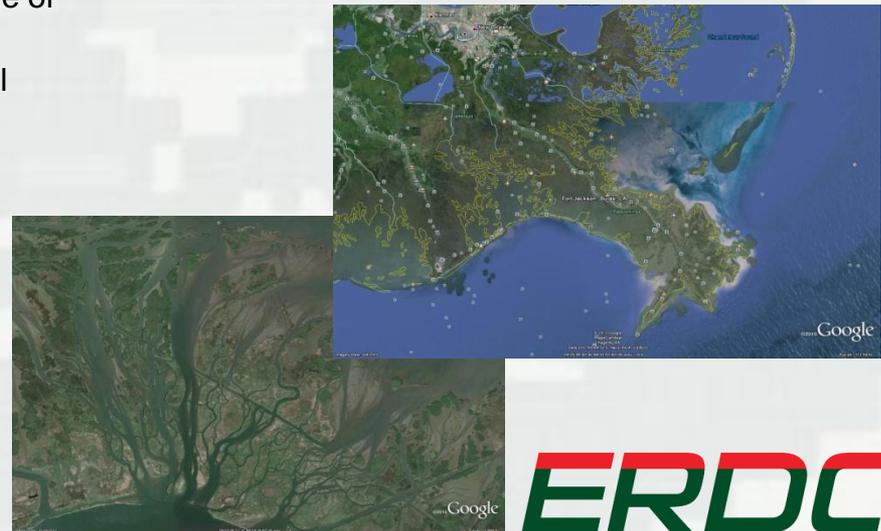
- Finalize TNs describing methods & applications of geochemical fingerprinting of sediment
- Finalize analysis & report on sedimentation rates in the FSP outlet
- Finalize analysis & report on geochemical signature of sediments infilling Calumet region
- Lead RSM webinar on applications of geochemical techniques to address potential dredging and sediment management issues

FY15 Products/Deliverables w/ planned dates for completion

- RSM Webinar, 4/2015
- Methods TN, 5/2015-Final
- Calumet TR, 5/2015-submitted
- Applications TN, 8/2015-submitted
- FSP TR/JP, 9/2015-submitted

Progress Brief

- Method TN submitted 12/2014. Revisions in progress
- Agreement with LSU to provide support for graduate student on FSP project. Expect contract awarded within weeks
- Initial PCA completed on Calumet data. Geospatial interpolation in progress
- Abstracts on geochemical techniques and case study of Calumet submitted to PIANC Dredging 2015



Nutrient/Contaminant Release for Open Bay/Lake Placement

Paul Schroeder

Project Objectives

- Provide conceptual model for phosphorus mass balance
- Develop evaluation framework and criteria for dredging and dredged material management impacts
- Measure and predict short-term and long-term nutrient availability and partitioning in the laboratory

FY15 Major Tasks Planned

- Elutriate and sequential batch leaching tests for Upper Chesapeake Bay and Toledo/Western Lake Erie
- Demonstrate evaluation framework for Toledo/Western Lake Erie

FY15 Products/Deliverables w/ planned dates for completion

- Nutrient availability TN, May 2015
- Phosphorus evaluation demonstration TR, Sep 2015
- Nutrient availability from dredging operations JP, Sep 2015

Progress Brief

- Laboratory testing completed
- Working draft of TN completed
- RECOVERY modeling of long-term phosphorus release initiated



BUILDING STRONG®

ERDC

Innovative solutions for a safer, better world

Rapid, Cost-Effective Monitoring at Receptors Near Dredging/Placement Sites

Deborah Shafer and Cheryl Pollock

Project Objectives

- Evaluate and test instrument package to quantify exposure of aquatic biological resources to dredging related turbidity and light reduction
- Develop a system for collecting long-term data that can be used to compare exposure attributable to dredging activities vs. ambient conditions

FY15 Major Tasks

- Bench Test of PAR Sensors
- Develop MatLab Data Analysis Routines
- Field Demo Egmont Key, FL Sept 2014-March 2015 (data collection ongoing)

FY15 Products/Deliverables

- TR Instrument Arrays and Methods for Evaluating Changes in Underwater Light Environment Associated with Dredge Plumes [In review](#)
- TR/JA Field Demo Results from Egmont Key

Progress Brief

- Bench testing and evaluation - complete
- Field demo ongoing –
 - Pre-dredging storm event captured
 - Post placement storm event captured
 - > 100 instruments deployed
 - Swash zone placement monitored
 - Single point placement monitored
 - Issues – Biofouling!!!, instrument burial, mullet fishing w/nets
 - Wipers were less effective than expected
- TR Instrument Arrays... - in review



Nearshore and Wetland Placement Remote Field Monitoring Techniques

Joseph Gailani

Project Objective

- To collect appropriate data pertaining to nearshore and wetland placement of DM (geophysical flow, meteorological, sediment property).
- Develop remote field data transmission methods
- Develop appropriate analysis methods and products
- Support multiple targeted SDP and DMM RTs pertaining to nearshore sediment transport.

Progress Brief

- Instrumented Wax Lake (Season 2)
- Instrumented Hamilton
- Data Analysis at Wax Lake (Season 1)
- Look for additional FY15/16 monitoring and data opportunities (York River, Sears Point, Avalon)
- Collaboration with CDR/EWN

FY15 Major Tasks Planned

- Monitor winds, waves, currents, turbidity, etc at Wax Lake
- Monitor winds, waves, currents, turbidity, etc at Hamilton Wetland Restoration
- Analyze data from Wax Lake, Hamilton

FY15 Products/Deliverables

- TN: Wax Lake hydrodynamic, wave, and sediment property data collection and analysis (6/30)
- TN: Hamilton Restoration data analysis (9/30)



Estimating Total Exposure for Regions with Navigation Channels

Joseph Gailani/Tahirih Lackey

Project Objective

- To identify exposure sources and pathways to receptors in areas that include dredging.
- Develop methods to quantify total exposure from all sources under various sources
- Place dredge sources within context of all sediment exposure mechanisms.
- PTM to track sediment from sources to receptors

FY15 Major Tasks Planned

- Analyze overflow dredging data at Egmont Key
- Complete development of v1 scenario builder tool

FY15 Products/Deliverables

- TN: Building CSM for regional exposure mechanism (7/15)
- TN: Scenario Builder Tool for PTM application to regions with navigation infrastructure (9/15)
- TR/JP – Quantifying Total Exposure using PTM (9/15)

Progress Brief

- Two databases that are currently being analyzed
- Continue developing scenario builder
- Continued development of PTM
- TN development



Nautical Depth for Navigation

Tim Welp

Project Objectives

- Implement (in conjunction with MCNP) nautical depth in Gulfport and Calcasieu and evaluate sediment conditioning in Atchafalaya Bar Channel
- Develop methodologies for USACE-wide application
- Provide engineering guidance for, and educate and involve other Districts with fluid mud

