# Flood Risk Management Newsletter

December 2009 vol 3 no 2

## Focusing on: Nonstructural flood risk management alternatives

**Table of Contents**



## Nonstructural Flood Risk Mitigation Methodologies & Policies

**Joe Remondini P.E., CFM, Chairman NFPC, Tulsa District**

Nonstructural flood risk reduction measures can function as a viable component of an integrated system of flood and coastal storm risk management alongside traditional structural measures and ecosystem restoration activities. They can be used in combination with or instead of channels, levees and floodwalls.

These measures and individual flood proofing options are becoming more widely used tools both in Corps Flood Plain Management and Flood Damage Reduction work and across the country in general. Floodplain Managers, citizens, government representatives and others are increasingly realizing that these options work extremely well as a green or an ecosystem restoration approach to reducing flood risks.

Nonstructural measures have been required for consideration for Corps of Engineers (Corps) flood risk reduction projects since 1974. However, they have not yet been fully integrated into the culture of Corps planning. Although they can perform cost effectively for risk reduction, nonstructural measures have nontraditional implementation requirements and specific policy guidance which detract from their consideration by some Corps planners. Elected officials and

the public are developing an appreciation for ecosystem values and recognize more the limitations of structural measures as well as the expense involved. The Corps is reconsidering the role of nonstructural measures for flood risk reduction and is moving forward to fully implement their contribution to the Corps' mission.

Nonstructural measures can take the form of rules and regulations such as local policies and practices that influence the future use of floodplains. Floodplain management measures such as local land use ordinances, building codes, and compliance with National Flood Insurance Program (NFIP) floodplain regulations are locally-initiated and enforced risk mitigation measures.

Nonstructural measures can also be actions that retrofit structures for reduced exposure to risk or remove existing structures from the floodplain. Property acquisition and flood proofing measures such as raising-in-place by lifting on pilings or on fill; moving structures away from the hazard; and wet and dry flood proofing are examples of actions that can mitigate risk.

Nonstructural mitigation measures are actions taken to reduce or eliminate the long-term risk to human life and property from natural hazards. Examples of these activities are evacuation, relocation, flood warning, and emergency preparedness.

The Corps of Engineers National Nonstructural/Flood Proofing Committee (NFPC) is planning to hold workshops at various Corps District locations in FY 2010. These workshop will be supported by the Flood Risk Management Planning Center of Expertise in the South Pacific Division. Workshop schedules are currently being determined; contact Eric Thaut, *Eric.W.Thaut@usace.army.mil*. The NFPC website is *https://www.nwo.usace.army.mil/nfpc/*. POC: Joe Remondini, *Joseph.Remondini@usace.army.mil*.

## Flood Risk Management & Nonstructural Measures

**Stephen O'Leary, AIA, CFM, Huntington District**

Nonstructural measures are often overlooked and/or avoided in project planning, but the Huntington District (LRH) has embraced them and has had much success planning and employing them in its projects. Structural measures are those that change and/or control the flood water flow to reduce the probability of flooding (dams, levees/flood walls, channels modification, etc.). Nonstructural measures are those that focus on floodplain management, on flood warning to reduce risks associated with flooding, and on moving above and away from flood waters – through flood proofing, acquisition/relocation, redevelopment sites, etc.

LRH has worked with these concepts through its Section 202 Flood Risk Management Program. The Section 202 program evolved from a flood in the spring of 1977 along the Levisa and Tug Forks of the Big Sandy and Upper Cumberland Rivers in southwestern West Virginia, southeastern Kentucky and western Virginia. The flood was in excess of the 0.2% chance (500-year) flood in many areas. It impacted tens of thousands of commercial and residential structures, and devastated areas and communities in the heart of the Nation's eastern coal production area. This flood affected areas in both the Huntington and Nashville Districts. Each District implements it own program under Section 202 authority. The LRH program area encompasses eleven counties in a mountainous region where development is concentrated in low lying valleys. Floods come quickly with debris-laden, high velocity floodwaters and are relatively short in

duration. Much of the area is rural and sparsely populated, and nonstructural measures provide cost effective alternatives. Since the early 1990's, over 560 structures have been flood proofed and another 800 have been acquired/relocated. Several commercial and residential redevelopment sites have been design and constructed. All participating communities have implemented a floodplain management plan.

