

# CLEAR CREEK

5259 The Clear Facts on

February 2004

Eco-Friendly Flood Damage Reduction

[www.clearcreekproject.com](http://www.clearcreekproject.com)

## Project History

The US Army Corps of Engineers (Corps) is preparing a General Reevaluation Report (GRR) addressing opportunities to reduce flood damages in the Clear Creek watershed. The Corps has recommended two different Federal flood damage reduction projects for Clear Creek in the past. The Clear Creek Flood Control Project was authorized by Congress in 1968 including conditions of authorization stipulated by the Secretary of the Army that the recommended plan be reviewed during preconstruction planning and modified to achieve the most reasonable balance between structural modification of the creek, floodplain regulations, and a broad program of floodplain management. The preconstruction planning study found that there was a lack of broad public support for the authorized project because of loss of trees and aesthetics and therefore the studies included extensive reformulation efforts. The authorized plan was to offer a 100-year level of protection and extended from FM 2234 in Fort Bend County to the mouth of Clear Lake. The plan resulting from the preconstruction planning study, completed in 1982, recommended a reduced project from Mykawa Road in Brazoria County to the mouth of Clear Lake providing a 10-year level of protection.

**1962** – Flood Control Act of 1962 authorized the Corps to study flood damage reduction on Clear Creek.

**1968** – A flood damage reduction project involving channelization was authorized by Congress. Due to concerns with impacts, additional studies were recommended.

**1972-1974** – Post-authorization studies were begun and public meetings were held.

**1982** – Second flood damage reduction project recommended in a Post-authorization Planning Report.

**1986** – The Corps, Harris County Flood Control District (HCFCD), and Galveston County sign a Local Cooperation Agreement making HCFCD and Galveston County local sponsors of the project.

**1991** – The second outlet control structure on Clear Lake is completed.

**1997** – The second outlet channel on Clear Lake is completed.

**1997** – Local sponsors recommend an alternative flood damage reduction plan to the Corps addressing public opposition to channelization.

**1999** – Corps agrees to re-evaluate the Clear Creek Project and begins work on the General Reevaluation Report (GRR).

**2001** – Corps and local sponsors agree to add the tributaries of Clear Creek, expanding the scope of the study to the watershed at large.



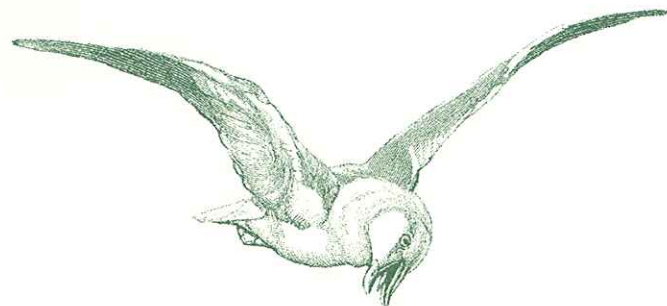
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BAY COLLECTION

# PROJECT GOALS

- Identifying and recommending an effective, affordable and environmentally sensitive Federal flood damage reduction project for Clear Creek.
- Conducting necessary engineering, economic, and environmental studies in a timely manner in order to establish a viable project that is acceptable to the public, local sponsors and the U. S. Army Corps of Engineers.

## PROJECT OBJECTIVES

- Reduce riverine flood damages along Clear Creek and its tributaries.
- Maximize the net economic benefits of any identified Federal flood damage reduction project.
- Avoid adverse environmental impacts when possible. Minimize and mitigate unavoidable adverse environmental impacts.
- Recognize and consider the existing aesthetic qualities of Clear Creek.
- Identify recreational opportunities.
- Preserve cultural resources. Minimize and mitigate unavoidable impacts to these resources.
- Identify possible eco-friendly flood damage reduction solutions.
- Identify any possible ecosystem restoration opportunities.



## How does a Federal flood damage reduction project like the Clear Creek Project obtain funding?

The process for developing a Federal flood damage reduction project begins when local interests see a need for flood protection and ask Congress for help. Congress directs the Corps to perform a study to see if a project is warranted.