Progress Brief

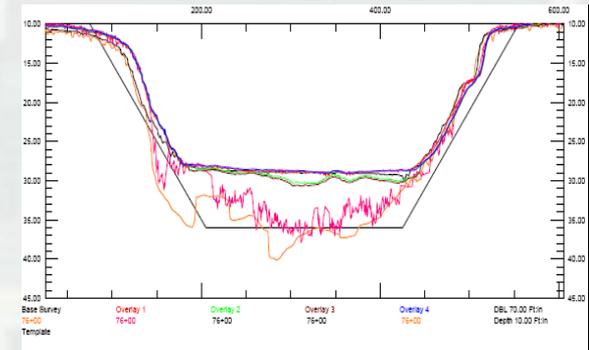
- ASCE paper submitted and TN at editors
- SWG survey equipment demo completed 2/15
- Ship simulator upgrade unexpectedly complex and expensive
- ETL engineering guidance in SME review

FY15 Major Tasks Planned

- Calibrate ERDC ship simulator with fluid mud hydraulic coefficients and conduct Calcasieu runs
- Demonstrate survey equipment in SWG
- Rheometry/mineralogical analysis on Gulfport and Calcasieu

FY15 Products/Deliverables w/ planned dates for completion

- ASCE manuscript 1/15
- Nautical Depth TN 3/15
- Upgraded ship simulator 5/15
- Engineer Technical Letter guidance 6/15
- Revised Hydro Surveying EM 8/15



STEMA - Silas - Bottom	347,701 yd ³
ODOM - mkIII - HI Freq 200Khz	346,632 yd ³
HI Freq 200Khz	338,620 yd ³
STEMA - Silas - Low density	314,407 yd ³
STEMA - Silas - High density	304,582 yd ³
ODOM - mkIII - LO Freq 28Khz	139,989 yd ³
LO Freq 41 Khz	60,482 yd ³



Sediment Engineering through Dredging and With Nature (SETDWN)

Coraggio Maglio and Jase Ousley

Project Objectives

- Quantify fines losses in dredging process
- Improve modelling capabilities
- Increase beneficial use of currently unacceptable navigation dredged materials – beach, nearshore

FY15 Major Tasks Planned

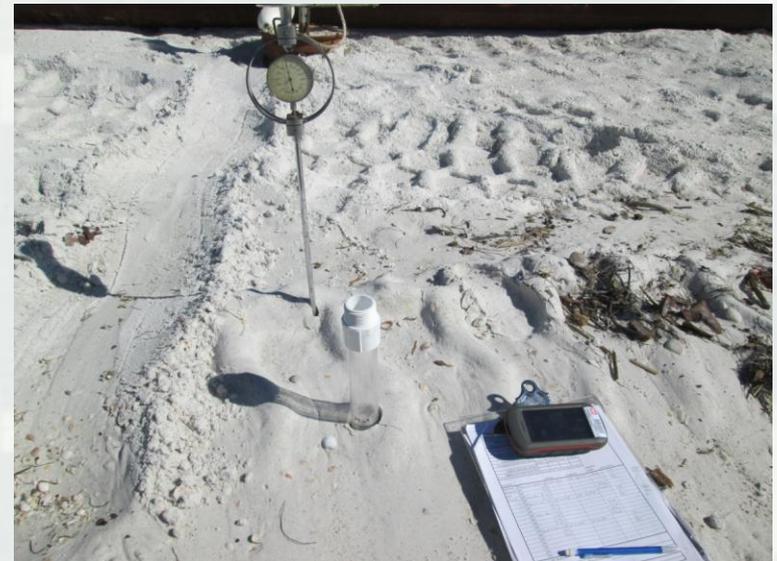
- Historical database mining SAJ & FDEP
- Field sampling at Egmont Key ongoing
- Intensive hopper dredge sampling 10 Mar 2015

FY15 Products/Deliverables w/ planned dates for completion

- FSBPA Presentation by Jase Ousley “Fate of Fines Sediment Loss During the Hydraulic Dredging Process”, February 2015
- Coastal Sediments Presentation and paper by Coraggio Maglio “Sediment Engineering Thru Dredging and With Nature”, May 2015.
- Locate and sample additional sites around the country at projects with high fines
- Providing support for St. Johns WQC

Progress Brief

- Nearly complete with historical data collection in FL trying to locate additional state/district data sets
- 2 months of twice daily samples collected at Egmont Key: slurry, return water & berm
- In-situ geotech core data finalized (USF)
- Working with SWG to sample Galveston Entrance channel beach placement – currently advertised solicitation



Dredged Material Management Focus Area

Situation: Costs for managing dredged material continue to increase. Numerous barriers impede BU for dredged sediments. Increasing demands for operational data to support management decisions. Cost-efficient, long-term management solutions for DM needed.

Barriers: Uncertainties regarding the performance of engineering and operational processes. Insufficient tools for collecting and managing critical operational data. Ineffective and/or unsubstantiated practices to address environmental issues.

Solution: Develop and transition methods and technologies to the field that are designed to not only optimize dredged material placement operations and management, but also provide enhanced capabilities to enable more beneficial use of dredged material.



Nearshore and Wetland Placement Transport Tools

Joseph Gailani

Project Objective

- To analyze appropriate data pertaining to nearshore and wetland placement of DM material.
- Develop appropriate process understanding and algorithms to predict fate of placed material
- Develop screening level tools to assess different aspects of nearshore placement

FY15 Major Tasks Planned

- New version of SAND model (include CE-Dredge output)
- V2 GTRAN model (Interface in progress)
- Data analysis for Wax Lake Season 2

FY15 Products/Deliverables

- Algorithms for other transport models (9/15)
- TN: V1: SAND-based DM BU model (9/15)
- GTRAN TN, V2 GTRAN (9/15)
- TR/JP Sediment Penetration into Wetlands (9/15?)

Progress Brief

- New versions of Sand model and GTRAN model are operational
- Data analysis in progress



Dredging Model Data Integration Framework

Linda Lillycrop and Tahirih Lackey

Project Objectives

- Demonstrate application of NDIF concepts to a dredging numerical model
- ID challenges, solutions, lessons learned
- Expand demonstration and lessons learned to Navigation models and data

FY15 Major Tasks Planned

- Develop a Data Management Plan
- Complete the base structure of the Web tool interface and populate with Tier 1 models as well as Test case data.
- Complete Test case data input component tools

FY15 Products/Deliverables w/ planned dates for completion

- DM-DIF Master Library TN 31 May 15
- DM-DIF Data Mgmt Plan 30 Aug 15
- Web Tool Update/TN 30 Sep 15

Progress Brief

- Master Library TN in development
- Data Mgmt Plan outlined
- Test case components in development
- Website development on track

Dredging Technologies
A tool to identify appropriate models based on selected criteria

Problem Criteria

- Location
 - + Dredging Location
 - + Placement Location/Type
- Dredge Type
 - + Hydraulic
 - + Mechanical
- Problem Type
 - Confined Disposal Facility Design
 - Containment Transport
 - Sediment Transport

Models

- Hydrodynamic
 - ADH
 - ADCIRC
 - CMS
- Sediment Transport
- Confined Disposal Facility
- Contaminant Transport
- Health Risk Assessment
- Sediment Assessment and Management
- Water Quality