The Section 202 Program has given the Huntington District the opportunity to use nonstructural measures on a large scale and to become nationally recognized experts and leaders in the planning and implementation of non-structural projects. District staff are advisory members of the National Nonstructural Flood Proofing Committee and the Flood Risk Management Center Planning Center of Expertise. They are regularly asked to assist other Districts with technical advice, independent technical review, and value engineering studies. Huntington developed a unique method to implement flood proofing measures and received an Al Gore Hammer award in 1997. LRH is currently developing user-friendly web-based cost estimating software for various flood proofing measures. Staff are providing expert advice and assistance for the Louisiana Coast Protection and Restoration Project and the Mississippi Coastal Improvements Program.

Many techniques can be used to reduce flood risk. Redevelopment sites provide areas to relocate entire flood prone communities above flood waters. Acquisition is a nonstructural measure. Acquired structures are removed from flood prone areas. Flood proofing allows mitigation of flood prone structures on an individual basis. Flood proofing techniques include elevation (raising in place), dry flood proofing, and ring walls. The photos below illustrate several nonstructural measures used in the LRH program. POC: Steve O'Leary, *stephen.d.oleary@usace.army.mil*.

Dry flood proofing (veneer wall)


Ring wall

Elevation – raising in place

Redevelopment site – Grundy, VA

# TANA – Tool for Analysis of Nonstructural Alternatives

**Rich Manguno, Keven Lovetro, Brian Maestri, New Orleans District**

Section 2013 of WRDA 2007 directs the Corps in its "calculations to ensure that the benefits and costs associated with structural and nonstructural alternatives are evaluated in an equitable manner." The requirement for feasibility-level scope for evaluation of nonstructural alternatives is accentuated by the analytical necessity to perform such evaluations within a risk-informed environment, as codified in ER 1105-2-101 (Planning - Risk Analysis for Flood Damage Reduction Studies).

As a consequence, New Orleans District developed a model, Tool for Analysis of Nonstructural Alternatives, or TANA, which can be used to quantify the uncertainty implicit in the analysis of two nonstructural flood damage reduction options: structure raising and buyouts. The user can assign a probability distribution to the key input variables used in the calculation of the benefits and costs. Input variables include stage-frequency relationships, depth-damage relationships, structure valuations, contents-to-structure value ratios, first floor elevations, structure raising costs, and acquisition costs. The model can then be used to quantify the uncertainty surrounding the without-project damages, the benefits attributable to the nonstructural options, and the costs of these measures. Finally, the model can be used to compare individual structure benefits and costs of the nonstructural alternatives under consideration and to assess their economic feasibility.

The TANA model is intended to be used in conjunction with the Hydrologic Engineering Center Flood Damage Analysis (HEC-FDA) program to quantify the uncertainty surrounding the stage-frequency relationships, represented by a normal distribution. Structure inventory format of HEC-FDA is also directly transferable in TANA.

The user can select from one of two probability distributions to address the uncertainty surrounding the depth-damage relationships: a triangular probability distribution with a minimum, maximum, and most likely value based on data obtained from a panel of local construction, repair, and insurance experts, or a normal distribution represented by a mean value and a standard deviation, which would be consistent with the generic residential depth-damage relationships developed by the Institute of Water Resources.

Local structure raising experts were consulted to develop a triangular probability distribution for the raising costs per square foot. Acquisition costs include the purchase of the land and structure, legal, demolition, relocation, and other miscellaneous costs.

In its current form, TANA is a Microsoft Excel workbook that uses the @Risk software. A contractor is currently developing a menu-driven interface for TANA, which will make it easier for users to input data and to acquire results. The enhanced model is scheduled for completion at the end of this calendar year, and it will be sent to the FRM PCX for model certification. POC: Brian Maestri, *brian.t.maestri@usace.army.mil* .