The Corps usually studies a flood damage reduction project in two phases. First, they perform an initial study to see if there is any opportunity for flood damage reduction. If a feasible opportunity is identified, a second more-detailed study is performed to examine flood damage reduction alternatives and recommend a project that best meets national and local needs.

Most studies are cost-shared with local sponsors. In this case, Harris County Flood Control District, Galveston County, and Brazoria Drainage District #4 are cost-sharing sponsors.

If studies conclude that a flood damage reduction solution is feasible, Congress may authorize the project and appropriate funds to construct it. Most projects are constructed with a combination of Federal funds and contributions from local sponsors.

In order for Congress to authorize and fund a project, detailed scientific studies must demonstrate the project's effectiveness and prove that it is a good economic investment for the nation. Studies involve hydrologic and hydraulic, economic, and environmental analysis. The studies follow a logical, prescribed process that the Corps calls "The Planning Process".

## WHO IS INVOLVED IN THE CLEAR CREEK GRR?



US Army Corps  
of Engineers®  
Galveston District



LEAD SPONSOR

LOCAL SPONSORS



## Steps in The Planning Process

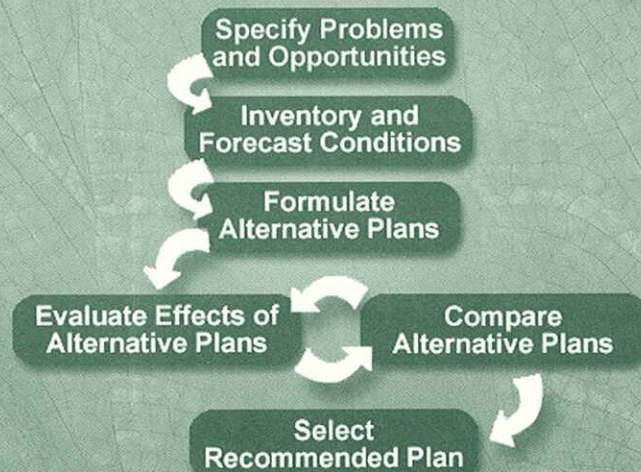
The Corps' Planning Process has six steps. First, the problem must be defined. In the case of Clear Creek, the primary problem is repeated flooding of structures (homes and businesses) during high water events. Another aspect of the problem is that Clear Creek is a valuable environmental and recreational resource.

Second, existing conditions in the project area must be well defined and understood. This involves performing a great deal of data collection. Examples of the types of data required include topographic data, water flow data, data that assists in understanding the physical characteristics of the stream, and data on the number of structures in the floodplain and their economic value. A variety of environmental studies are also conducted, including an inventory of habitats that could potentially be affected by flood damage reduction measures.

The combined results of these studies establish what is known as the "Without Project Condition." This represents the baseline against which any potential flood damage reduction solution is measured. Also, since the planning horizon is 50 years after project implementation, the future of the study area is projected using scientific methods based on current and future expected growth patterns. The projected future condition is called the "Future Without Project Condition." The "Without Project Condition" tells the planner the extent and magnitude of the damages to structures and other investment in the floodplain as well as where various forms of ecological resources exist in the floodplain. Knowing this information allows the planner to develop solutions to reduce flood damages and to identify the environmental consequences of those solutions.

Next, an array of both structural and non-structural flood damage reduction measures are considered and screened. In the case of Clear Creek, examples of these measures include such things as conveyance improvements, detention basins, by-pass channels, buyouts, bridge widenings, and floodplain management practices. The measures are specific to different areas along the creek, because a measure that may be effective or acceptable in one location may not be an effective tool for another location on the creek.