ADCIRC Hydrodynamic

The Advanced CIRCulation model (ADCIRC), is a two-dimensional, depth-integrated, barotropic, time-dependent long wave, hydrodynamic circulation model

Input Parameters

- Grid and boundary information
- Model parameter and periodic boundary condition

Output Parameters

- General diagnostic output
- Iterative solver
- ITPACKV 2D diagnostic output
- 3D Density, Temperature and/or Salinity at Specified Recording Stations
- 3D Velocity at Specified Recording Stations
- 3D Turbulence at Specified Recording Stations

Access
ADCIRC at Coastal & Hydraulics Laboratory

Documentation
Fact Sheet (PDF)



Dredging Portal

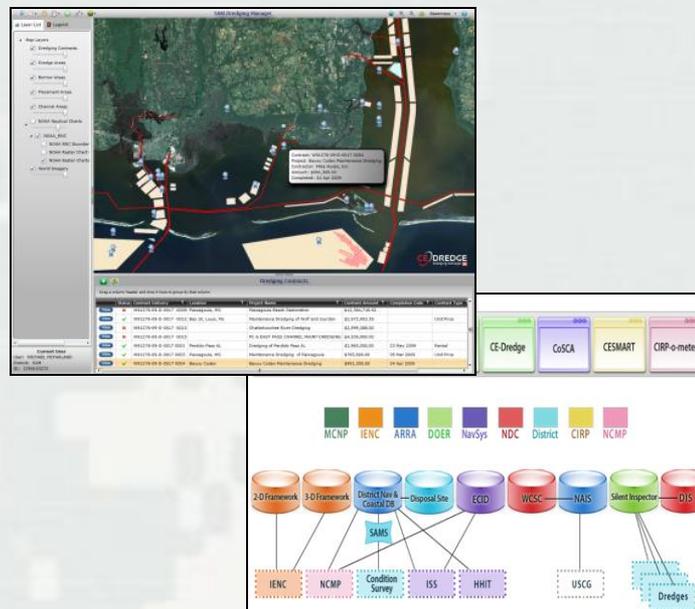
Linda Lillycrop and Paul Schroeder

Project Objectives

- Provide nat'l database architecture for dredging data integration
- Assist linking web viewers/portals/data to dredging portal
- Facilitate archival of data for future access
- Improve interfaces/guidance to existing screening level tools
- Facilitate retrieval of data and population of web tools and models
- Convert screening tools to web tools for easy access and compatibility across operating systems
- Develop new tools to evaluate or implement new technologies and research finding.

Progress Brief

- Developing Navigation/Dredging Portal
- Coordinating w/Pis to expand SAGA database
- Coordinating expansion of Histories database
- No progress on web tools, awaiting further development of portal and databases



FY15 Major Tasks Planned

Continue integration dredging databases/District data
Expand dredging histories/Sediment databases
Convert screening tools to web tools

FY15 Products/Deliverables w/ planned dates for completion

- CE-Dredge TN, Aug15
- Navigation/Dredging Portal, Sep15
- SAGA WebApp/R&D data, Sep15
- Initiate Expanded Dredging Histories, Sep15
- Open water placement screening tools



Improved Numerical Methods for PTM Application

Tahirih Lackey

Project Objectives

- Include new algorithms in PTM that will advance modeling capabilities.
- Improve fate modeling accuracy and efficiency by addressing: Transport process, model platform, and the current Lagrangian structure of PTM.

FY15 Major Tasks Planned

- Produce Technical Documentation to support modeling efforts
- Additional Tech Transfer
 - DM DIF collaboration/Website
 - Workshop

FY15 Products/Deliverables w/ planned dates for completion

- PTM TR: Advanced Methods in Lagrangian Far Field Fate Modeling: Part 1– 3/15
- PTM JP: Lagrangian Transport of Sediment Resuspended Due to Dredging Operations – 3/15
- PTM TR: BBL Dynamics – 4/15

Progress Brief

- Draft of PTM TR 1 Complete (author review)
- Draft of PTM JP Almost Complete
- Draft of PTM TR 2 (in progress)



Historical Data Analysis for Infilling CSM

Ashley Frey and Lauren Coe

Project Objectives

- Develop method to analyze channel infilling based on past dredging and site conditions
- Determine when, where, and what type of material will be dredged based on forcing factors

FY15 Major Tasks Planned

- Collect dredging, placement, and meteorological data for Galveston-Houston
- Collect dredging, placement, and meteorological data for third pilot site
- Finalize procedure for evaluating dredging based on meteorological conditions

FY15 Products/Deliverables

w/planned dates for completion

- TN – Mayport site (Jun 2015)
- TN – Galveston/Houston site (Sep 2015)

Progress Brief

- All milestones on schedule
- All data collected for Galveston-Houston, analysis in progress
- Coordinating with Lauren Dunkin (CSAT)



Optimization of Dredged Material Transport

Tim Welp

Project Objectives

- Provide information and **scoping-level** dredging and DM transport evaluation tools to make evaluation of dredge suitability and production rates easier for Corps, consultants, and stakeholders to increase BU
- These tools consist of knowledge-based expert systems (varying degrees of sophistication) to enhance and speed up the decision making process and also transfer information and knowledge.

FY15 Major Tasks Planned

- Complete DREDGABL (linked with SEDMAN)
- Complete Mechanical Dredge Production Estimator
- Complete Hopper Dredge Production Estimator
- Complete Pipeline Dredge Estimator tool



FY15 Products/Deliverables w/ planned dates for completion

- TN Water Injection Dredging 3/15
- DREDGABL KBES & SEDMAN web app 4/15
- Mechanical Dredge Production Estimator web app 5/15
- Hopper Dredge Production Estimator web app 7/15
- Cutterhead Dredge Production Estimator web app 9/15

Progress Brief

- Polishing DREDGABL and refining SEDMAN
- WID Technote to editor
- Mechanical & Hopper Dredge Production Apps under development
- Cutterhead Dredge Production Estimator one way or another.



BUILDING STRONG®

ERDC

Innovative solutions for a safer, better world

Modeling Transport in Wetting/Drying and Vegetated Regions

Earl Hayter

Project Objectives

- Develop new algorithm for CH3D-MB that accounts for vegetation induced turbulence dampening and flow cross-section reduction.
- Develop algorithm to represent the effect of vegetation in the water column on the transport of suspended mixed sediment.
- Develop algorithm for CH3D-MB to simulate wetting and drying of shorelines, mudflats, tidal marshes, etc.