# Some Recent Corps Publications

**Disclaimer:** This listing is for information only and is not a complete list of FRM-related USACE publications.

*"Prairies and Water Management on Corps Lands,"* Pamela Bailey, U.S. Army Corps of Engineers Engineer Research and Development Center, Ecosystem Management and Restoration Research Program, ERDC TN-EMRRP-ER-11, February 2009.
*http://el.erdc.usace.army.mil/elpubs/pdf/er11.pdf*

*"Handbook on Gopher Tortoise (Gopherus polyphemus): Health Evaluation Procedures for Use by Land Managers and Researchers,"* Lori Wendland, Harold Balbach, Mary Brown, Joan Diemer Berish, Ramon Littell, and Melissa Clark, U.S. Army Corps of Engineers Engineer Research and Development Center, Construction Engineering Research Laboratory, ERDC/CERL TR-09-1, January 2009.
*http://www.cecer.army.mil/techreports/ERDC-CERL_TR-09-1/ERDC-CERL_TR-09-1.pdf*

*"Library of Habitat Models to Evaluate Benefits of Aquatic Restoration Projects on Fishes,"* K. Jack Killgore, Jan Jeffrey Hoover and Catherine E. Murphy, U.S. Army Corps of Engineers Engineer Research and Development Center, Ecosystem Management and Restoration Research Program, ERDC TN-EMRRP-ER-10, August 2008.
*http://el.erdc.usace.army.mil/elpubs/pdf/er10.pdf*

*"A GIS Based Tool for Extracting Shoreline Positions from Aerial Imagery (Beach Tools) Revised,"* Gary A. Zarillo, Justin Kelley, and Vickie Larson, U.S. Army Corps of Engineers Engineer Research and Development Center, Coastal and Hydraulics Laboratory, ERDC/CHL CHETN-IV-73.
*http://chl.erdc.usace.army.mil/library/publications/chetn/pdf/chetn-iv-73.pdf*

*"Considerations for Modeling Flow Control Structures in ADaptive Hydraulics (ADH),"* Gaurav Savant and Charlie Berger, U.S. Army Corps of Engineers Engineer Research and Development Center, ERDC TNSWWRP-09-3.
*http://libweb.wes.army.mil/uhtbin/hyperion/TN-SWWRP-09-3.pdf*

*"Considerations for Stationary Ice Covered Flows in ADaptive Hydraulics (ADH),"* Gary L. Brown, Gaurav Savant, Charlie Berger, and Davide S. Smith, U.S. Army Corps of Engineers Engineer Research and Development Center, ERDC TN-SWWRP-09-4.
*http://libweb.wes.army.mil/uhtbin/hyperion/TN-SWWRP-09-4.pdf*

*"Application of Habitat Equivalency Analysis to USACE Projects"* by Gary L. Ray, U.S. Army Corps of Engineers Engineer Research and Development Center, ERDC TN-EMRRP-EI-04.
*http://el.erdc.usace.army.mil/elpubs/pdf/ei04.pdf*

*"Development of a River and Stream Water Quality Module"* by Billy E. Johnson and Zhonglong Zhang, U.S. Army Corps of Engineers Engineer Research and Development Center, Environmental Laboratory, ERDC/EL TR-09-4.
*http://el.erdc.usace.army.mil/elpubs/pdf/trel09-4.pdf*

*"Building a Stronger Corps—A Snapshot of How the Corps is Applying Lessons Learned From Katrina,"* U.S. Army Corps of Engineers, 30 April 2009.
*http://www.mvp.usace.army.mil/docs/USACE_PK_Update_Report_Final.pdf*

## Of Interest...

The "Tales of the Coast Website" is up and running. The Tales provides examples of coasts and morphology and dynamics, along with the changing societal uses of the area, and corresponding Corps involvement in helping address water resource needs, whether related to coastal storm damage reduction, navigation, or ecosystem restoration and other environmental considerations. Other parts of the site describe the different types of coasts and relevant processes - information typically missing from other coastal websites, but relevant to Corps coastal work and coastal management more broadly. There is also discussion of "sharing the coast," and "the Corps and the Coast." Take a look!
*http://www.iwr.usace.army.mil/coasts/*

The Institute for Water resources has also developed a website on its climate change related activities. The "Responses to Climate Change" website, *http://www.iwr.usace.army.mil/inside/products/climatechange/index.cfm*, has information on news concerning the program, interagency activities, USACE guidance, and links to other agencies and organizations.