### Six Step Planning Process

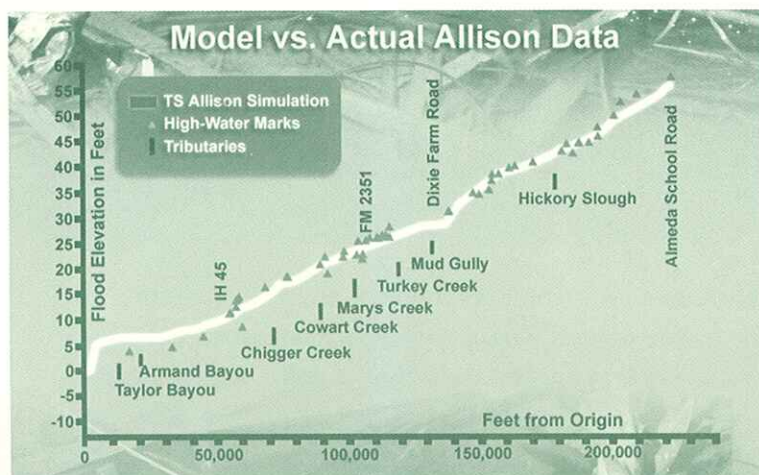


Measures are then evaluated using hydrologic and hydraulic models. These models are prepared specifically for Clear Creek using data that is collected to establish the "Without Project Condition". They simulate what would happen if a measure were implemented. For example, the models representing the creek could be run as though a detention basin were in place in a general location along the creek. The models predict what the water elevation would be for the entire creek during a rainfall event if the detention basin were constructed.

The models can help predict which measures are mechanically effective and economically efficient in solving the flood damage problem. Solutions must produce more monetary benefits than costs to be considered economically efficient. The measures that do the most economical and efficient job of reducing damages are selected for the project plan and become "anchor" components. Once these "anchors" are identified, more measures are modeled and added to the plan until no more economically efficient solutions can be found. All the components that make up the solution are then presented as the most economical plan called the National Economic Development, "NED," plan. The NED Plan sets the engineering performance requirements for any other plans that might be developed. The NED plan also demonstrates the extent of Federal funding. Another plan may be formulated and recommended to Congress for implementation, but it must have at least the same engineering performance as the NED plan, although it may cost the local sponsor more money. That plan is called the "Recommended Plan" or the "Locally Preferred Plan."

# Are the models used for the Clear Creek Project Accurate?

The models simulating flooding along Clear Creek were compared to actual high water marks observed during Tropical Storm Allison. The comparison proved that the models are very accurate.



## What is a "structural" flood damage reduction tool?

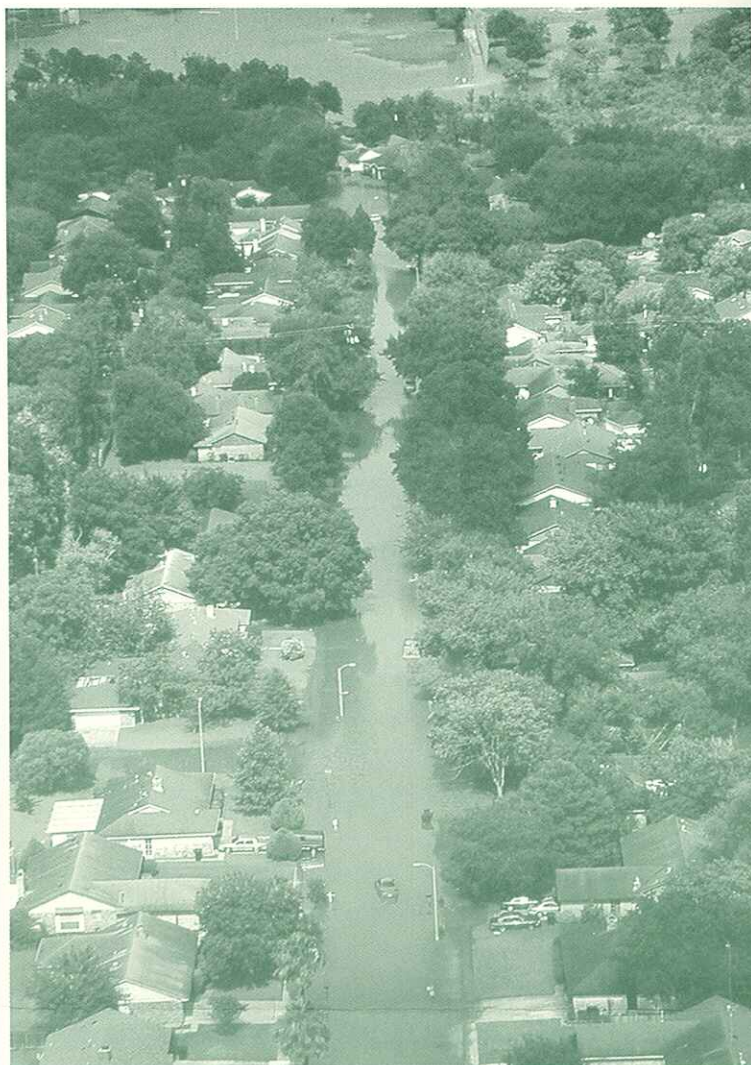
The types of measures that are considered "structural" flood damage reduction tools are those that would result in an actual lowering of water elevations during an extreme storm event. Examples of these types of tools for flood damage reduction include:

- Conveyance improvement
- Detention basins
- By-pass channels
- Bridge widenings
- Levees or flood walls
- New outlets

## What are "non-structural" flood damage reduction tools?

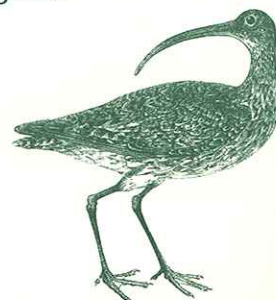
"Non-structural" tools are measures that change the potential for damages caused by flood events or by removing structures from the floodplain or floodway. These types of measures include:

- Buyouts
- Raising structures
- Flood-proofing structures
- Floodplain management and regulation
- Flood alerts

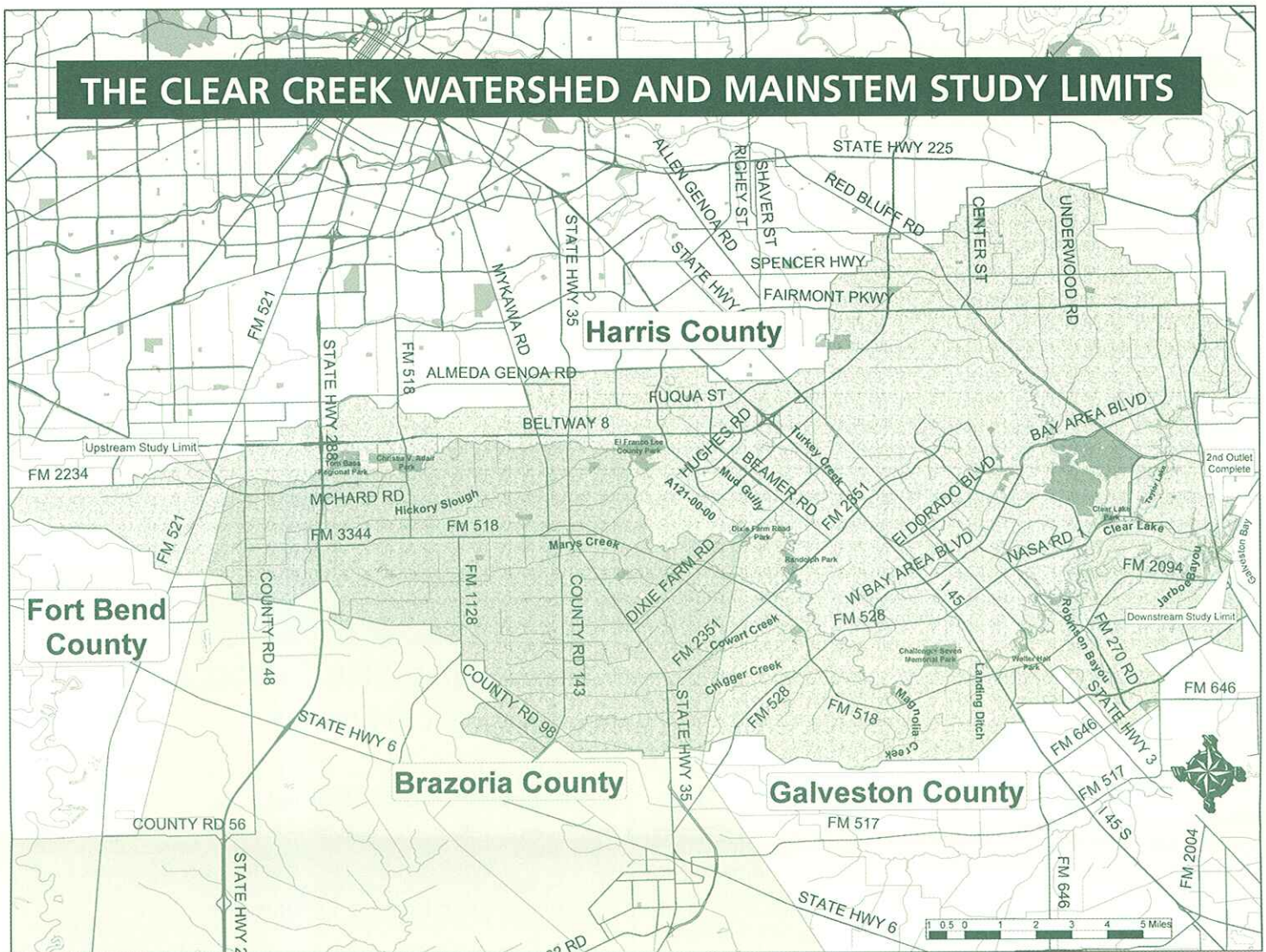


## Floodplain Management Planning

The Clear Creek Steering Committee is currently reviewing guidance and requirements for preparing a Floodplain Management Plan designed to preserve the level of flood damage reduction protection resulting from any Federal project that may be constructed. The plan must be implemented within one year after the flood damage reduction project is complete. The Federal requirement for this plan protects the significant financial investment that must be made by the nation's taxpayers to build a project. The Corps and local sponsors are providing input and information to the Steering Committee as the plan is designed.



## THE CLEAR CREEK WATERSHED AND MAINSTEM STUDY LIMITS



## A List of Initial Flood Damage Reduction Measures Being Evaluated and Considered

- Conveyance Improvement from Stone Road to Bennie Kate
- Offline Detention in the area from SH 288 to Alameda School Rd.
- Offline Detention in the area from Country Club Dr. to Bennie Kate
- Linear Detention in the area from SH 288 to Alameda School Rd.
- Expanding Existing Detention at David L. Smith Detention Site
- Expanding Existing Detention at HCFCF Detention Basin A521-02-00
- Remove Dredged Material/Deepen for Conveyance
- Detention on Mud Gully
- Detention on Turkey Creek
- Detention on Marys Creek
- New High-Flow Bypass in the area from 2351 to Dixie Farm Rd.