FY15 Major Tasks Planned

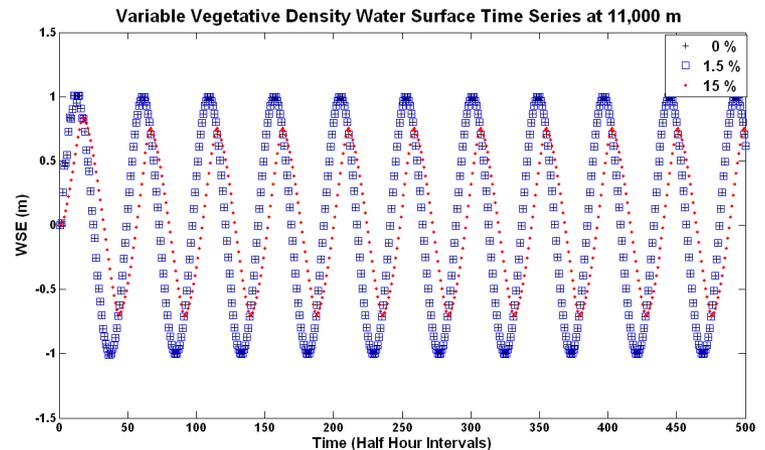
- Implement and test vegetation resistance algorithm in LTFATE
- Analyze sediment and wave data collected by D Bryant in his *Wetland Sediment Migration Processes* RT.

FY15 Products/Deliverables w/ planned dates for completion

- Technical Note on Vegetation Algorithm (June 2015)

Progress Brief

- The vegetative resistance algorithm was developed and incorporated into CH3D-MB.
- Testing of this algorithm on an idealized estuary is underway.



DOER Sediment Transport into ADH

Chris Massey

Project Objectives

- Implement current LTFATE sediment & contaminant transport into ADH
- Develop DOER-ADH team
- Incorporate new (FY14) LTFATE into ADH

FY15 Major Tasks Planned

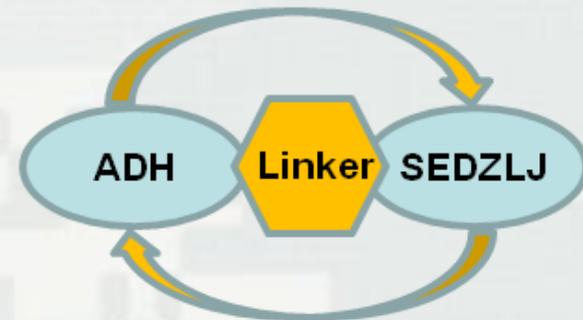
- Expanding linker/translator to 3D ADH
- Updating code to work with updated ADH
- Verification on 3D test suite
- Technical Report

FY15 Products/Deliverables w/ planned dates for completion

- Linker/Translator and Modularized SEDZLJ (9/2015)
- Technical Report (9/2015)

Progress Brief

- Work is progressing to incorporate new version of ADH for 3D work
- Updated test cases have been obtained for use with new version of ADH
- Coordination with ADH team continues
- It is expected that all milestones/products will be completed by the end of FY15.



GIS Identification and Ranking of Beneficial Use Sites

Candice Piercy

Project Objectives

- Develop a transparent, scientifically-defensible, and consistent decision support tool for identifying and ranking potential BUDM Pas
- ID mapping tool: manual decision tree or ArcGIS
- Ranking tool: Excel-based PROMETHEE ranking tool

FY15 Major Tasks Planned

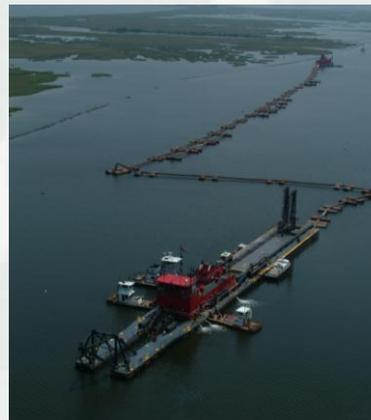
- Complete and demo coastal ranking tool with District PDT members
- Complete coastal mapping decision tree and ArcGIS tool
- Develop feature lists and assessments for riverine and lacustrine environments

FY15 Products/Deliverables w/ planned dates for completion

- Coastal ID and ranking framework TN (with NJ case study) – Sept 2015
- Standalone coastal ranking tool with user documentation (Bridges/Wilson?)

Progress Brief

- ID mapping: Developed coastal BU feature list (NNBF and BU coastal classification)
- Ranking: Developing feature condition, benefits, and constraints assessments (~50% complete)
- Challenges
 - What is the most relevant spatial scale for BU projects?
 - How to deal with nested and complexed features (ex. back barrier marsh)
 - Balancing need for specificity with need for flexibility



Instrument and Stand Alone Model Interfaces

Matt Taylor and Jarrell Smith

Project Objective

- To replace outdated and non-functioning interfaces for MPFATE and Xradiography
- Develop guidance based on case studies

FY15 Major Tasks Planned

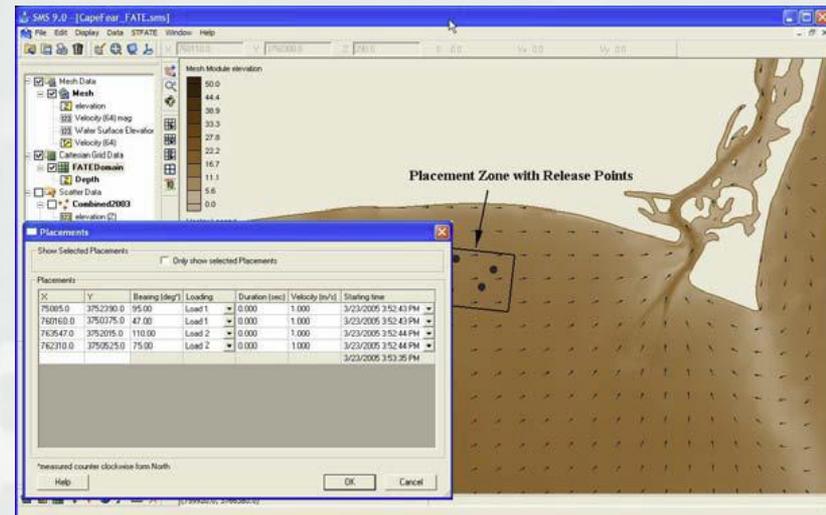
- Xradiography interface
- MPFATE interface

FY15 Products/Deliverables

- Xradiography users manual
- TN: MPFATE v2.0
- TN: Dispersive nearshore placement sites

Progress Brief

- Xradiography interface being applied
- MPFATE interface developed and is presently being tested
- MPFATE data structure being modified



Environmental Resource Management

Focus Area

Situation: Increasingly stringent restrictions on dredging operations “in the name of” resource protection, inflating O&M costs. Limited or no scientific evidence to justify or refute the need for restrictions. Restrictions are “codified” by habit and precedent.

Barriers: Precautionary principle dominates current approaches. Uncertainties regarding natural resources and T&E species interactions with dredging operations. Negative perceptions about dredging. Managing risks requires quantifiable, scientific evidence.