## PROSPECT Courses FY 2010

| No. | Title | Dates | Location |
|---|---|---|---|
| 13 | Coastal Engineering | 22-26 Feb 2010 | Vicksburg, MS |
| 394 | Advanced Streambank Protection | 5-9 Apr 2010 | Grenada, MS |
| 11 | Coastal Project Planning | 19-23 Apr 2010 | Duck, NC |
| 270 | Economic Analysis | 19-23 Apr 2010 | Alexandria, VA |
| 123 | Flood Frequency Analysis | 17-21 May 2010 | Davis, CA |
| 11 | Coastal Project Planning | 30 Aug – 3 Sep 2010 | Duck, NC |

**Additional Information:** *http://pdsc.usace.army.mil/downloads/PurpleBook2010.pdf*

# Conferences

*This listing is for information only and is not a complete list of FRM-related meetings. These meetings are not endorsed by the Corps of Engineers unless specifically stated.*

16 – 20 Feb 2010 – International Erosion Control Association – Dallas, TX
*http://www.ieca.org/conference/annual/ec.asp*

9-11 Mar 2010 –"America's Coast: Becoming an Administration Priority" – ASBPA Coastal Summit 2010 – Washington, DC *http://www.asbpa.org*

13 – 20 Mar 2010 – Interdisciplinary Climate Change Research Symposium – Saguaro Lake Ranch, AZ *http://www.disccrs.org/symphelp.html*

24 -26 Mar 2010 - International Drought Symposium: Integrating Science and Policy – Riverside, CA *http://cnas.ucr.edu/drought-symposium*

29 – 31 Mar 2010 – 2010 American Water Resources Association Spring Specialty Conference "Geographic Information System (GIS)" and Water Resources VI – Orlando, FL
*http://www.awra.org/meetings/Florida2010/*

25–28 April 2010 — Ports 2010, Jacksonville, FL *http://content.asce.org/conferences/ports2010/*

28 – 29 Apr 2010 – Water & Environment 2010 – CIWEM Annual Conference – London, England *http://www.ciwem.org/events/annual_conference*

16–21 May 2010 — Association of State Floodplain Managers 34th Annual National Conference, "Building Blocks of Floodplain Management," Oklahoma City, OK
*http://www.floods.org/*

18 – 20 May 2010 - River Management Society and National Association of Recreation Resource Planners 2010 Symposium "Bridging Conservation and Recreation" – Portland, OR
*http://www.river-management.org/symposium-2010/home.htm*

26 – 28 May 2010 – FRIAR 2010 - Second International Conference on Flood Recovery Innovation and Response – Milano, Italy *http://www.wessex.ac.uk/10-conferences/friar-2010.html*

7 – 10 June 2010 – National Planning Community of Practice Conference, "Planning Smart, Building Strong" – Orlando, FL
*http://www.usace.army.mil/CECW/PlanningCOP/Pages/2010_plnconf.aspx*

27 June – 1 July 2010 — Joint Federal Interagency Conference – 9th Federal Interagency Sedimentation Conference (FISC) and 4th Federal Interagency Hydrologic Modeling Conference (FIHMC). Las Vegas, NV *http://www.jfic2010.org/*

30 June – 5 July 2010 — International Conference on Coastal Engineering, Shanghai, China *http://www.icce2010.cn/*

18 – 19 Aug 2010 – Aquaculture Engineering Society Issues Forum – Roanoke, VA *gboard@vt.edu*

23–27 August 2010 — Watershed Management Conference, "Innovations in Watershed Management under Land Use and Climate Change," Madison, WI *http://content.asce.org/conferences/watershedmanagement2010/index.html*

17 – 20 Oct 2010 – DELTAS2010 – New Orleans, LA *http://www.americaswetland.com/article.cfm?id=1056&cateid=1&pageid=3*

2 – 5 Nov 2010 – Floodplain Management Annual Conference – Henderson, NV *http://www.floodplain.org/conference.php*

13 – 17 Nov 2010 – Fifth National Conference on Coastal and Estuarine Habitat Restoration Galveston, TX – *http://www.estuaries.org/conference*

5–9 September 2011 — Coastal Structures 2011, Yokohama, Japan *http://www.jsce.or.jp/committee/ocean/coastalstructures/*

## Subscribe – Unsubscribe – Feedback

To subscribe/unsubscribe: *http://operations.usace.army.mil/flood.cfm*.

We would love your input – recommended article length is ½ to 1 page. Articles should be submitted to Doyle L. Jones, Canvassing Editor, Doyle.L.Jones@usace.army.mil.

Also, we would appreciate your feedback. Contact Dinah McComas, Managing Editor, Dinah.N.McComas@usace.army.mil or Doyle Jones.