- Expand Existing Detention on Chigger Creek
- Expand Existing Detention on Cowart Creek
- Enlarge High-Flow Bypasses in the area from Whispering Pines to near Marys Creek
- Widen I-45 Bridge Opening
- Buyouts
- Floodplain Management Planning
- Conveyance Improvement from SH 288 to Stone Road
- Linear Detention along Marys Creek
- Linear Detention along Cowart Creek
- Additional Flow Capacity out of Clear Creek (Second Outlet)

# FAST FACTS

1700 structures would be damaged by a 1% exceedance probability (100-year) flood.

The value of these structures alone exceeds \$115 million, not counting the value of the land on which they are located.

The 1% exceedance floodplain, or 100-year floodplain, means that there is a 1% chance of flooding in that location in any single year.

## Assessing Potential Environmental Impacts

Before the environmental impacts of any flood damage reduction measure can be evaluated, the baseline environmental condition must be understood. For the Clear Creek GRR, a new Environmental Impact Statement (EIS) is being prepared. The environmental inventory, or description of the existing environment, has been completed. Data collected for the EIS includes:

- Water Quality
- Climate
- Sediment Quality
- Vegetation Communities (Habitats)
- Fish and Wildlife Resources
- Threatened and Endangered Species
- Geology
- Physiography
- Hazardous, Toxic, and Radioactive Wastes
- Socioeconomic Resources
  - Population, Employment, Community Cohesion
  - Environmental Justice, Economy,
  - Land Use, Flooding
- Cultural Resources
- Hydrology

## COMPLETION DATE FOR THE STUDY

The goal for completion of the Clear Creek General Reevaluation Report is July 2005.

## What does the project economist do?

The economist translates changes in water surface profiles into changes in dollar damages based on an inventory of damageable property with the flood impact area.