Solutions:

- Fill critical knowledge gaps for effective risk management
- Develop innovative, quantitative approaches that will support determining actual risks associated with dredging with regards to T&E species
- Demonstrate the effectiveness of less obstructive management practices that represent alternatives to currently imposed restrictions.
- Promote collaboration and partnering with state and federal regulators



Evaluation of Interior Least Tern Management Alternatives

Richard Fischer and Todd Swannack

Project Objectives

- Develop a range-wide metapopulation model for ILT to evaluate population persistence across a range of scenarios
- Compare the expected performance of alternative management strategies for increasing ILT reproductive success (including no action)
- Inform decisions about management of threats to ILT populations
- Provide science support to the USFWS recommendation to delist ILT (2013 Five-Year Review)

FY15 Major Tasks Planned

- Complete TernPOP (Range-wide Metapopulation Model)
- Complete 7(a)(1) Conservation Plans for SWD, LRD, and NWD
- Complete post-listing ILT Monitoring Plan
- Field test Monitoring Plan methods

FY15 Products/Deliverables

- Model: TernPOP (Range-wide Metapopulation Model)
- TR: Model Description
- Conservation Management Agreement with SWD
- Conservation Management Agreement with LRD
- TN/JA: Range-wide Post-listing Monitoring Plan
- JA: Metapopulation Modeling results for ILT

Progress Brief

- ILT Model Working Group and Modeling Team both assembled with significant coordination.
- Modeling Team near completion of habitat, flow, and dispersal sub-models. On schedule.
- ERDC-EL weekly coordination with USFWS ILT Recovery Lead.
- MVD “Conservation Plan for the Interior Least Tern, Pallid Sturgeon, and Fat Pocketbook Mussel, in the Lower Mississippi River” near completion (Killgore/Fischer)
- Draft Plans for SWD and LRD in progress with respective PDT’s



Threatened & Endangered Species Team (TEST)

Richard A. Fischer

Project Objectives

- Identify and document TES with biggest impacts to USACE mission (monetarily and operationally)
- Prioritize resolvable TES issues with respect to potential ROI
- Investigate system-level approaches with high ROI (e.g., beach nourishment, RSM)
- Identify needed R&D with high impact to TES recovery or decreased mission impact
- Develop a R&D investment plan based on priorities and ROI
- Integrate *Engineering With Nature and ESA 7(a)(1)* as proactive tools for conservation and species recovery

FY15 Major Tasks Planned

- Identify existing tools in ERDC portfolio (Web-enabled, GIS Map for TES & USACE Projects; USACE TES Protection and Management System)
- Engage ERDC PI's on R&D (current projects; future needs)
- Organize a TEST technical team (ERDC), then explore national and regional USACE teams to address specific species/issues
- Investigate upcoming ESA Listings relative to USACE missions
- Initiate national and regional assessments to identify where USACE has significant potential influence on TES recovery

FY15 Products/Deliverables

- TN: *The Role of Interagency Cooperation in the Conservation of Threatened and Endangered Species Endangered Species Act Section 7(a)(1)*
- TN: *Threatened and Endangered Species Team Approach—USACE Southeastern Region Opportunity Assessment Working Meeting*

Progress Brief

- Transition from Gerhardt-Smith to Fischer
- Coordination with Focus Area Leads, DOTS/DOER
- Completing 2 TN's relevant to TEST
- Working on Draft TEST Plan for moving forward
- CESAS: Communication on beach nourishment and 7(a)(1)
- CESAM: Draft 7(a)(1) Plan for Alabama Shad
- ERDC/FWS/ABC: Interior Least Tern Recovery



Mental Modeling Decision Tools

Matt Wood

Project Objectives

- Identify barriers to successful development & deploy of innovation in Nav O&M
- Identify mechanisms to overcome barriers
- Recommend actions to improve current state

FY15 Major Tasks Planned

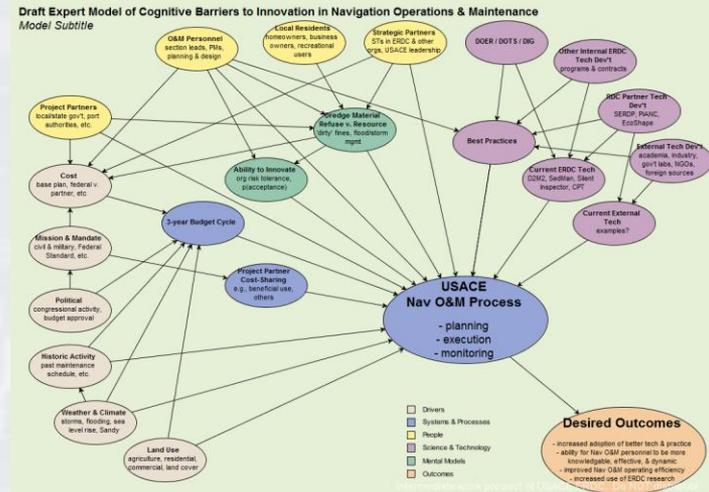
- Complete Mental Model interviews
- Develop final expert model
- Produce recommendations

FY15 Products/Deliverables w/ planned dates for completion

- Final expert mental model Apr15
- Technical report Sep15
- Journal article Sep15

Progress Brief

- 13 of 20+ interviews completed
- Well represented:
 - USACE
 - Other Gov't (FWS, EPA, etc.)
 - NGOs (farm assns,)
- Under-represented:
 - Dredging contractors



Determining Population-Level Impacts of Dredging on Endangered Species

David Smith

Project Objectives

- Develop a simulation of a worst case dredging event.
- Estimate the influence of behavior on exposure of fish to sediment from a simulated dredging event.
- Estimate population impacts from a time varying estimate of sediment exposure.

FY15 Major Tasks Planned

- Fish movement model and extraction of sediment exposure estimates (Task 3)
- Development of population model linking short term sediment exposure to population outcomes (Task 4)

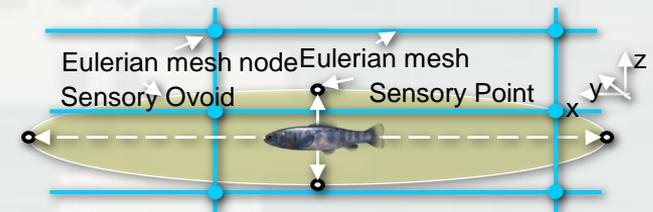
FY15 Products/Deliverables

- ADH/PTM Hydrodynamic model simulations (9/14), CHL Technical report
- Review sediment impacts on fisheries (10/14), Journal publication ready for submission
- Bonus manuscript – Assessing fish benefits of dredge material using indices of growth. (FY15)
- Manuscript – Exposure of migrating fish to a simulated point source sediment discharge in an advective environment (end of FY 15/early FY 16 per PMP)

Progress Brief

- Task 1 – methods compilation –complete 2Q FY13
- Task 2 – ADH model simulations – complete 3Q FY14
- Task 3 – Fish movement models – 50% - 1Q FY16 completion
- Task 4 – Population model – 10% 4Q FY16.
- Assessing impacts of low concentrations/short duration exposure to sediment and linking them to physiological endpoints relevant to populations is difficult

Sensory system linkage to CFD output



Effects-Based Criteria for Water Quality Compliance Monitoring

Burton Suedel

Project Objectives

- Develop suspended sediment effects data and weight-of-evidence approach for aquatic species that are associated with problematic environmental windows in US waterways

FY15 Major Tasks Planned

- Completed suspended sediment effects study using FLEES (SMB)
- Fill knowledge gaps supporting risk assessments
- Collaborate w/regulatory agencies & publish