In order to accomplish this, the number and location of homes and businesses in flood prone areas is determined along with the value of those structures. Using the hydrologic and hydraulic models, flood damage reduction measures are evaluated based on their effectiveness at lowering the water level enough to significantly reduce the damage to structures that would flood during predicted high water events. The economist calculates how much money would be saved if that flood damage reduction measure were implemented.

## Calculating the Flood Damage Reduction Benefit

To calculate the potential flood damage reduction benefit, use this simple formula:

$$\begin{array}{r} \text{Without Project Condition \$\$ Damages} \\ \text{(minus) - With Project \$\$ Damages} \\ \hline = \text{Net Benefit or Flood Damage} \\ \text{Reduction Benefit} \end{array}$$

## Interagency Coordination Team

The Interagency Coordination Team consists of members of several state and Federal agencies and was formed to provide environmental advice and assistance to the Study Team as flood damage alternatives are investigated. The team consists of:

- U.S. Army Corps of Engineers
- Harris County Flood Control District
- Galveston County
- Brazoria Drainage District #4
- U.S. Fish and Wildlife Service
- Natural Resource Conservation Service
- National Marine Fisheries Service
- Environmental Protection Agency
- Texas Park & Wildlife Department

## Restored Prairie - Before and After



Chinese Tallow trees, an invasive species, were removed from this prairie. - Armand Bayou Nature Center, 1999



Native prairie grasses recovered after the trees were removed. - Armand Bayou Nature Center, 2003

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### What is Ecosystem Restoration?

Plant communities and wildlife habitats that have been degraded by agricultural practices, invasive species, subsidence or other processes can be restored or enhanced. Examples would be replanting a forest that has been cleared, restoring native tall-grasses to a pasture that was once a native prairie, and restoration of a salt marsh lost to subsidence.

### Facts on Ecosystem Restoration Opportunities

Federal funds can be devoted to ecosystem restoration within the flood damage reduction study area. Ecosystem restoration requires a cost-sharing co-sponsor. Cost-shared monies must come from a separate non-federal source.

Ecosystem restoration opportunities in the Clear Creek watershed exist independent of the flood damage reduction project.

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### Types of Ecosystem Restoration Being Evaluated

- Restoration of Floodplain Forests
- Restoration of Degraded Prairies
- Restoration of Salt Marsh
- Preservation of Existing High Quality Habitats

### What is Eco-friendly Flood Damage Reduction?

Eco-friendly flood damage reduction involves the use of measures that may enhance habitats along Clear Creek and its tributaries or enhance water quality in the watershed while reducing flood damages. An example would be building a detention basin designed to remain permanently wet versus a basin that would only hold water during a flood event. A permanently wet basin can support vegetation capable of serving two purposes: wildlife habitat and water quality enhancement. Wetland plants growing in this type of feature uptake potential water pollutants and reduce the amount of sediment that enters the creek.

# WHAT'S NEXT?

Evaluation of the location, number and value of structures along the tributaries is being completed. The first round of hydrologic and hydraulic modeling for the flood damage reduction measures being considered for the main stem has also been completed, and the Study Team is currently assessing which measures may serve as anchor components.

## Next steps include:

- Complete assessments of habitats that could potentially be impacted by flood damage reduction measures.
- Identify ecosystem restoration co-sponsors.
- Select the measures that will serve as "anchors" and evaluate added measures that will contribute to a systems solution.
- Evaluate combinations of measures that do the best job of reducing flood damages.

## STAY INFORMED

- Visit the Clear Creek Project web site at [www.clearcreekproject.com](http://www.clearcreekproject.com)
- Attend open houses and public meetings.
- Watch for Clear Creek Update mailers in your mailbox.
- Check your local weekly newspaper for project newsletters.

## SUBMITTING COMMENTS

- Complete a comment card at any public meeting or open house.
- Send written comments to:

Robert Heinly  
U. S. Army Corps of Engineers  
Clear Creek Planning Lead  
P. O. Box 1229  
Galveston, Texas 77553-1229

Submit your comments via the project web site at

[www.clearcreekproject.com](http://www.clearcreekproject.com)

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