FY15 Products/Deliverables w/ planned dates for completion

- Walleye paper published in JGLR
- Oyster paper published in ESCO
- Sturgeon paper accepted in JAI (Jan 15)
- SMB paper in prep (Sept 15)
- WOE Paper (Sept 15)

Progress Brief

- Coordination with GLDT
- Milestones: Develop WOE approach for environmental windows
- Anticipated obstacles
 - None



Emerging Aquatic Species Detection Technologies

Jay Bennett

Project Objectives

- Develop an automated active acoustic system to rapidly detect, track, and identify aquatic animals in immediate vicinity of Corps dredges and other activities
- Leverage Army Small Business Technology (STTR) Program – STTR Topic titled, “Preserving Navigation Access for the War Fighter – Development of an Acoustic Marine Watch System to Support Corps Channel Maintenance and Enhancement Activities”
- STTR Phase I (6 mos.) – \$100K engineering design and testing;
- STTR Phase II, Year 1 (2 yr) – \$375K/year assembly, testing and evaluation, delivery

FY15 Major Tasks Planned

- Develop Specifications for Contract Requirements (Jacksonville and Mobile Districts) Q3 and Q4 of FY15
- Initial STTR Demonstration Q4-FY15

▪ FY15 Products/Deliverables

- Initial Specifications for Dredging Contract Requirements Q4-FY15

▪ Progress Brief

- Mobile District Meeting (DQM, Specification Development, Initial Equipment Testing)
- Review of STTR Progress



Critical Habitat Modeling of Physical Parameters for Endangered Sea Turtle Habitat

Lauren Dunkin

Project Objectives

- Demonstrate relative suitability of selected sites within the CH zone for *C. caretta* by developing a spatially-explicit ecological model.

FY15 Major Tasks Planned

- Extract morphological, environmental, and anthropogenic parameters from remote sensing data
- Develop curves based on regional range values for each parameters (input from PDT and SME)
- Implement a spatially derived model using input from the parameters and weighting coefficients
- Generate map product for study area

FY15 Products/Deliverables w/ planned dates for completion

- Model Framework – (August 2015)
- Map Product – (September 2015)
- Journal Article – (2015)

Progress Brief

- Mosaic dataset generated for the study area (SE Florida)
- Extracting parameters from topographic/bathymetric data
- Discussions to acquire nesting data



Environmental Windows Cost Compliance

Todd Swannack and Jennifer Smith

Project Objectives

- Determine costs of environmental windows
- Assess if cost-reduction strategies are possible

FY15 Major Tasks Planned

- Complete reporting

FY15 Products/Deliverables w/ planned dates for completion

- TR: Environmental Windows Dredging Costs Impact Study

Progress Brief

- Report on schedule, has been drafted and reviewed by PDT members.
- No major obstacles expected



Ecologically-Based Design Criteria for Beaches

Craig Fischenich

Project Objectives

- Identify the biological needs of special status and candidate species using beach habitats
- Develop engineering criteria for beach restoration and nourishment that avoid jeopardy and, to the extent practical, fulfil the above needs
- Prepare guidance and tools to support effective designs and sound management practices

FY15 Major Tasks Planned

- Literature review/PDT formulation/general organization of the work effort
- Conduct an expert elicitation workshop to develop CEMs for beaches and the special status species using beach habitat



FY15 Products/Deliverables w/ planned dates for completion

- TN – Status and trends of US beaches and associated special status species (9/15)
- CEMs – Conceptual ecological models linking management actions, coastal processes, beach conditions, and life cycle requirements for special status species. (Draft 9/15)
- TN - Biological requirements for special status species that utilize beach habitat (Draft – 12/15)

Progress Brief

- This work unit is a new start with anticipated ramp-up in the second half of the FY. Efforts to date have centered on literature compilation.
- Are working to bring on-board an IPA from LSU (Brandon Edwards, a Post Doc geographer that has focused his research on beaches).
- Only concerns at present relate to coordinating & hosting the expert elicitation workshop this summer. May require some assistance.



Risk Management Focus Area

Situation: USACE Districts are increasingly challenged to define the environmental risks and uncertainties posed by dredging, as well as the risks to the navigation program that are posed by environmental issues and constraints

Barriers: Lack of fundamental descriptors for key processes. Limitations on the ability to integrate information in a timely fashion to make credible, risk-informed decisions that will withstand regulatory scrutiny

Solution: Improve the scientific understanding of the processes contributing to the risks relevant to the navigation dredging program

- Develop a suite of peer-reviewed process models, risk models and decision analysis tools to support decisions based on a more comprehensive understanding of risk, uncertainties, and benefits



RECOVERY Q-TEA Development

Carlos E. Ruiz and Natalie Rogers

Project Objectives

- To provide tools for rapid assessment and generation of a Conceptual Site Model (CSM) to be further evaluated under a model like RECOVERY resulting in the coupled framework RECOVERY In Situ.
- The In Situ CSM generating tool will provide a spatial representation of the remedial action surface layer and underlying profile; resulting from deposition of particulate matter from ongoing sources (CSOs), deposition from atmospheric sources, dissolved and particulate matter from upstream sources and other seasonal disturbances like dredging events.

FY15 Major Tasks Planned

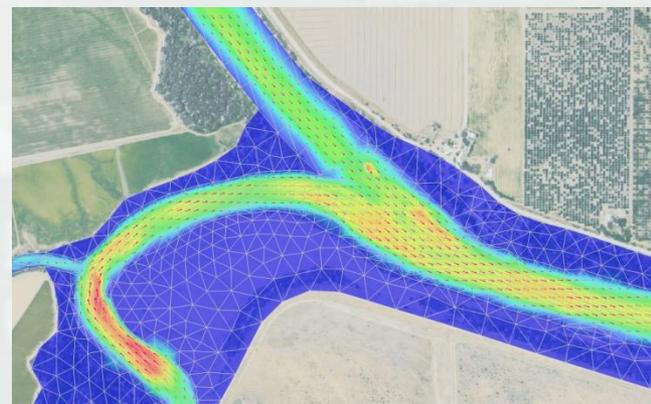
- Development of CSM framework
- Development of CSM
- Incorporate new formulations RECOVERY

FY15 Products/Deliverables w/ planned dates for completion

- | | |
|---------------------------------------|-------|
| ▪ TN – In Situ CSM Framework | 6/15 |
| ▪ TN – New formulations into RECOVERY | 6/15 |
| ▪ Biological formulations | |
| ▪ In Situ CSM Generating Tool | 10/15 |
| ▪ TR – In Situ CSM Generating Tool | 12/15 |

Progress Brief

- Outline for In Situ CSM Framework TN completed
- Biological Formulations for RECOVERY
- Develop contaminant processes and formulations to be incorporated into RECOVERY



Measuring and Analyzing Environmental Condition and Benefits

Kelly A. Burks-Copes and Jennifer Wozencraft

Project Objectives

- **Explore** the potential opportunities to measure and analyze environmental conditions and benefits (i.e., ecosystem goods and services) to support the USACE Navigation mission
- **Develop** strategies, methodologies and tools to efficiently and effectively measure and analyze ecosystem condition and response to USACE O&M activities.
- **Build** upon the Natural and Nature-based Features (NNBF) study (Post-Sandy Recovery) and the EWN ABQ Triple Win (Burks-Copes) and Atchafalaya (Suedel) studies

FY15 Major Tasks Planned

- **Task 1:** Complete the development of EGS metrics
- **Task 2:** Complete Case Studies (FL & NJ)
- **Task 3:** Complete TNs and WP
- **Task 4:** Complete Brochures, Coffee Table Book, and Journal Articles (2) for NNBF Efforts

FY15 Products/Deliverables w/ planned dates for completion

- **WP #1** describing the challenges for the EGS community of practice (FY 15)
- **TN #1:** Seminal lit review and outline of our approach (FY15)
- **TN #2:** Metrics development (FY15)
- **TN #3:** Case studies – Florida & NJ (FY15)
- **TN #4:** Case study – Suedel/Fredette study (FY15)
- Factsheet & Web Materials

Progress Brief

- Draft of TN 1 complete & submitted to review
- TN 2-3: Analysis complete by May 2015, TNs & WP submitted to review by Sept 2015
- Analysis for TN #4 is underway – TN by EOY



Next Generation Toxicity Testing for the Dredging Program

Daniel Farrar, Gui Lotufo and Jacob Stanley

Project Objectives

- Make definitive recommendation for the use of chronic testing for dredge material evaluations.
- Modify existing test methods to improve ease of testing while maintaining or improving test responsiveness.

FY15 Major Tasks Planned

- Conduct literature review of acute and chronic tests and use information obtained to make recommendation regarding chronic testing.
- Participate in method development and round robin testing of modified *Chironomus dilutus* test method with the EPA, USGS and private industry.

FY15 Products/Deliverables w/ planned dates for completion

- TR-"Evaluation of the relative performance of acute and chronic sediment toxicity test methods for freshwater and marine environments" (Sept. 2015).
- Presentations of *C. dilutus* method development process at national meetings and publication of revised EPA and ASTM test methods. (Nov. 2015).

Progress Brief

- Acute/chronic literature review is ongoing (~70% complete)
- Advisory group is identifying and evaluating required modifications to the *C. dilutus* test method.



BUILDING STRONG®

ERDC

Innovative solutions for a safer, better world

Cost Effective Technologies for Managing Contaminants in Beneficial Use

Trudy J. Estes

Project Objectives

- Identify/develop treatment processes
 - Economical
 - Readily scalable
 - Effective in multiple & complex matrices
 - Minimize re-handling – in-situ preferred
- Develop field useful tools

FY15 Major Tasks Planned

- Execute flask/bench testing
 - Biological/composting treatment
 - Geochemical controls
- Identify key geochemical processes & products
 - Develop simplified modeling/design approach

FY15 Products/Deliverables w/ planned dates for completion

- London Convention white paper (complete)
- Website (6/30/15)
- Journal articles – (2) (draft 9/15/15)

Progress Brief

- Biological treatment status
 - See next slide
- Geochemical treatment status
 - Synthesizing relevant literature
 - Sediment homogenization & characterization
 - Instrumentation set up
- Preliminary website layout
- Obstacles
 - In-situ treatment manual/TEAM manual – high priority
 - Acevedo temporary assignment
 - Instrumentation problem
 - Incubator failure



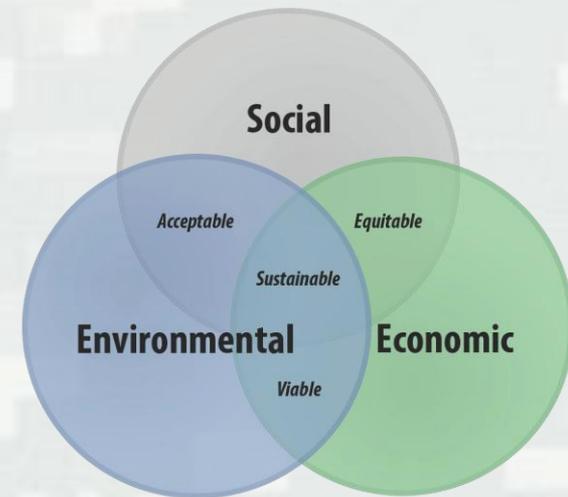
Engineering With Nature...



...the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental and social benefits through collaborative processes.

Key Elements:

- Science and engineering that produces operational efficiencies
- Using natural process to maximum benefit
- Broaden and extend the benefits provided by projects
- Science-based collaborative processes to organize and focus interests, stakeholders, and partners



www.engineeringwithnature.org



EWN Status

- *Engineering With Nature* initiative started within USACE Civil Works program in 2010. Over that period we have:
 - Engaged across USACE Districts (23), Divisions, HQ; other agencies, NGOs, academia, private sector, international collaborators
 - Workshops (>20), dialogue sessions, project development teams, etc.
 - USACE Business Lines engaged: Navigation, Ecosystem Restoration, Flood Risk Management, Water Operations
 - Implementing strategic plan
 - Focused research projects on EWN
 - Field demonstration projects
 - Communication plan
 - Awards
 - 2013 Chief of Engineers Environmental Award in Natural Resources Conservation
 - 2014 USACE National Award-Green Innovation



Publications and Recognition

**A Design Manual:
Engineering
With Nature
Using
Native Plant
Communities**

wetland science & practice
Published by the Society of Wetland Scientists
Vol. 32, No. 1 March 2015

Author: Dr. Pamela U.S. Army and David
Sponsored by Engineer U.S. Army

"ENGINEERING WITH NATURE" PROMOTES TRIPLE-WIN OUTCOMES

ABSTRACT

The U.S. Army Corps of Engineers' "Engineering With Nature" (EWN) initiative supports sustainable development of infrastructure by advancing technical and communication practices in order to intentionally align natural and engineering processes to efficiently and sustainably deliver economic, environmental, and social benefits through collaborative processes. The tools and projects that have been developed through EWN support planning, engineering, and operational practices that beneficially integrate engineering and natural systems to produce more socially acceptable, economically viable, and environmentally sustainable projects.

The EWN initiative's focus on developing practical methods provides an achievable path toward an ecosystem approach to navigation infrastructure development. By combining sound science and engineering with advanced communication practices, the EWN initiative is providing a robust foundation for collaborative project development. Engineering With Nature is being pursued through innovative research, field demonstrations, communicating lessons learned, and active engagement with field practitioners across a wide range of organizations. The objectives of EWN are consistent with those communicated in the

"Working with Nature" philosophy of the World Association for Waterborne Transport Infrastructure (PIANC) and the "Building with Nature" initiative of EcoDelta Foundation, a public-private knowledge institute in the Netherlands.

INTRODUCTION

Pursuing the objective of sustainable development of navigation infrastructure poses both challenges and opportunities for the U.S. Army Corps of Engineers (USACE). Advancing best practices will involve identifying the practical actions that can be taken to better align and integrate engineering and natural systems to produce more socially acceptable, economically viable and environmentally sustainable projects. Engineering With Nature (EWN) is a USACE initiative that supports more sustainable practices, projects, and outcomes through collaborative engineering, environmental, and social benefits through collaborative processes. The tools and projects that have been developed through EWN support planning, engineering, and operational practices that beneficially integrate engineering and natural systems to produce more socially acceptable, economically viable, and environmentally sustainable projects.

The EWN initiative's focus on developing practical methods provides an achievable path toward an ecosystem approach to navigation infrastructure development. By combining sound science and engineering with advanced communication practices, the EWN initiative is providing a robust foundation for collaborative project development. Engineering With Nature is being pursued through innovative research, field demonstrations, communicating lessons learned, and active engagement with field practitioners across a wide range of organizations. The objectives of EWN are consistent with those communicated in the

ecological processes

Dedicated to the USA, Host Country of PIANC's AGA 2014 and the 33rd PIANC World Congress

ERDC environmental research supports USACE civil

By Dr. Beth Fleming
Director, Environmental Laboratory
U.S. Army Engineer Research and Development Center

The U.S. Army Engineer Research and Development Center's (ERDC) Environmental Laboratory (EL) scientists and engineers work to develop sustainable solutions to the nation's civil and military environmental challenges. Engineers understand that solutions developed for civil works challenges can be leveraged to solve military challenges and vice versa. This cross-boundary approach allows EL to focus on durable needs for customers that balance social, economic and environmental factors as part of a sustainable solution.

ERDC's scientific expertise in environmental research and risk and decision analysis converge within the Army and Department of Defense. We are committed to sharing the application of these capabilities in a repeat way and demonstrating the environmental impact, risks, benefits and sustainability of new technologies and materials in all of our work initiatives. These such initiatives are the focus of this column.

Life Cycle Assessment – an early initiative in the protection phase that focuses on minimizing the impact of materials throughout their lifecycle. This includes a scientifically defensible approach for environmental life cycle assessment (ELCA) seeks to institutionalize a practice that assesses environmental impacts associated with new materials, processes and technologies, and provides a new way

of looking at existing activities such as dredging. This initiative, while in its introductory stages, is already proving valuable to both the civil works and military mission communities.

The U.S. Army Corps of Engineers, through its development activities, is responsible for the placement of Great reclamation technologies to reduce the concentration of nutrients constituents (NC) in the receiving environment. These new technologies will allow range managers increased flexibility in reconfiguring range impact areas and decrease the risk of a breeding invasive species that may impact regulatory guidelines related to NC migration activities in surface and ground water, as well as potential upstate into neighboring systems.

Other reclamation technologies allow range managers to anticipate future contamination problems from changes in training issues and military operations, assess and repair degraded areas, and expand range management options to reduce the risk and availability of valuable riparian areas.

Examples of great reclamation technologies include rapid revegetation using organic polymer; herbivore, riparian, and wetland; or large socks to prevent migration of sediment flow. Research Operation Support (ROS) and wet water better protecting technology include of water shed land barriers that passively treat MC surface water contamination prior to coming off the impact area without requiring training activities, and transport plants that capture TSS in wet high efficiency

Inland Port
2011 Issue VI

USACE Promotes Environmental Sustainability

Parana Canal Impact Projections

Ports Must Promote PIANC and IRPT

USA TODAY
A GANNETT COMPANY

Supplement to Gannett Government Media Publications

SOCIETY OF AMERICAN MILITARY ENGINEERS - JANUARY-FEBRUARY 2014 - VOL. 106 - NUMBER 067

TME
The Military Engineer

Maj. Gen. John Peabody on the Future of Civil Works
Page 44

The Restoration of Fort Ord
Page 63

How the Air Force

SPECIAL EDITION

U.S. ARMY CORPS OF ENGINEERS

FREE 2014 EDITION

BEVERLY HICKS
Be Back Bruck

The BUZZ A Quarterly Newsletter

July 2015

The BUZZ is a forum for Silver Jackets heavy discussion, appreciation and research.

Inside this issue:

- Welcome Yamin Seda-Sanabria...1
- High Water Risk Program Begins Awareness & Speeches Action...2
- Silver Jackets Participation Visit of Discovery RiskMap Meetings...4
- Flood Barrier Testing and Certification Program...6
- Coastal Resilience Wins Disaster Resilience Act Challenge...8
- Blueprint for Cities to Reduce Stormwater & Flood Damages...12
- New FloodSmart Products...13
- Continuing Discussion on Leadership...14
- New Climate Resilience Toolkit...15
- FEMA Launches a Redesign Website for FEMA...16
- Upcoming Events...17

Building Bridges

CORPS' MISSION AT HOME AND ABROAD

Ms. Seda-Sanabria holds a bachelor's degree and master's degree in Civil Engineering from the University of Puerto Rico at Mayaguez. She earned a Master of Science degree in Engineering Mechanics from Mississippi State University in 1996. She received the American Society of Civil Engineers' Young Government Civil Engineer National Award in recognition of her public and professional service achievements. In 2002, she received the Women of Color Government and Defense Award for Technical Innovation in recognition for her efforts leading to the development and implementation of innovative technologies for rapid load capacity assessment of bridges. She has authored more than 30 publications, including peer-reviewed journal and conference papers, invited articles, and technical reports. She is a member of various professional engineering organizations, including the American Society of Civil Engineers, the Association of State Dism Society Officials, the U.S. Society on Dams, and the Sigma Xi Research Society.

ENVIPOINETS

CORPS VS. NATURE Climate change creates

PRIME POWER Profile of the 249th

TEAM STEM Outreach from

GREAT GETAWAYS recreation areas

EWN Action Projects

1. Sediment Retention Engineering to Facilitate Wetland Development (San Francisco Bay, CA)
2. Realizing a Triple Win in the Desert: Systems-level Engineering With Nature on the Rio Grande (Albuquerque, NM)
3. Atchafalaya River Island and Wetlands Creation Through Strategic Sediment Placement (Morgan City, LA)
4. Portfolio Framework to Quantify Beneficial Use of Dredged Material (New Orleans and New England)
5. Engineering Tern Habitat into the Ashtabula Breakwater (Ashtabula, OH)
6. Living Shoreline Creation Through Beneficial Use of Dredged Material (Duluth, MN)
7. A Sustainable Design Manual for Engineering With Nature Using Native Plant Communities
8. Landscape Evolution of the Oil Spill Mitigation Sand Berm in the Chandeleur Islands, Louisiana
9. Guidelines for Planning, Design, Placement and Maintenance of Large Woods in Rivers: Restoring Process and Function
10. The Use and Value of Levee Setbacks in Support of Flood Risk Management, Navigation and Environmental Services: A Strategy Document
11. Strategic Placement of Sediment for Engineering and Environmental Benefit: An Initial Guide to Opportunities and Practices



Creating Value for the Nation

- Value arguments resonate
 - Must take assertive control of the dialogue
- Correcting the hyper-focus on risk is achieved by giving more attention to compensating benefits
 - ...Not by giving more attention to risk
- There are potentially valuable allies in “unlikely” places
- Our projects produce multiple benefit streams, but you have to claim them!

